

**SUMMATIVE ASSESSMENT OF POSTGRADUATE
RADIOLOGY TO ENSURE QUALITY IN THE PROFESSION**

By

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**Thesis submitted in fulfilment of the requirements for the degree
Philosophiae Doctor in Health Professions Education**

Ph.D. HPE

in the

DIVISION HEALTH SCIENCES EDUCATION

FACULTY OF HEALTH SCIENCES

UNIVERSITY OF THE FREE STATE

BLOEMFONTEIN

JANUARY 2016

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DECLARATION

I hereby declare that the work submitted in this thesis is the result of my own independent research. Where help was required, it is acknowledged as such. I further declare that this work is submitted for the first time at this university/faculty towards a Philosophiae Doctor degree in Health Professions Education and that it has never been submitted to any other university/faculty for the purpose of obtaining a degree.

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DEDICATION

First, I would like to dedicate this thesis to my mother, Christina Hurter, who loves me, dressed me, fed me, nursed me and has the wisdom to realise that education is the only way to create opportunities for her children, so that they would be able to care for their families when it became their own responsibility. We never had much, but we always had enough. She taught us that our hard work will be commended by our superiors. It is through her influence that I can analyse information critically and search for the truth. Thank you, Mom, for your continued support and motivation throughout my life, even to this day.

Secondly, I dedicate this work to my father, Isak Hurter, who is the foundation and pillar that carried our family through the years. You proved to the world that, even from humble beginnings, with very few or no opportunities in life, one can create something special. Your life's work and dedication has always been to God. Everything you ever did was built and decided around this divine entity. Even though you have now forgotten most of life, sometimes even forgetting me, our family and our existence, you still remember God. Your unwavering faith is a rock for us all.

Furthermore, I dedicate this thesis to my children, Mian, Delanu and Wybrandt. You are my life. Because of you I learned that so many things are unimportant. You help me daily to become a better father. Thank you for being patient whenever I had to do my "homework". I love you with my whole being. I will always be there to guide you to live your lives to the fullest and become whoever, whatever and wherever your dreams may involve.

Finally, I dedicate this work to the one person without whom I would not have been. Sunette, you are my wife, my friend, my companion, my soulmate in life. We have lived through many challenges and have survived. You have given me the impossible. We have taken turns to carry one another and we have become a formidable team that contributes to so many things in society. You are living proof that life is worth fighting for. No fate is accepted without a fight, not even death. Challenges become opportunities. Thank you for listening, motivating and just plain being next to me at all times. We have come thus far. What will we attempt next? We will nurture our children, as always.

ACKNOWLEDGEMENTS

I want to take the opportunity to acknowledge the following people, without whom this work would not have been possible.

- My promoter, Professor Gert van Zyl, dean, Faculty of Health Sciences, University of the Free State. Your eye for detail amazes me time and again. Thank you for your continued patience and constant support throughout a very busy schedule.
- My co-promoter, Professor Marietjie Nel, Division of Health Professions Education (HPE), Faculty of Health Sciences, University of the Free State. Thank you for giving me the opportunity to complete my Ph.D. in HPE and for being willing to help any time of the day, to give advice and to guide me.
- My co-promoter, Professor Coert de Vries, Department of Clinical Imaging Sciences, Faculty of Health Sciences, University of the Free State. Thank you for always thinking out of the box and coming up with solutions and suggestions when I thought that I had reached a dead end.
- Dr Johan Bezuidenhout, Division of Health Professions Education, Faculty of Health Sciences, University of the Free State. Thank you for your valued support and willingness to jump in and seek help where I could not.
- The support staff at the Division of Health Professions Education, Faculty of Health Sciences, University of the Free State, Elmarie Roberts and Cahrin Bester, for your constant support and patience.
- My language editor, Hettie Human, for having the eyes of an eagle, the patience of a saint and the fervour to deliver to deadline.
- My registrars and medical officers at the Department of Clinical Imaging Sciences, Kimberley Hospital Complex, Northern Cape. Thank you for keeping the department functional without wavering on the standard of service we render, and allowing me the time to complete this thesis.
- The respondents who participated in this study: without your valued input in this research, this work would have been impossible to complete.
- To my brothers, Marius, Anton and Christo, who supported me throughout this time: thank you for motivating me whenever I needed it.

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LIST OF ACRONYMS

ABR	American Board of Radiology
ABIM	American Board of Internal Medicine
ACGME	Accreditation Council for Graduate Medical Education
AfriMEDS	African Medical Education Directions for Specialists
ANTA	Australian National Training Authority
BLS	Basic life support
BRRAT	Bristol Radiology Report Assessment Tool
CanMEDS	Canadian Medical Education Directions for Specialists
CAR	Canadian Association of Radiologists
CaRMS	Canadian Resident Matching Service
CAT	Critically appraised topic
CATs	Critically appraised topics
CBE	Community-based education
CHE HEQC	Council on Higher Education, Higher Education Quality Committee
CME	Continuing medical education
CMSA	The Colleges of Medicine of South Africa
CPD	Continued professional development
CR (CMSA)	The College of Radiologists of South Africa
CT	Computed tomography
CV	Curriculum vitae
EFPO	Educating Future Physicians for Ontario
e-MCQ	Electronic multiple-choice question
EMQs	Extended matching questions
EPOC	Effective Practice and Organisation of Care
ERIC	Education Resources Information Center
ESR	European Society of Radiology
ETQA	Education and Training Quality Assurance Body
FC Rad Diag(SA)	Fellowship of the College of Radiologists of South Africa
GMC	General Medical Council
GPS	Global positioning system
HOD	Head of department
HODs	Heads of departments

HPCSA	Health Professions Council of South Africa
IT	Information technology
KF	Key feature
MCQ	Multiple choice question
MCQs	Multiple choice questions
MD	Medical doctor
MDT	Multidisciplinary Teamwork
MEDINE	Medical Education in Europe
MEQ	Modified essay question
MEQs	Modified essay questions
Mini-IPX	Mini-Imaging Interpretation Exercise
M.Med.	Magister in Medicine
MOC	Maintenance of Certification
MRI	Magnetic resonance imaging
MSF	Multi-source feedback
MTFs	Multiple true-false questions
NQF	National Qualifications Framework
NRF	National Research Foundation
OBE	Outcome-based education
OBEI	Outcome-based education inventory
OSCE	Objective structured clinical examination
OSCEs	Objective structured clinical examinations
PACS	Picture Archiving and Communication System
PGY	Postgraduate year
Rad-DOPS	Radiology Direct Observation of Procedural Skills
RANZCR	The Royal Australian and New Zealand College of Radiologists
RCPSC	The Royal College of Physicians and Surgeons of Canada
RCR	The Royal College of Radiologists
RIS	Radiology Information System
RISE	Radioisotope Safety Exam
R-ITI	Radiology-Integrated Training Initiative
RSSA	Radiological Society of South Africa
SAQA	South African Qualifications Authority
SAQs	Short-answer questions
SASSETA	South African Safety and Security Education and Training Authority

SNWG	Societal Needs Working Group
TFQs	True-false questions
TLAs	Teaching and learning activities
UFS	University of the Free State
UPS	Uninterruptible power supply
WPBA	Workplace-based assessment

SUMMARY

Key terms: assessment training, competence, feedback, guidelines for assessors, knowledge, patient safety, quality assurance, quality in the profession, radiology, roles, semi-structured interviews, skills, summative assessment, teaching and learning activities.

The College of Radiologists of South Africa (CR CMSA) is responsible for conducting the summative assessment of radiologists. With summative assessments being completed biannually it is important to provide directive documentation to ensure the reliability of consecutive summative assessments, and quality in the profession. The lack of clear guidelines for assessors and moderators of the summative assessment in postgraduate radiology and the lack of an assessment qualification to become an assessor prompted investigation and is the reason for this research.

An in-depth study was done by the researcher to construct a directive for summative assessment in postgraduate radiology to ensure quality in the profession and to propose guidelines for assessors and moderators of the summative assessment, as well as guidelines for candidates who are preparing for the summative assessment. The objectives of this study included conceptualising and contextualising the lack of directive documentation for summative assessment in radiology, identifying the factors that play a role in the summative assessment of postgraduate students in radiology, identifying the factors that play a role in the preparation for summative assessment in radiology, determining guidelines for assessors and moderators and, finally, constructing a directive for summative assessment in postgraduate radiology.

A qualitative research design was followed to address the research objectives. As basis for the study in-depth theoretical perspectives were gathered to conceptualise and contextualise summative assessment in radiology. A number of teaching and learning activities were identified from the theoretical perspectives; these activities can be used to prepare for summative assessment.

Individual semi-structured interviews were conducted with interviewees, who fell in two target groups. The first group, as "providers" of the summative assessment, included assessors and moderators of the radiology summative assessment. The second group, as "users" of the summative assessment, included candidates who were within one year post

summative assessment. Interviews were conducted with interviewees in both groups until the data became saturated. The findings of the interviews were tabulated according to themes, categories and subcategories that emerged from the interviews with all the interviewees. The researcher discusses and summarises all findings in the thesis. The findings were triangulated between the two groups as well as with the theoretical perspectives to contribute to the trustworthiness of the study.

This study addresses current shortcomings, for example, limited feedback to candidates and the lack of guidelines for selecting assessors and moderators who are involved in the assessment. The study also addresses assessment training of assessors and moderators of the radiology summative assessment. Various instruments and tools were identified for use in radiology summative assessment and for adding value to radiology training through guidance to candidates on how to prepare for the summative assessment. Criteria for identifying a candidate's readiness for the summative assessment and criteria for being a competent radiologist were discussed.

Summative assessment is the final step for any candidate to be certified a safe radiologist who is deemed competent to practice radiology independently. A safe radiologist needs to demonstrate general radiology knowledge, skills, roles and competencies as identified from the study, and must have the ability to manage any scenario encountered by a general radiologist. The competent radiologist should know to consult for guidance when needed and practice lifelong learning.

The gap in knowledge that was addressed was the lack of directive documentation that is needed to guide assessors and moderators to repeatedly certify safe, competent radiologists.

The researcher presents guidelines for assessors and moderators to ensure the quality of the assessment instrument and tools, the assessment process and the profession, as well as guidelines for candidates on preparing for the summative assessment. Heads of departments are presented with guidelines on when to present a candidate for the summative assessment; convenors are presented with guidelines on how to conduct the assessment, and assessors and moderators are presented with criteria for identifying competent radiologists.

OPSOMMING

Sleuteltermes: assesseringsopleiding, bevoegdheid, terugvoer, riglyne vir assessore, kennis, pasiëntveiligheid, gehalteversekering, gehalte in die professie, radiologie, rolle, semigestruktureerde onderhoude, vaardighede, summatiewe assessering, onderrig-en-leeraktiwiteite.

Die College of Radiologists of South Africa (CR CMSA) is verantwoordelik vir die afneem van die summatiewe assessering van radioloë. Aangesien summatiewe assessering sesmaandeliks plaasvind, is dit belangrik om rigtinggewende dokumentasie te verskaf om die betroubaarheid van opeenvolgende summatiewe assesserings en gehalte in die professie te verseker. Die afwesigheid van duidelike riglyne vir assessore en moderatore van die summatiewe assessering in nagraadse radiologie, en die afwesigheid van 'n assesseringskwalifikasie vir voornemende assessore, het aanleiding gegee tot die ondersoek en is die rede vir hierdie navorsing.

Die navorser het 'n dieptestudie uitgevoer om 'n gids vir summatiewe assessering van nagraadse radiologie saam te stel, om gehalte in die professie te verseker en om riglyne vir assessore en moderatore van die summatiewe assessering, sowel as riglyne vir kandidate wat voorberei vir die summatiewe assessering, voor te stel. Die doelwitte van hierdie studie het ingesluit die konseptualisering en kontekstualisering van die afwesigheid van rigtinggewende dokumentasie vir summatiewe assessering in radiologie, identifisering van faktore wat 'n rol speel in die summatiewe assessering van nagraadse studente in radiologie, die identifisering van faktore wat 'n rol speel in die voorbereiding vir summatiewe assessering in radiologie, die bepaling van riglyne vir assessore en moderatore en, laastens, die saamstel van 'n gids vir summatiewe assessering in nagraadse radiologie.

'n Kwalitatiewe navorsingsontwerp is gevolg om die navorsingsdoelwitte aan te spreek. As basis van die studie is diepgaande teoretiese perspektiewe versamel om summatiewe assessering in radiologie te konseptualiseer en kontekstualiseer. 'n Aantal onderrig-en-leeraktiwiteite, wat ter voorbereiding vir die summatiewe assessering gebruik kan word, is ook uit die teoretiese perspektiewe geïdentifiseer.

Individuele semigestruktureerde onderhoude is uitgevoer met ondervraagdes wat in twee teikengroepe geval het. Die eerste groep, as "verskaffers" van die summatiewe assessering, het assessore en moderatore van die summatiewe assessering ingesluit. Die tweede groep, "gebruikers" van die summatiewe assessering, het kandidate wat binne die afgelope jaar die summatiewe assessering afgelê het, behels. Onderhoude is met ondervraagdes in albei groepe gevoer totdat die data versadig was. Die bevindinge van die onderhoude is getabuleer volgens die temas, kategorieë en subkategorieë wat uit die onderhoude met al die ondervraagdes tevoorskyn gekom het. Die navorser bespreek en som al die bevindinge in die tesis op. Die bevindinge is tussen die twee groepe sowel as met die teoretiese perspektiewe getrianguleer, en dit dra tot die geloofwaardigheid van die studie by.

Hierdie studie het die huidige tekortkominge, byvoorbeeld, beperkte terugvoer aan kandidate en die afwesigheid van riglyne vir die seleksie van assessore en moderatore wat by die assessering betrokke is, aangespreek. Die studie het ook aandag geskenk aan opleiding van assessore en moderatore van die radiologie summatiewe assessering. Verskeie instrumente en hulpmiddels is geïdentifiseer vir gebruik in radiologie summatiewe assessering, en vir toegevoegde waarde vir radiologie-opleiding deur leiding aan kandidate ten opsigte van hoe om vir die summatiewe assessering voor te berei. Kriteria vir die vasstelling van 'n kandidaat se gereedheid vir die summatiewe assessering, sowel as kriteria om 'n bevoegde radioloog te wees, is bespreek.

Summatiewe assessering is die finale stap vir enige kandidaat voor hy/sy as 'n veilige radioloog, wat beskou word as bekwaam om radiologie onafhanklik te beoefen, gesertifiseer word. 'n Veilige radioloog moet algemene radiologiekennis, -vaardighede, -rolle en -bevoegdhede kan toon, soos deur die studie geïdentifiseer, en moet die vermoë hê om enige scenario wat van 'n algemene radioloog vereis word, te kan hanteer. Die bevoegde radioloog moet weet hoe om ander te raadpleeg vir leiding wanneer hy/sy dit nodig het, en moet lewenslange leer beoefen.

Die kennisgaping wat aangespreek is, is die afwesigheid van rigtinggewende dokumentasie wat nodig is om leiding te verskaf aan assessore en moderatore, sodat hulle herhaaldelik veilige, bevoegde radioloë kan sertifiseer.

Die navorser bied riglyne vir assessore en moderatore om die gehalte van die assesseringsinstrumente en -hulpmiddels, die assesseringsproses en die professie te verseker, sowel as riglyne vir kandidate ten opsigte van voorbereiding vir die summatiewe assessering. Riglyne vir departementshoofde word voorgestel vir wanneer om 'n kandidaat vir die summatiewe assessering in te skryf; riglyne vir sameroepers behels die wyse waarop die assessering aangebied moet word, en riglyne vir assessore en moderatore word voorsien met kriteria om bevoegde radioloë te identifiseer.

SUMMATIVE ASSESSMENT OF POSTGRADUATE RADIOLOGY TO ENSURE QUALITY IN THE PROFESSION

CHAPTER 1

ORIENTATION TO THE STUDY

1.1 INTRODUCTION

In this research project, an in-depth study was done by the researcher with a view to constructing a directive for summative assessment of student learning in postgraduate radiology, to ensure quality in the profession and to propose guidelines for assessors and moderators, as well as students preparing for the summative assessment.

The Colleges of Medicine of South Africa (CMSA) is currently acknowledged by the Health Professions Council of South Africa (HPCSA) as the official national examining body by contract for specialists in South Africa (Bothma 2013:20). The CMSA is one of its kind globally because its Colleges cover all the disciplines of medicine and dentistry (Wikipedia 2014:Online). The College of Radiologists of South Africa (CR (CMSA)) is responsible for the summative assessment of radiologists. The assessment regulations are contained in the "Regulations for Admission to the fellowship of the College of Radiologists of South Africa" (CR (CMSA) 2013:7). The competencies required of radiologists are clear but the requirements for assessors and moderators are not stipulated.

Searching the respective websites of the CMSA (CMSA 2014a:Online) and the College of Radiologists of South Africa (CR (CMSA) 2014a:Online), the researcher was unable to find any specific guidelines for assessors and moderators of the summative assessment of student learning in postgraduate radiology. The question that comes to mind is whether proper directive documentation and guidelines for assessors and moderators, which are tailor-made for the radiology summative assessment, are currently available.

The researcher is not aware of any proper assessment qualification to be an assessor that is currently required by the CR (CMSA). The aim of this study was to gain a better understanding of summative assessment with a view to making a contribution to summative assessment of student learning in radiology by creating an assessment directive for

postgraduate radiology, including guidelines for assessors and moderators that aim to promote quality assurance in the profession.

This study may function as directive documentation for summative assessment of student learning in postgraduate radiology to provide proper guidelines to assessors and moderators of radiology summative assessment and to address current shortcomings, for example, limited feedback to candidates and a lack of criteria for selecting assessors and moderators for the radiology summative assessment. The study may ensure quality in the profession by providing guidance to assessors and moderators, and identifying the different methods, instruments and tools to be used in radiological summative assessment. The study will add value to training in radiology by contributing to effective preparation for summative assessment.

The purpose of Chapter 1 is to familiarise the reader with the background to the research problem, the problem statement, the research questions, and the overall goal, aim and objectives of the study. It sets out the significance and value of the study, and presents an overview of the research design and methods of investigation. After orienting the reader, the researcher concludes the chapter by presenting an overview of the study and the layout of the chapters in the thesis.

1.2 BACKGROUND TO THE RESEARCH PROBLEM

According to Wilbrink (1997:Online), during the 19th century, assessment developed into the typical structure that characterises it today. Wilbrink suggests that our assessment traditions are inherited from societies, dating back many centuries in humanity's history (Wilbrink 1997:Online). He argues that assessment itself is complex and can be analytically broken down into its content, its origins in medieval university assessments, its instrumental powers to encourage students to study, and its uses as a didactic tool in the hands of the state (establishment) (Wilbrink 1997:Online). Wilbrink observed that, in the past, educational systems primarily served the upper classes of society. He (Wilbrink 1997:Online) posits that, in the 20th century, education moved from benefitting a few rich individuals to "mass education, even extending to mass higher education". The problem that is created and noted as an observation by Willbrink is that the assessment procedures practised by past cultures were handed down to present times and boldly adopted for mass education, leading to major challenges and shortcomings in our current education systems,

creating lower quality of educational life for many candidates (Wilbrink 1997:Online). Wilbrink regards these assessment practices as punishment and as a tool to keep the student focused on studying.

In a traditional assessment system the typical scenario involves the student not knowing beforehand exactly what is required of him or her. This is due to the absence of properly defined exit-level outcomes. The motivation to study is, in actual fact, the fear of failing the examination or test paper (punishment). This leads to a negative perception of assessment among students and possibly suboptimal performance of the candidates.

"Traditionally the purpose of assessment was to measure the level of knowledge acquired by the candidate. The educator was the sole judge with no proper evaluation of the candidate's level of understanding of the study material" (Hurter 2013:3). Meuller, as quoted by Hurter (2013:3), is of the opinion that traditional assessment is limited to eliciting a specific response from the candidate by requiring him or her to recall or recognise facts. He argues that the assessment situation is often removed from real life and that it becomes teacher centred. He continues that, in contrast to traditional assessment, alternative assessment today requires the candidate to perform a task that is real-life based and that needs construction and application of knowledge gained (Meuller 2003:Online).

In South Africa we are challenged to move away from these traditional assessment methods retained from the past. We have progressed in radiology assessment from a dual system that was in place for the Magister in Medicine (M.Med.) summative assessments conducted by the different universities that provide radiology education and the examinations offered by the CR (CMSA), to a single exit examination for radiology in South Africa (Andronikou 2012a:2).

Andronikou (2012a:2) contends that the character and assessment environment of the M.Med. examination created a variety of opinions and led to critique by some, "with allegations of leniency towards poor candidates". The author (Andronikou 2012a:2) is of the opinion that, although external assessors were invited, several factors could lead to the M.Med. assessment being biased, among which the fact that,

- the assessments were conducted locally;
- the examination panel included a larger number of local assessors;
- the convener was local;

- the local examination material that was used may have led to a certain approach to the assessment; and
- the possibility existed that external assessors had to return "goodwill" for the sake of their own candidates.

Andronikou (2012a:2) explains that these were among the reasons for the CR (CMSA)'s review of the assessment process. Today assessors from all academic radiology departments as well as radiologists working in private practice are included in the assessor and moderator body.

The CR (CMSA) has become the examination body for national summative assessment in radiology and is faced with the challenge of hosting an unbiased assessment while incorporating contemporary assessment techniques (Andronikou 2012a:2). This may require the support of an expanded, well-trained assessor and moderator body of which the members are familiar with international assessment methods, instruments and tools (Andronikou 2012a:2).

Because of this change in the summative assessment processes of radiology in South Africa, many different assessment modalities and tools exist; however, they are not structured into specific guidelines for assessors and moderators of the CR (CMSA). Such guidelines are needed for the proper summative assessment of final radiology examination candidates to ensure that they are competent radiologists.

To fulfil its mandate to ensure quality in the profession, the CR (CMSA) needs to prove competency of candidates. Many definitions exist for competency but for the purpose of this introduction the researcher will focus mainly on the Canadian Medical Education Directions for Specialists (CanMEDS) Framework (RCPSC 2014:Online). The CanMEDS Framework is based on research in which hundreds of fellows of the Royal College of Physicians and Surgeons of Canada (RCPSC) participated, and sets out the knowledge, skills and abilities that specialists need to improve the care and outcomes of their patients (RCPSC 2014:Online). It is founded on the various responsibilities and tasks that all physicians need to fulfil to become competent doctors (RCPSC 2014:Online). Every medical doctor should be empowered to become a "medical expert, communicator, collaborator, manager, health advocate, scholar, and professional" (RCPSC 2014:Online).

The CanMEDS Framework identifies all the competencies a doctor should attain to be fully functional. Every role of a physician is identified through "key competencies". These are further defined through "enabling competencies" that explain in more detail exactly what is needed to fulfil each role (RCPSC 2005:1).

The CanMEDS Framework was adopted in South Africa by the Undergraduate and Postgraduate Committees of the HPCSA as the African Medical Education Directions for Specialists (AfriMEDS) Framework, which is relevant to the South African scenario. The AfriMEDS Framework was formerly acknowledged by the HPCSA with the permission of the Governing Council of the RCPSC (HPCSA 2014:1). The AfriMEDS Framework has not yet been implemented for postgraduate students and therefore the researcher adopted the CanMEDS Framework for identifying competency.

Competency is not proven by assessing only the lower levels of cognition – skills, attitude and behaviour also need to be assessed (Boursicot, Etheridge, Setna, Sturrock, Ker, Smee, Sambandam 2011:372). This should be done by using a wide range of assessment methodologies (Boursicot *et al.* 2011:370). These authors recommend that assessments should measure competence in management of complex patient presentations, inter-professional and team skills, ethical behaviour and professionalism. They argue that summative assessment is just the final element of an overall assessment plan for the prescribed curriculum (Boursicot *et al.* 2011:371).

To ensure that the assessment is valid, reliable and trustworthy, several components of the assessment should be quality assured. These components are summarised by the Australian National Training Authority (ANTA) as,

- "the assessment system,
- the assessment process,
- the assessors,
- collecting the evidence and
- making the judgement" (ANTA 2001:6).

The College of Radiologists of South Africa follows the model of the Royal College of Radiologists (RCR) (Andronikou 2012b:email). The researcher did not find any guidelines for assessors and moderators for the CR (CMSA) on their website.

The CMSA General Examination Guidelines (CMSA 2014b:1) is the most up to date document the researcher could find after requesting information from the CMSA. According to this document, the assessors for the CR (CMSA) assessments are representatives of all the radiology training institutions in South Africa. The CMSA states that all assessors should have observed at least one CMSA examination before they may be included as assessors on the examination panel (CMSA 2014b:3), and that the candidate assessor should preferably have been nominated at the last preceding examination as an assessor for the next examination. The nominee should be experienced and competent in the radiology field and have a good academic history. Nominations must be approved by the president of the College of Radiologists of South Africa (CMSA 2014b:3).

1.3 PROBLEM STATEMENT AND RESEARCH QUESTIONS

Currently assessors for the CR (CMSA) comprise practitioners with many years of experience as well as consultants who qualified over the past ten years and who may be less experienced in summative assessment.

In the past many opinions have been published on what is needed for a candidate to be deemed competent. The perspective of the researcher is that this competency can only be proven through assessments that are quality controlled and properly moderated by qualified assessors who have been trained in assessment and moderation, and who act according to accredited guidelines. The members of the CR (CMSA) are the custodians of quality assurance in the radiology profession.

Therefore clear guidelines are essential for providing validity, reliability and trustworthiness in the assessment system. The current information revolution challenges everyone with daily technological and intellectual progress, and we need to ask ourselves what a general radiologist needs to know to be deemed competent in the field, how this will be assessed and how this will be taught. Traditional methods will not be able to answer this call in modern times.

The problem that was identified and addressed in this study is the lack of a formally approved assessment directive and guidelines for assessors, moderators and students involved in summative assessment of student learning in postgraduate radiology. This is a problem that warrants investigation, as the lack of clear guidelines for the profession,

academic departments, assessors and moderators, as well as radiology registrars holds a serious threat for quality assessment procedures.

No studies on guidelines for assessors and moderators for summative assessment of the single-exit radiology examination in South Africa were found. Searches were conducted in several databases, including the National Research Foundation (NRF) website and the Nexus database system. However, studies were found in other disciplines of the Colleges of Medicine of South Africa (CMSA). The researcher found work related to postgraduate assessment in South Africa: "An assessment model for the training of medical postgraduate students in urology" (Wentzel 2012:1). This work is on the quality of assessments, but in the field of urology. Other relevant scientific work that was found includes research conducted in the domain of radiology assessment: "A competency-based continuous assessment programme as part of a revised curriculum for the postgraduate radiology training at the University of the Free State" (Janse van Rensburg 2015:1), which was done on formative assessment in radiology, not summative assessment as in this study.

The researcher also searched databases like the Cochrane Library, Cochrane Effective Practice and Organisation of Care (EPoC) group database, U.S. National Library of Medicine, including the Pubmed/Medline databases, Embase/Elsevier database, Education Resources Information Center (ERIC), Best Evidence Medical Education database and Google Scholar to recognise related publications. Wherever information was gathered from such dissertations, theses or publications, the researcher acknowledged the authors with proper citation to acknowledge their intellectual property. If, by any chance, an author was not properly acknowledged, the researcher may be contacted to correct the error.

To conclude, the researcher did not find any recent scientific publications on summative assessment of student learning in postgraduate radiology, or on the roles of assessors and moderators in South African radiology.

In order to address the problem, the following research questions will be addressed:

1. Can the lack of directive documentation for summative assessment of postgraduate training in radiology be conceptualised and contextualised?
2. What are the factors that play a role in summative assessment of postgraduate students in radiology?

3. What are the factors that play a role in the preparation of candidates for summative assessment in radiology?
4. (a) What criteria will be essential in compiling directive documentation for summative assessment in postgraduate training in radiology, and
(b) What guidelines can be developed for assessors and moderators?
5. Can the criteria and guidelines in 4(a) and (b) be converted into a directive for summative assessment of student learning in postgraduate radiology?

These five research questions created the point of departure from which the research was conducted and completed. The findings of this study will present the groundwork for creating a directive for summative assessment of student learning in postgraduate radiology.

1.4 OVERALL GOAL, AIM AND OBJECTIVES OF THE STUDY

1.4.1 Overall goal of the study

The overall goal of the study was to provide formally approved directive guidelines for assessors, moderators and students involved in summative assessment of student learning in radiology to guarantee competency of students who have completed their studies successfully, to ensure quality in the profession and to improve education through proper feedback.

1.4.2 Aim of the study

The aim of the study was to develop directive documentation for summative assessment of student learning in postgraduate radiology to ensure quality assessments and quality in the profession. It will include guidelines for assessors, moderators and other role players. Furthermore, it will include recommendations regarding principles and purposes of assessment to ensure quality in assessment instruments, methods and tools employed in summative assessments in postgraduate radiology.

1.4.3 Objectives of the study

To achieve the aim of this study the following objectives were pursued:

1. Conceptualising and contextualising the lack of directive documentation for summative assessment in radiology by gathering theoretical perspectives through this research.
This objective addresses research question 1.
2. Identifying the factors that play a role in the summative assessment of postgraduate students in radiology.
This objective addresses research question 2.
3. Identifying the factors that play a role in the preparation for summative assessment in radiology.
This objective addresses research question 3.
4. Determining (a) criteria regarded essential for compiling directive documentation for summative assessment in postgraduate training in radiology, and (b) guidelines for assessors and moderators.
This objective addresses research question 4.
5. Constructing a directive for summative assessment of student learning in postgraduate radiology, including guidelines for assessors, moderators and other role players, and making recommendations regarding principles and purposes of assessment to ensure quality in assessment instruments, methods and tools employed in summative assessments in postgraduate radiology.
This objective addresses research question 5 in view of a holistic and scientific product.

1.5 DEMARCATION OF THE FIELD AND SCOPE OF THE STUDY

The study fits in the field of Health Professions Education and lies in the domain of Clinical Assessment with the emphasis on developing directive documentation for assessors and moderators in as far as summative assessment of student learning in postgraduate radiology is concerned. This study is classified as interdisciplinary because it falls in the domains of both Health Professions Education and radiology.

The results and conclusions of this research may be useful in summative assessment of radiology candidates currently hosted by the College of Radiologists of South Africa.

The researcher divided the participants into two groups. The first group consisted of individuals with super-specialised or general knowledge in the field of radiology and experience of being assessors and/or moderators of summative assessment in postgraduate radiology. The second group comprised candidates who had recently completed the

summative assessment for postgraduate radiology, irrespective whether they had been successful or not.

The researcher is an independent general radiologist currently registered with the HPCSA. After completing his Bachelor's degree in Medicine and fulfilling his duties of internship and community service, he started his career in Family Medicine as a Medical Officer and then continued to start specialising in Internal Medicine. He was granted the opportunity to specialise in radiology and after completion of his studies he worked in Ireland to gain experience in general radiology in private and public sector facilities. He returned to South Africa where he resuscitated the public sector radiology service in the Kimberley Hospital Complex, South Africa. It is here that he realised the dire need for training more radiologists and the need for quality assurance in radiology assessments. After completing a course in Health Professions Education on Teaching, Learning and Assessment in 2013, he realised the need to provide guidelines for assessors and moderators of radiology summative assessment.

This study commenced in January 2014 and completed by January 2016, with the collection and reporting of the data conducted during 2015.

1.6 THE VALUE AND SIGNIFICANCE OF THE STUDY

A directive for summative assessment of student learning in postgraduate radiology may help to ensure quality in the profession by providing guidance to assessors and moderators; adding value to training in radiology; highlighting the importance of feedback as an integral part of assessment; identifying the different methods, instruments and tools to be used in radiological summative assessment; and contributing to effective preparation of the candidates for summative assessment.

Currently assessors and moderators do not have to show proof of any assessment qualification to become an assessor. The outcome of the study may serve as a directive to the CR (CMSA) to provide proper guidelines to assessors and moderators of the College and to address current shortcomings, such as limited feedback to candidates and a lack of criteria for selecting assessors and moderators for the College's assessment.

1.7 RESEARCH DESIGN OF THE STUDY AND METHODS OF INVESTIGATION

1.7.1 Design of the study

A qualitative research design, using a literature study and semi-structured interviews, was employed to find a solution for the research problem. Semi-structured interviews consisted of the researcher asking the participants questions identified through a literature review or study of background theoretical perspectives. Such interviews gave the participants the opportunity to respond to open-ended questions.

1.7.2 Methods of investigation

The researcher used various methodologies to collect data for the study. These included a literature review and as part of the empirical phase, two groups of semi-structured interviews in the context of a "supplier" and a "user" – this improved triangulation of the study. The research included a literature review to conceptualise and contextualise the need for guidelines for assessors and moderators in summative assessment of postgraduate radiology. The literature review was followed by qualitative semi-structured interviews of assessors and moderators and post-summative-assessment candidates to obtain information relevant to both groups.

A comprehensive narrative of the research methodology, the target population, contextualisation of the theoretical perspectives, the application of the semi-structured interviews (including the ethical considerations), data analysis and reporting are provided in Chapter 3. A schematic overview of the study is given in Figure 1.1.

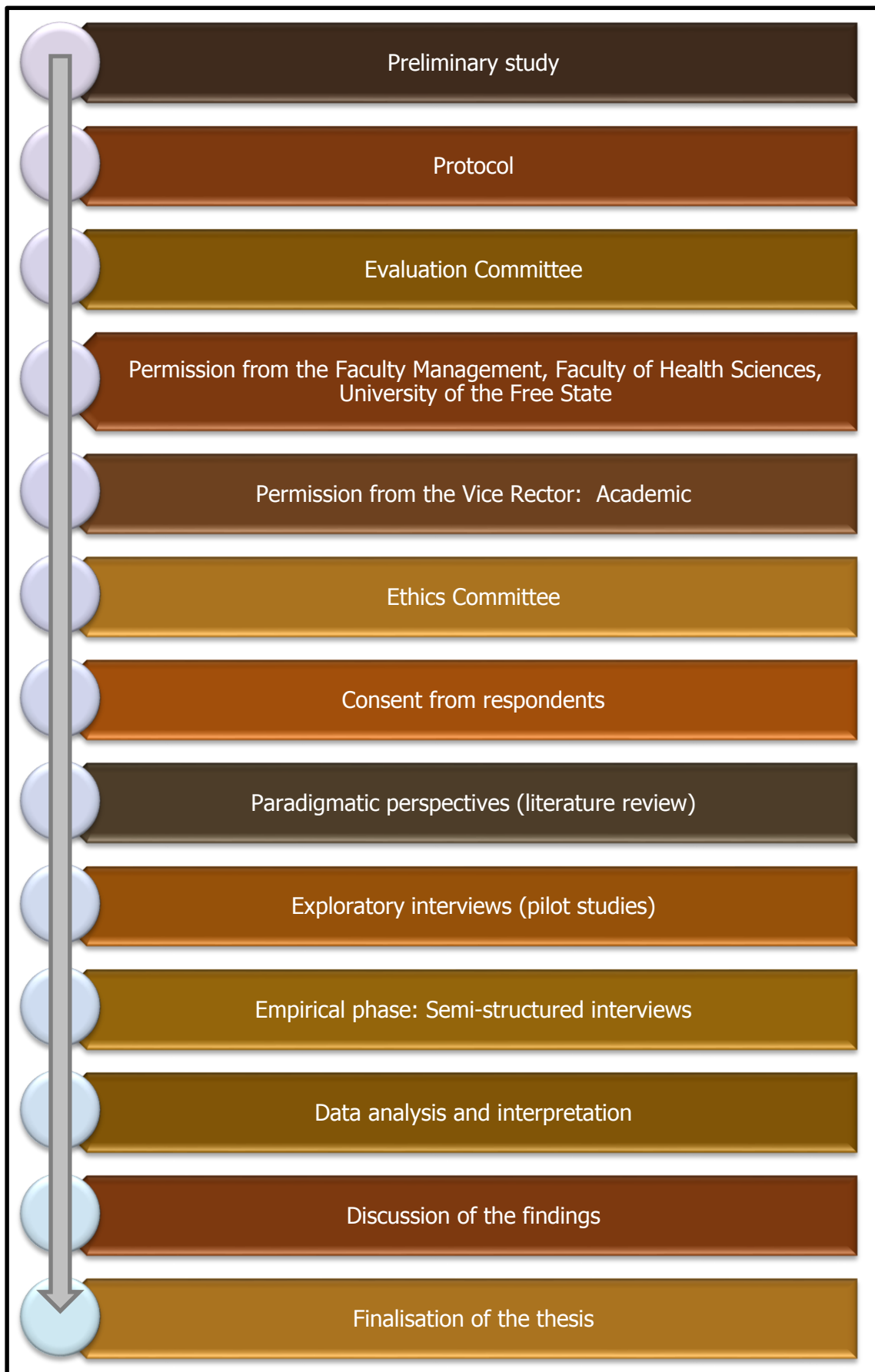


FIGURE 1.1: A SCHEMATIC OVERVIEW OF THE STUDY
[Compiled by the researcher: Hurter 2014]

1.8 IMPLEMENTATION OF THE FINDINGS

The results and conclusions of this study, including all findings, will be made available to the Professional Board of the College of Radiologists of South Africa.

In addition, this report will be submitted to the management of the Faculty of Health Sciences, University of the Free State (UFS). The researcher will furthermore submit this study to academic journals for publication with the aim of contributing to the further development and expansion of Health Professions Education. The final report on this study will be presented at Health Professions Education or radiology conferences and seminars.

1.9 ARRANGEMENT OF THE REPORT

To give the reader a better understanding of the topic, the research design, the methodology and the end product, the researcher will report the study according to the following synopsis:

In Chapter 1, ***Orientation to the study***, the researcher provides a concise introduction with the aim of placing the study in context. The problem statement and the research questions are stated. The overall goal, aim and objectives of the study are given, followed by an explanation of the demarcation of the field and scope of the study into summative assessment of radiology. The value and significance of the study are summarised, followed by a description of the research design and the methods used in this study, to finally present the reader with a better understanding of the contents of this report. A schematic overview is given, together with an explanation of how the findings will be implemented. Thereafter a description of the arrangement of the thesis follows. The chapter is finalised with some concluding remarks.

In Chapter 2, ***The conceptualisation and contextualisation of summative assessment in postgraduate radiology***, the researcher expounds the theoretical orientation to the study and provides theoretical background perspectives on constructive alignment, the principles and definitions of competency, learning outcomes related to radiology, assessment principles, types of assessment, assessment methods, instruments, tools and guidelines for assessors and moderators. The researcher also deals with the role

of feedback to students in the assessment process and explains various teaching and learning activities (TLAs) that can be incorporated within the radiology curriculum.

Chapter 3, ***Research design and methodology***, contains an in-depth discussion of the research design and methodology selected for this study. Theoretical aspects of the methodology are explored. This includes semi-structured interviews with individual participants divided into two groups, conducted to identify and explore potential guidelines for assessors, moderators and students with the goal of compiling directive documentation for summative assessment of student learning in postgraduate radiology.

In Chapter 4, ***Findings of the semi-structured interviews with assessors and moderators: analysis and discussion***, the researcher couples the methodology of the semi-structured interviews with the information gathered from the interviews with assessors and moderators. This is followed by a discussion and report on all the results and findings.

In Chapter 5, ***Findings of the semi-structured interviews with candidates that are within one year post summative assessment: analysis and discussion***, the researcher describes the semi-structured interviews and data gathered from the interviews with candidates who had completed the radiology summative assessment. It is followed by a discussion and report on all the results and findings.

In Chapter 6, ***Summative assessment of postgraduate radiology to ensure quality in the profession***, the researcher contextualised and conceptualised the summative assessment in radiology, presented factors playing a role in the preparation of candidates for the summative assessment, identified criteria for presenting a candidate for the summative assessment, identified criteria to be considered when deciding that a candidate is ready (competent) for radiology practice and presented a summary of recommendations to be considered in future radiology summative assessments with the aim to ensure quality in the profession.

In Chapter 7, ***Conclusion, recommendations and limitations of the study***, an overview of the study together with conclusions, recommendations and limitations of the study, are discussed.

1.10 CONCLUSION

Chapter 1 presented an introduction to the reader in order to contextualise the setting within which the research on the topic of summative assessment in postgraduate radiology to ensure quality in the profession was conducted.

In the next chapter, Chapter 2, entitled, ***The conceptualisation and contextualisation of summative assessment in postgraduate radiology***, the theoretical perspectives relevant to the research will be discussed.

CHAPTER 2

THE CONCEPTUALISATION AND CONTEXTUALISATION OF SUMMATIVE ASSESSMENT IN POSTGRADUATE RADIOLOGY

2.1 INTRODUCTION

The CR (CMSA) is currently the examination body for the radiology summative assessment in South Africa (Bothma 2013:20). Within this setting it has become necessary to provide formally approved guidelines for assessors and moderators of summative assessment in radiology. Furthermore, it has also become increasingly important to provide students with clear guidelines on the way they need to prepare for the summative assessment. A literature review was done to consider the current scenario and to determine what structures and guidelines are already in place, and to pave the way for further development. This will assist the researcher in identifying guidelines, which will be summarised in a directive document for future use in radiology summative assessment. The researcher has structured this review according to the principles of constructive alignment.

In this chapter, the researcher examines when a candidate can be considered as competent within the radiology context. To this end, the CanMEDS- and AfriMEDS-principles, as well as the definitions of competency as identified by the CR (CMSA), is investigated. This is followed by the identification of the learning outcomes that all radiology candidates need to achieve to be declared competent. The summative assessment follows the training period to authenticate that the candidate did indeed achieve the prescribed outcomes. The assessment needs to be quality controlled and should be preceded by training for assessors. The researcher presents literature on assessment and then investigates the processes of moderation. This leads to a discussion on the role of feedback to students and the identification of TLAs that can be used to review the curriculum that is used to train candidates to become competent radiologists.

Figure 2.1 summarises the main aspects of this review schematically.

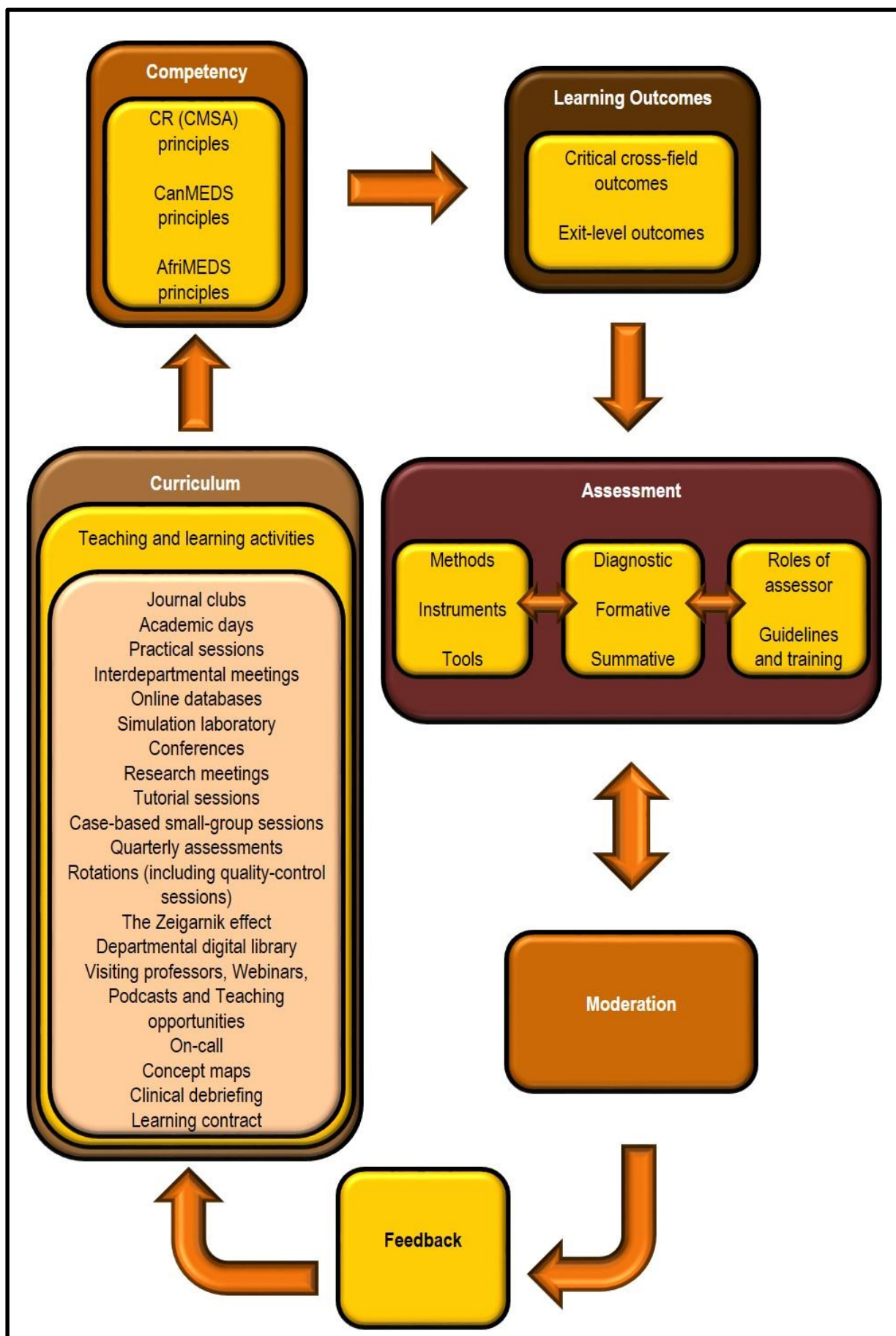


FIGURE 2.1: SYNOPSIS OF CHAPTER 2
 [Compiled by the researcher: Hurter 2015]

2.2 CONSTRUCTIVE ALIGNMENT

As early as 1969, in the city of New York, Bellack (1969:283), who specialised in analysing lecturer behaviour, acknowledged the dire need to critically re-evaluate our traditional ways of thinking about curriculum design, regardless of the challenges that this may bring. Bellack (1969:283) is of the opinion that solace for this can be found in exchanging modern ideas through collaboration among current curriculum theorists and practitioners, without forgetting to converse about such curriculum improvements with professional forebears.

Bellack emphasises that curriculum specialists should avoid instinctively repeating the ideas and opinions of theorists who functioned in a different intellectual period and social environment, instead, curriculum specialists should see their field in perspective, and realise that each generation is faced with new challenges and problems that exemplify their field of practice (Bellack 1969:283). Bellack (1969:291) reiterates that lessons should be learned from the past, as a reminder of the possibilities and complexities that are linked to curriculum change, but that solutions should be found in the present without the adoption of past dogmas and traditions.

The Canadian Resident Matching Service (CaRMS) (Lum & Zaleski 2010:11), was established in 1969 (CaRMS 2015:Online). The CaRMS is a nationwide Canadian organisation that was established after medical students called for an autonomous body to provide a "fair and transparent application and matching service" for admission and placement of candidates into postgraduate medical training posts throughout Canada (CaRMS 2015:Online).

This was the stimulus for several changes in Canada's medical training over a period of several decades. There were few radiology registrars, because of limited radiology training posts (Lum & Zaleski 2010:11). During the 1970s and early 1980s, radiology registrars were mainly training in general radiology by rotating at a specific hospital for a few months (Lum & Zaleski 2010:11). This practice only changed in the 1980s after advances in technological imaging and the introduction of ultrasound and computer tomography (CT), which led to modality-based training. This training involved a registrar rotating at a specific modality for a month to three months (Lum & Zaleski 2010:11).

With the addition of more modalities, e.g. magnetic resonance imaging, fluoroscopy and mammography, curricula had to be adapted to keep up with the technological advances of the last three decades.

New concepts, such as constructive alignment, emerged to aid successful adaptation, from the traditional deliberation and analysis processes of the past, to modern alternatives of teaching, learning and assessment paradigms. Constructive alignment is a term that was created by John Biggs in the late nineties (Biggs 1996:347) and has been implemented in many universities throughout the world (Biggs 2014:Online). Biggs explains that constructive alignment is an example of outcome-based education (OBE), which focuses on improving teaching and learning by identifying the outcomes that we want the students to achieve, and then continuing to align our teaching and assessments to these outcomes (Biggs 2014:Online).

In other words, learning outcomes, assessment approaches and TLAs need to be aligned so that the learning outcomes actually drive the assessment process and subsequent TLAs (curriculum) by actually "planning backwards" (Hurter 2013:48).

According to Biggs (1996:360) the model that emerges from constructive alignment suggests that the teacher needs to identify clearly what it is that the students need to learn and how they will have to prove their level of understanding. Biggs (1996:360) continues by stating that the "performance objectives" of the student should be graded from "most acceptable to barely satisfactory", by assessing the candidate in a manner that will best educate the requisite learning objectives. Thus, to be deemed competent, the candidate needs to prove that his/her level of learning matches the desired learning outcomes.

2.3 COMPETENCY

The question that arises from the above is: "When, then, can the radiology candidate be deemed competent?"

Epstein and Hundert (2002:226) define competency in medical practice as "the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individuals and communities being served. This is important to answer the expectancy of the public".

According to Leach (2002:243) (cf. Point 2.3.2), the United States-based Accreditation Council for Graduate Medical Education (ACGME) identified six interconnected spheres of influence to define competency in medicine: medical knowledge, patient care, professionalism, communication and interpersonal skills, practice-based learning and improvement, and systems-based practice. Competence in medical practice becomes a routine of lifelong learning rather than a once-off accomplishment at the end of the training period (Leach 2002:243).

Augustine, McCoubrie, Wilkinson and McKnight (2010:326) comment that "**competence** defines what doctors can do in controlled assessments, whereas **performance** measures what they actually do in reality". In the researcher's own words: performance signifies how well a competent physician does what s/he is supposed to do in real life.

2.3.1 The College of Radiologists of South Africa

The regulations for admission to the fellowship of the CR (CMSA) (2013:2) define radiological competency as,

the "why" and the "how" a candidate specialist should perform, as s/he might, due to his/her potential, subjective cognitive knowledge-base and psychological behavioural processes or human-related attributes; which s/he has (or does not have) and must reveal or manifest, in order to effectively accomplish radiological competence. Radiological competence is the "what" the radiology specialty demands of a candidate specialist, i.e. the requirements to practise radiology acceptably and safely, and be able to accomplish radiological objectives, within the scope of clinical medical practice, effectively. To be deemed competent in radiology entails the eliciting and evaluating of the final state of a candidate specialist's capability, which demonstrates that person's level of effectiveness (performance) as a radiologist against an external norm.

The CR (CMSA) further categorises competence as,

fundamental competence (the competence that is basic to the practice of radiology), core competence (the competence that characterises radiology and its practise), elective competence (the competence that prepares the candidate for potential expansion and development of radiology and its practise as determined or influenced by projected small changes in the environment) (CR (CMSA) 2013:2).

The CR (CMSA) (2013:2) states that radiological competence furthermore includes radiological understanding, demonstrating a logical grasp of radiology, and radiological expertise indicative of practical, "cognitive and interpersonal skills when practising radiology and when providing an all-inclusive clinical imaging service." The CR (CMSA) (2013:6) concludes with the attributes of a radiologist, namely, the individual and specialised virtues and qualities that project the character of the candidate and contribute to individual and shared professionalism in radiologists.

The CR (CMSA) identifies all the above-mentioned definitions and categories of radiological competence to demonstrate the multidimensional approach needed to describe radiological competence as comprehensively as possible (CR (CMSA) 2013:2).

To identify the attributes that are needed to be deemed a competent radiologist, the researcher also investigated the CanMEDS Physician Competency Framework (RCPSC 2005:1).

2.3.2 CanMEDS Physician Competency Framework

The CanMEDS Physician Competency Framework that was approved in 1996 by the governing council of the Royal College of Physicians and Surgeons of Canada (RCPSC) (RCPSC 2014:Online) forms the foundation for all specialty-specific goals of teaching in medicine.

The CanMEDS Project was a combined effort of many Royal College fellows, family physicians and educators, who started consulting with one another in the early 1990s, to review the literature available at the time and debate on existing medical education guidelines with the purpose of creating a framework to reform medical training so that physicians could be better prepared for the 21st century (Frank 2005:4).

The motivation for the project flowed from concerns that had been expressed by fellows of the RCPSC since the late 1980s about challenges and changes in the medical fraternity on matters such as "patient consumerism, government regulations, financial imperatives, medical information on the Internet, litigation, technology and the explosion in medical knowledge" (Frank 2005:5). The RCPSC's Health and Public Policy Committee formed a Societal Needs Working Group (SNWG) to identify those competencies that are imperative

in specialist disciplines. The product of their work was the CanMEDS Framework, which was developed through different phases over a period of just over a decade (Frank 2005:5).

During the first phase of development (1993-1996), "competencies" was the core concept identified by the SNWG for developing a medical education plan – competencies were seen as the decisive goal of training future physicians. The first phase was accomplished over three years and it was followed by a validation survey conducted by the SNWG on two cohorts of fellows before it was accepted by the RCPSC in 1996 (Frank 2005:5).

Phase 1 (cf. Figure 2.2) was followed (1996-1997) by several pilot projects in faculties of medicine all over Canada (phase 2), aimed at investigating methods of incorporation for the purpose of guaranteeing that the framework was integrated in specialist medical training (Frank 2005:6).

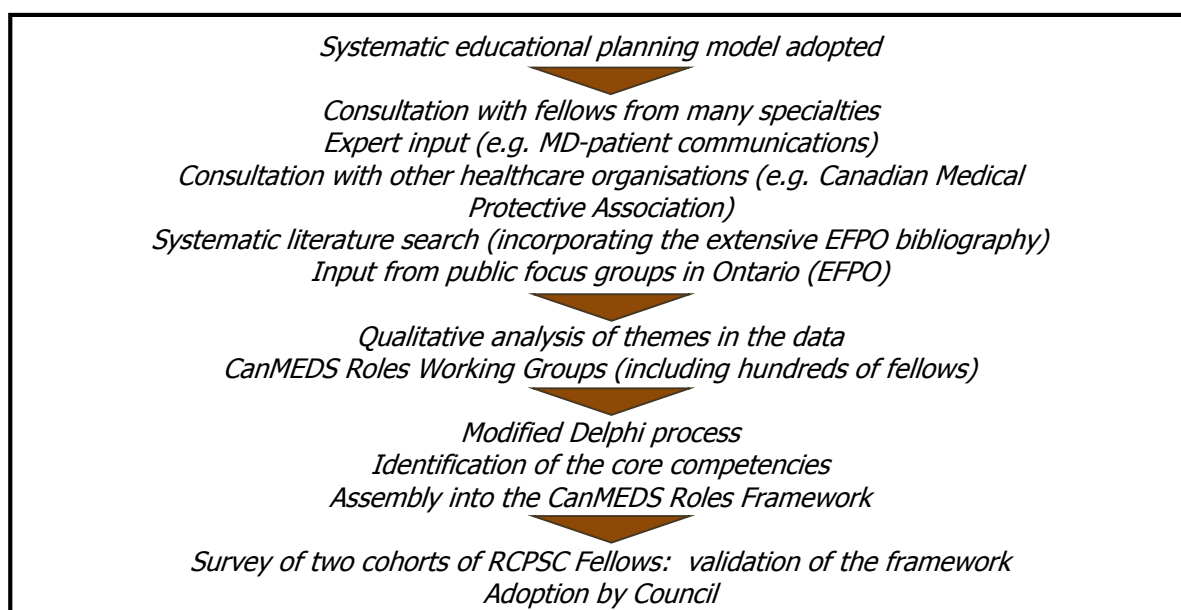


FIGURE 2.2: CANMEDS PROJECT METHODOLOGY FOR THE DEVELOPMENT OF THE COMPETENCY FRAMEWORK IN PHASE 1
(From Frank 2005:6)

From 1997 to 2002 the CanMEDS competencies were integrated (phase 3) into the "standards of all residency education", with the purpose of streamlining it with every specific speciality and sub-speciality. The types of standards that were revised included, "general accreditation, specialty-specific accreditation standards, specialty-specific credentials standards, objectives of training, final in-training evaluation reports and exam blueprints" (Frank 2005:6).

During the implementation of the framework an outcome evaluation was conducted to investigate the effectiveness of CanMEDS in Canada. The findings were surprising in that it showed that CanMEDS was widely implemented, not only in specialist training, but also in undergraduate medical training and continuing medical education (CME). The surveys identified challenges in certain competencies, e.g. health advocate and manager, which lead to the creation of phase 4 (2002) aimed at faculty development, of which the aim was to meet the needs of medical educators (Frank 2005:7).

During 2003 the RCPSC commissioned eight working groups consisting of several "Royal College Fellows, family physicians, nurses, postgraduate deans, program directors, educationalists, psychologists, and residents" to reassess the framework for any issues that may have arisen since 1996. This led to the new, revised CanMEDS Framework, which was approved by the RCPSC in 2005 (Frank 2005:7). The CanMEDS cloverleaf diagram was created in 2001 to demonstrate the integrated competencies that a physician should achieve (cf. Figure 2.3).

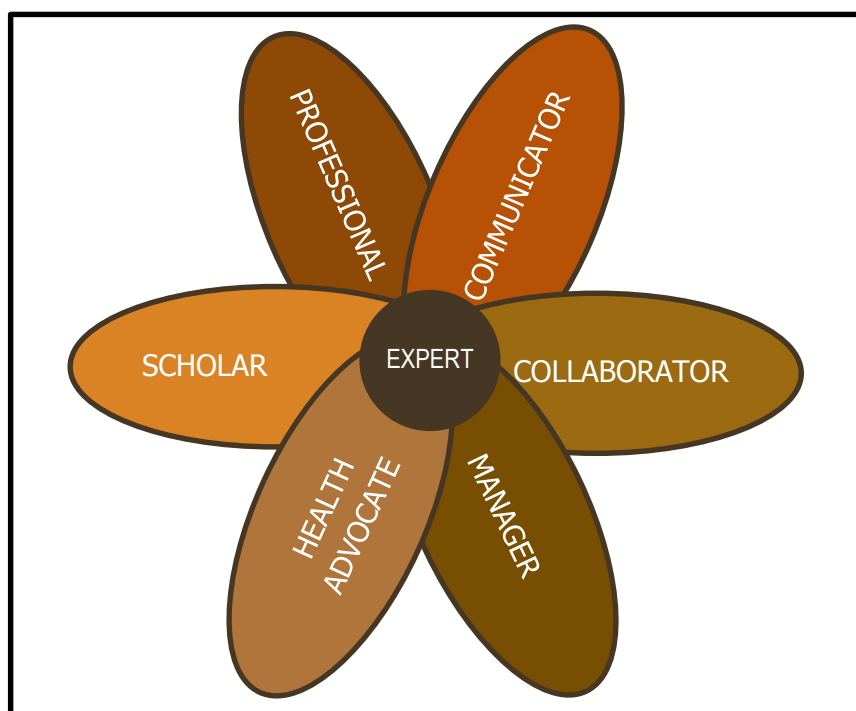


FIGURE 2.3: CANMEDS PHYSICIAN COMPETENCY FRAMEWORK
(From RCPSC 2014:Online)

The purpose of CanMEDS is to improve patient care. It includes an all-inclusive description of the competencies that should be achieved through specialist training and implemented during daily practice (Frank 2005:1).

The CanMEDS Framework, therefore, "is a competency framework" that was developed to answer the call to address the challenges faced by physicians globally because of the information explosion, which provides increasingly effortless access to medical information. Many faculties of medicine have adopted the CanMEDS Framework for medical training and have moved away from traditional teaching techniques to OBE to ensure the best possible patient results (Frank 2005:1).

Each CanMEDS role has a list of elements that explains the role in more detail. This is followed by key competencies that define what a registrar should be able to achieve and, finally, this is followed by enabling competencies, which clarify exactly how the registrar should function (behaviours, skills and attitudes) to achieve all the competencies.

The researcher summarises the different roles as follows:

As a **medical expert**, a physician should be well educated in medicine and continually refresh his/her clinical knowledge and expertise with the right frame of mind relevant to his/her practice, working efficiently as an adviser, incorporating the CanMEDS principles while aiming to deliver the best, "ethical and patient-focused health care" to make an all-inclusive and proper evaluation of a patient by practising preventive and therapeutic medicine efficiently and successfully (RCPSC 2005:1). S/he should be competent in performing different procedures, demonstrating proper diagnostic and therapeutic skills and should consult other physicians appropriately, realising the limits of his/her proficiency (RCPSC 2005:1).

The doctor as a **communicator** should show empathy by developing a reassuring feeling of trust in the patient and the patient's family. Such interactions should always be ethical in nature (RCPSC 2005:3). This is achieved by correctly obtaining and amalgamating applicable data and viewpoints of the patients and their families, other professionals and colleagues. The doctor should clarify and correctly convey, orally and in writing, applicable information to patients, their families and professional colleagues, to create a collective perspective of diagnostic and therapeutic concerns, challenges and future management of the patient.

As a **collaborator** a doctor should work appropriately as an effective player with other members of the inter-professional healthcare team. This can only be achieved by preventing and resolving inter-professional conflict through negotiation (RCPSC 2005:5).

To fulfil the **managerial** role, practitioners should make a contribution to effective management and functioning of their institution and organisation. They should plan their career paths well, manage their practices and distribute limited healthcare funds and assets properly, aiming at serving in senior management administrative positions relevant to their practice (RCPSC 2005:6).

The **health advocate** should take action to improve the patient's wellbeing and resolve problems that may arise during patient care (RCPSC 2005:7). This behaviour should be extended to the welfare of the communities (community) that are entrusted to him/her by identifying the determining factors of the health and wellbeing of the communities, while continuously promoting the health of the individual community members and patients (RCPSC 2005:7).

The **scholar** role should continue to improve specialised practice by maintaining lifelong learning. This is achieved through critical thinking and analysis of information and its origins, so that new knowledge can be applied appropriately to decision making in the real world to help with the education of families, patients, medical students, registrars, healthcare professionals and communities (RCPSC 2005:9). The physician should contribute to the "creation, dissemination, application, and translation of new medical knowledge and practices" (RCPSC 2005:9).

A **professional** doctor should be committed to his/her patients, profession and humanity by always practising ethical principles (RCPSC 2005:10). To demonstrate this s/he should involve himself/herself in guidelines prescribed by professional boards dedicated to the wellbeing of the individual physician, but also to sustainable practice in general (RCPSC 2005:10).

An example of the way the CanMEDS Framework can be applied within the radiology context has been put forth by Finlay and Probyn (2010:29) (cf. Table 2.1):

TABLE 2.1: CANMEDS ROLES FOR RADIOLOGY
(From Finlay & Probyn 2010:29)

CanMEDS role	Role descriptors
<i>Medical expert</i>	<i>Medical knowledge of clinical radiology, anatomy, physics, pharmacology and contrast, quality assurance, biostatistics, and epidemiology. Diagnostic reasoning, clinical judgment and decision making, consultancy skills. Manual and procedural skills competency.</i>
<i>Communicator</i>	<i>Communication skills during clinical encounters: patients, families/significant others, team members. Establishing rapport, trust, empathy, compassion. Verbal and nonverbal communication awareness. Written documentation of clinical encounters (e.g. reports, consultations).</i>
<i>Collaborator</i>	<i>Effective healthcare team functioning and collaborative decision making (e.g. nurses, technologists, support staff, referring clinical services). Team skills of delegation, awareness of team dynamics, constructive negotiation, conflict resolution, management and prevention. Interprofessionalism, respect for others.</i>
<i>Manager</i>	<i>Resource allocation and decision making (e.g. care prioritisation, protocoling). Skills and knowledge required for sustainable practice: technical, computer, organisation, office management. Leadership and administrative roles. Personal time management, work/life balance.</i>
<i>Health advocate</i>	<i>Advocacy for individual, patients, communities. Recognition of determinants of health and public-interest health concerns (e.g. screening programmes). Patient safety (e.g. radiation).</i>
<i>Scholar</i>	<i>Skills for lifelong learning: continuing professional development, critical appraisal, research literacy, journal clubs, translating knowledge in to practice. Teaching (students, residents, fellows, technologists, clinical colleagues, laypersons), assessing learners and giving feedback. Role modelling, mentoring.</i>
<i>Professional</i>	<i>Concepts of ethical practice: integrity, honesty, compassion, respect. Adherence to professional regulatory standards, peer review processes, medical-legal frameworks. Awareness of personal health and professional behaviours of self and others.</i>

During the evolution of the CanMEDS Framework, ACGME initiated an Outcome Project in 1999 and endorsed the following required general competencies (cited by Kavic 2002:96) that must be demonstrated by registrars qualifying in all medical specialist domains:

- *Patient Care that is compassionate, appropriate, and effective for treating health problems and promoting health;*
- *Medical Knowledge about established and evolving biomedical, clinical, and cognate (e.g., epidemiological and social-behavioral) sciences and the application of this knowledge to patient care;*
- *Practice-based Learning and Improvement that involves investigation and evaluation of their own patient care, appraisal, and assimilation of scientific evidence and improvements in patient care;*

- *Interpersonal and Communication Skills that result in effective information exchange and teaming with patients, their families and other health professionals;*
- *Professionalism, as manifested through a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to a diverse patient population;*
- *Systems-based Practice, as manifested by actions that demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide care that is of optimal value.*

From this ACGME and the American Board of Radiology (ABR) jointly developed The Diagnostic Radiology Milestone Project, which specifically identifies outcomes for every core competency that needs to be achieved by all residents during their training period in diagnostic radiology (ACGME 2012:Online). The document includes relevant instruments for assessing whether the required outcomes have been reached, e.g. "Peer reviews, End-of-Rotation Global Assessment, Case/Procedure Logs, Direct observation and feedback, Procedural competency checklists, Self-Assessment, Reflections/Portfolio and Simulation/OSCE [objective structured clinical examination]."

In 1999 the Bologna Declaration was signed by most European countries, and it paved the way for freedom of movement for all graduates throughout Europe. The purpose of the declaration was to create a system of comparable degrees within a bigger European higher education area. It became clear that guidelines, specifying the learning outcomes and competences for each discipline, were needed. This led to the development of the European Quality Assurance Standards for Higher Education (Cumming & Ross 2008:6).

Because of inconsistent implementation of the Bologna principles across Europe, the Tuning Project came in to existence in 2000, with the purpose of providing a more robust outcome-based approach that would align the learning outcomes and the prescribed competencies for all specialisations in higher education in Europe (Cumming & Ross 2008:6).

The Tuning Project defined learning objectives, learning outcomes and competencies for a wide spectrum of qualifications, but more detailed guidelines were needed for health sciences education, which led to The Tuning (Medicine) Project in 2004 (Cumming & Ross 2008:9). This framework was developed through similar processes as the CanMEDS Framework and included reviews of existing frameworks, development of a draft

framework, and tuning workshops throughout Europe from 2005 to 2007. The framework was reviewed through a web-based opinion survey of academics, graduates and employers who rated the learning outcomes, after which the outcomes were ranked in order. These rankings were approved by the Medical Education in Europe (MEDINE) Thematic Network, followed by an expert panel review. It was finally presented to the European Commission in 2008 (Cumming & Ross 2008:11).

The final output of the Tuning (Medicine) Project is a set of learning outcomes/competences which draws on previous work on learning outcomes in medicine, has been generated through an iterative process of expert review and refinement, has been the subject of a Europe-wide internet-based opinion survey and subsequent analysis, and which has been approved by the MEDINE [Thematic] Network and an Expert Panel (Cumming & Ross 2008:19).

This global phenomenon of reviewing modern training platforms also spread to Australia, New Zealand and Singapore, where the Royal Australian and New Zealand College of Radiologists (RANZCR) realised after many discussions that all was not well in their radiology training programmes, which led to a new training platform being introduced in January 2010 (Ming Wang, Burns, Walters & Slavotinek 2010:123). Some of the challenges that were identified by the RANZCR (Ming Wang *et al.* 2010:125) are listed by the researcher, because he has had similar experiences in the South African context.

- *Directors of radiology complained that their trainees were too exam-focused, paradoxically sometimes to the detriment of improving their radiology expertise.*
- *Supervisors of training complained of difficulty in adequately evaluating trainees in larger centres or networks, where many trainees rotated between more than one site of training and that no explicit parameters for identifying, managing, or terminating a poorly performing trainee were defined.*
- *Trainees, to varying degrees, complained of some lack of supervision, insufficient teaching, or both at some centres, particularly at smaller centres further from the major metropolitan teaching hospitals.*
- *Examiners complained that trainees appeared to be getting worse in their ability to interpret plain radiographs and barium studies, and were doubtful about their practical expertise in performing ultrasound examinations and interventions.*

- *Some trainees and disgruntled candidates, perhaps unsurprisingly, complained that some components of the final viva voce examinations were set at an unrealistically high standard.*
- *Examiners and candidates alike were increasingly aware that the format of the final viva voce examination no longer reflected the clinical practice environment that most trainees experience.*
- *Despite mandating high-stakes examinations in medical physics, classical and imaging anatomy, systems-based radiodiagnosis and pathology, the College had little by way of specified syllabus or curriculum.*
- *Employers in private practice complained that trainees were not sufficiently prepared to function independently in private practice immediately after completing their training.*
- *Academic radiologists complained that the research and publication output of diagnostic radiologists in Australia and New Zealand was disproportionately low.*
- *Governments complained that radiologists as a group were unable to provide adequate imaging services for the relatively far-flung rural population, even in fairly large urban centres remote from the major cities.*
- *The educational basis of the training programme and the examinations was opaque. Without an explicit curriculum, there was no basis on which to determine the appropriateness of the assessment. Following the review of the examinations, there were also some questions around the validity and reliability of the examinations (Ming Wang *et al.* 2010:125).*

Within the RANZCR at the time, many of the assessment and curriculum development processes were reliant on a small group of professionals, with little documentation available on training and assessment (Ming Wang *et al.* 2010:126).

From the challenges listed above it is clear that several countries identified the need to develop frameworks to clearly define competency, assessment processes and curriculum development in medical education.

Miller started this process as early as the 1990s (Miller1990:63) by suggesting a framework for clinical assessment, the familiar Miller's pyramid (cf. Figure 2.4), which has been used for the past two decades to assess clinical competence (Boursicot *et al.* 2011:372).

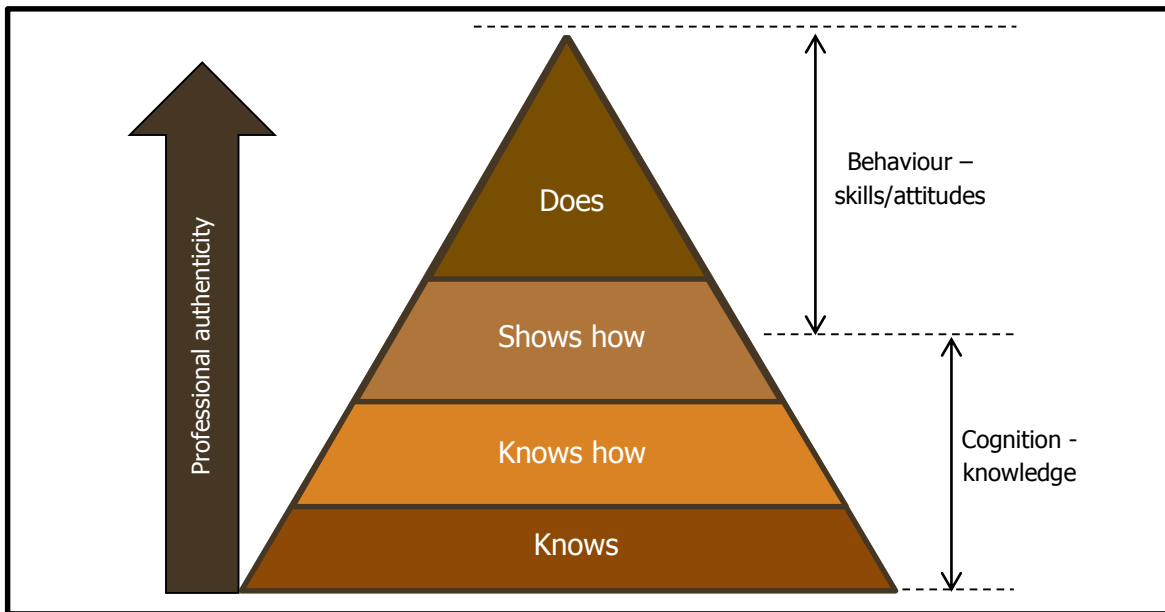


FIGURE 2.4: MILLER'S PYRAMID
(From Gupta, Dewan & Singh 2010:912)

This is an extension of Bloom's Taxonomy (cf. Table 2.6), involving a simplification to three levels of assessing competence, namely, knowledge (recall or recognition of information), skills (comprehension and application) and behaviour (attitude, problem solving) (Collins 2006:545).

Miller (1990:63) recognised that there is more to the practice of medicine than just knowledge. A candidate should know how to use his/her newly acquired knowledge to develop several skills that s/he must utilise to develop a specific management plan to finally correctly diagnose and manage a patient. Miller states, further, that it is this quality of having sufficient knowledge and proper judgement, together with the strength and skill to perform a specific task, that defines competence (Miller 1990:63).

Schuwirth and Van der Vleuten (2004:974) also conclude that, within the real-life setting, attaining knowledge is not the goal, rather, it forms only one element of solving problems that the physician may be faced with during daily practice.

2.3.3 AfriMEDS Framework

The AfriMEDS Framework is a document that was adopted with permission from the CanMEDS Physician Competency Framework by the "Undergraduate Education and Training Subcommittee of the Medical and Dental Professions Board in collaboration with training

institutions and the South African Committee of Medical and Dental Deans" (HPCSA 2014:1).

The reason for this adoption and supplementary modification was to align the framework within the South African and the wider African context.

The framework is created on the same fundamental structure of knowledge, skill and attributes, from which all the relevant competencies and learning outcomes of the CR (CMSA) were developed (CR (CMSA) 2013:3).

Of note is the difference between the CanMEDS and AfriMEDS Framework. In CanMEDS the central role is coined as the candidate becoming an "Expert", while in the AfriMEDS context, the candidate becomes a "Healthcare Practitioner". The role of "Manager" in CanMEDS is expanded to include "Leader and Manager" in the AfriMEDS Framework. The principles followed within the key competencies and enabling competencies of a "Healthcare Practitioner" and "Leader and Manager" are comparable to the CanMEDS principles. The CanMEDS Framework was developed for postgraduate study, from which the AfriMEDS Framework was adapted for graduate study.

2.4 LEARNING OUTCOMES

From the discussion of "When should a candidate be deemed competent?" flows "What does s/he need to know to become competent (learning outcomes)?"

An outcome is a culminating demonstration of learning; it is what the student should be able to do at the end of a course (Davis 2003:227).

Carrol (2001:Online) explains that learning outcomes are a combination of three essential components:

- What task the candidate needs to complete that demonstrates what s/he has learned.
- The background within which the student will demonstrate the acquired knowledge, skills and attributes.
- How well s/he has to demonstrate his/her acquired knowledge, skills and attributes.

Carrol (2001:Online) provides an example: "The student will be able to design and draft a company report using information provided in case study materials such that the final report is suitable for discussion at Board level."

Learning outcomes should describe what the resident should achieve (learner behaviour) and not what the curriculum is going to teach (Collins 2006:544). Collins (2006:545) argues that learning outcomes can only be assessed accurately if they are described in a measurable manner by using words such as, "state, explain, list, identify, and compare". By using immeasurable terms like "know, understand, learn, or become familiar with", it becomes difficult to assess whether the outcomes were reached (cf. Table 2.2).

TABLE 2.2: EXAMPLES OF MEASURABLE AND IMMEASURABLE LEARNING OUTCOMES (From Collins 2006:544)

<i>Immeasurable learning objective</i>	<i>Understand the appearance of pneumothorax on a supine chest radiograph</i>
<i>Measurable learning objective</i>	<i>Describe five findings of pneumothorax that can be seen on a supine chest radiograph</i>

The topic of learning outcomes is directly linked with the concept of OBE. Wentz (2011:35) explains that OBE is a relatively new concept in medical education, and requires medical educators to define in the form of learning outcomes what they want their students to learn, "what they want them to be able to do and how they want them to think and act". In medicine this is analogous to the clinical knowledge, skills, reasoning abilities and professional conduct that the educators would want the students to achieve during the training process (Wentz 2011:35).

Wentz (2011:35) furthermore clarifies that, in OBE, the main goal is achieving the outcomes, and not necessarily the time it takes to teach those outcomes or the methods of teaching. From this it can be deduced that the effectiveness of a training programme is measured by whether the outcomes have been achieved and whether the methods that were used, were successful in assisting the student to achieve the relevant competencies. OBE therefore helps in identifying effective training methods and doing away with ineffective ones (Wentz 2011:35), which may potentially recognise OBE as the answer to the call of Quinn, Bingham, Shourbaji and Jarquin-Valdivia (2007:660), who argue that medical teachers are confronted with the challenge of restructuring and adapting the content of medical education.

The authors (Quinn *et al.* 2007:660) are of the opinion that, as educators, we must do more to prepare residents for challenges that they may be confronted with in future. Quinn *et al.* (2007:660) propose that residents should be introspective about the manner in which they practice medicine, zealous about patient safety, motivated to work in collaboration with healthcare team members and willing to adapt when presented with evidence-based medicine that may oppose what they may have learned or have done in the past. These qualities are essential if they have to overcome one of the concerns of educators, as pointed out by Quinn *et al.* (2007:660), namely, that one of the challenges these upcoming specialists are confronted with is the fact that they are often trained in inefficient, substandard and risky environments.

One of the leaders on the topic of OBE, Harden, states in his discussion on learning outcomes that significant progress has been made towards moving in the direction of OBE (Harden 2007a:666). Although learning outcomes have been specified in several frameworks within the last few decades, for OBE to be implemented successfully, two components need to be fulfilled. First, the learning outcomes should be made very clear, and second, the specified outcomes should act as a definite basis for developing the curriculum (Harden 2007a:666). According to Harden, the first fundamental step is generally not a challenge anymore, but there is insufficient progress towards the second requirement. Harden differentiates between three groups of teachers, those who ignore OBE as something that will pass, those who have identified their learning outcomes, and those who use their learning outcomes to plan their curriculum. Harden states,

The learning outcomes are central to and provide the underpinning for discussions and decisions by curriculum committees and planning bodies. Such decisions are meaningless unless carried out in the context of the learning outcomes.

A leading example of where OBE has successfully been implemented is the United Kingdom's General Medical Council (GMC). Rubin and Franchi-Christopher (2002:368) report that, "In line with current educational theory and research we have adopted an outcome-based model. This sets out what is to be achieved and assessed at the end of the medical course."

The GMC clearly states that it is the regulating body that "sets the knowledge, skills and behaviours" that every British medical student should be taught (GMC 2015:Online). The

outcomes specified by the GMC follows the CanMEDS Framework but very clearly outlines the outcomes in a document named, "Tomorrow's Doctors, Outcomes and Standards for Undergraduate Medical Education" (GMC 2009:Online). This document is currently under review and a new version, including guidelines for postgraduate students, is planned for release in 2015 (GMC 2015:Online).

Harden, Crosby and Davis (1999:7) recognised that OBE is an excellent approach in curriculum planning, and that it offers several advantages. It engages all role players within the medical education fraternity, including those who have not necessarily studied education. It encourages all parties involved to focus on the student and encourages lecturers to realise their accountability and role in quality assurance of medical training. Furthermore, OBE will highlight areas in the curriculum that may otherwise be neglected, e.g. ethics (Harden 2007a:666).

Medical educators who ignore OBE will likely vanish over time (Harden 2007a:667). Some medical teachers (the second group listed above) only identify their learning outcomes to display it to visitors or curriculum evaluators, but never implement them, and it goes unnoticed by teachers and students. Lastly, teachers who implement OBE use it to design, deliver and document their goals and outcomes for the purpose of designing and developing their curriculum and are therefore likely to prosper in years to come.

Harden suggests the outcome-based education inventory (OBEI) (2007a:667) (cf. Table 2.3) can be used to assess the progress of implementation of OBE in a specific training programme. Scores between zero and five are given to every one of the nine elements and this finally provides a quantitative report on how effective OBE has been implemented in the institution.

TABLE 2.3: THE NINE DIMENSIONS IN THE OUTCOME-BASED EDUCATIONAL INVENTORY. EACH DIMENSION IS RATED ON A SCALE FROM 0 TO 5 (From Harden 2007a:667)

1	Statement of learning outcomes	0	1	2	3	4	5
2	Communication with staff/students	0	1	2	3	4	5
3	Educational strategies	0	1	2	3	4	5
4	Learning opportunities	0	1	2	3	4	5
5	Course content	0	1	2	3	4	5
6	Student progression	0	1	2	3	4	5
7	Assessment	0	1	2	3	4	5
8	Educational environment	0	1	2	3	4	5
9	Student selection	0	1	2	3	4	5

The **statement of learning outcomes** grades whether learning outcomes have been outlined and published. It may range from complete absence of such documentation to comprehensive, easy, accessible documentation (Harden 2007a:667).

Communication with staff and students outlines how effectively the teaching staff and students have been made aware of the learning outcomes and how familiar they are with the content of such documentation. Communication to educators and residents may be in the form of printed or web-based documents or brochures. It may also be included within an orientation programme of the training department. Availability of this information to all role players does not mean that an effective OBE model is in place, unless decisions on the curriculum are influenced by the learning outcomes (Harden 2007a:667).

Education strategies and learning opportunities should include activities aimed at reaching the exit learning outcomes. Strategies such as problem-based learning (case-based learning in radiology), community-based education (CBE) and multi-professional teaching (e.g. working as a team player as part of a group) should mirror the learning outcomes, so that the teaching methods and learning opportunities can be aligned with the specified learning outcomes according to the principles of constructive alignment.

Learning opportunities, including e-learning, may be used to address many learning outcomes, as is currently done in radiology. The researcher is aware of examples, such as Learning Radiology (2015:Online) and STATdx (2015:Online). These databases can be used as educational tools for teachers and residents in radiology. Another educational strategy that can contribute to achieving learning outcomes was investigated by Issenberg, McGaghie, Petrusa, Gordon and Scalese (2005:10), who concluded that high-fidelity medical simulation is a valuable teaching instrument that complements medical training.

OBE does not dictate the specific teaching and learning activities to be included in planning the curriculum and therefore teachers may use a wide variety of methods and tools to achieve the stated outcomes. However, OBE does stimulate the teacher to analyse the curriculum critically (Harden 2007a:669), thereby guiding the teacher to reassess the validity of the outcome and the effectiveness of the teaching strategy.

Course content is a major challenge facing medical teachers today, mainly because of the rapid development of technology when it comes to radiological imaging and medical

knowledge. The teacher must guard against causing information overload and curriculum congestion (Harden 2007a:669). Learning outcomes will guide the teacher to deciding what should be retained in, added to and omitted from the curriculum within this changing environment. The important question that should be asked is, what level of competency is the student expected to achieve, especially as it relates to a general radiologist, at the specific level of his/her educational development?

Teaching content that may be included in a curriculum relate to topics such as economic issues, globalisation of healthcare delivery, and government pressures (Harden 2006:22).

Norman (2008a:131) is of the opinion that curricula are not challenged often enough and too often lectures are presented without an apparent underlying golden thread (a continuum) weaving through the teaching module. OBE ensures that the medical teacher plans the teaching method and content properly so that it is in line with the learning outcome that is being addressed.

Student progression. Learning outcomes can be used during formative assessment to monitor a resident's progress during the training programme towards the exit-level outcomes, which should all be achieved by completion of the programme. Harden describes a model for monitoring student progress in OBE and suggests that learning outcomes can be fixed as goals to be achieved within a curriculum plan (Harden 2007b:681).

Assessment is an integral part of OBE. It can be detrimental to the teaching programme if the assessment system, the teaching modules (curriculum) and the learning outcomes are not aligned (Harden 2007a:669). The assessment method must support the learning outcomes and recognise whether a student has accomplished the indicated outcomes (Shumway & Harden 2003:570). The authors demonstrate that learning outcomes can be aligned with many different assessment methods, e.g. written assessments with essays and multiple-choice questions (MCQs), performance assessments such as an objective structured clinical examination (OSCE) and portfolios (Shumway & Harden 2003:578).

More modern assessment methods may include work-based assessments, as described by Norcini and Burch (2007:855). These authors argue that workplace-based methods achieve the three fundamental requirements for assessment methods that aid learning. First, the curriculum, the outcomes and the assessment methods are aligned. Second, it is possible

to provide students with immediate feedback (during and/or after the assessment). Lastly, the assessment itself becomes a tool to guide the student towards achieving the desired outcomes.

Portfolios as an assessment method may be used to assess outcomes such as self-reflection, critical thinking and personal development (Davis, Amin, Grande, O'Neill, Pawlina, Viggiano & Zuberi 2007:718). Other assessment methods will be discussed in greater depth by the researcher under the heading, "Assessment" (cf. Point 2.5).

Harden (2007a:669) further addresses the issue of "compensation", where a student fails in one module but passes another module, and in the end completes the training programme without achieving all of the necessary outcomes. The author states that, in OBE, the student should achieve all the learning outcomes across the different modules according to the prescribed standards and therefore compensation becomes irrelevant. Harden (2007a:670) continues by declaring that, by implementing OBE, the student is educated to show greater conscientiousness in proving that s/he has achieved the required outcomes. Furthermore, OBE emphasises the value of feedback as an integral part of assessment (Harden 2007a:670).

The **educational environment** is another important component of OBE. Roff (2005:291) points out that the environment in which postgraduate residents receive their training has been investigated more critically over the last decade. Roff argues that good role models, competitiveness among students, intellectual and interpersonal challenges, gender and racial discrimination, and bullying of students by teachers and service providers are all factors that will influence the student's perception of his/her training platform, and therefore likely affect the extent to which the learning outcomes will be achieved successfully (Roff 2005:291).

According to Harden (2007a:670), OBE, if it is implemented correctly, dictates an ideal learning environment warranted by the identified learning outcomes. An example of setting an ideal environment will include working as a collaborative team player as one of the outcomes. If any challenges are identified through the feedback process, potential problems can be addressed timeously.

Quinn *et al.* (2007:664) reiterate that, by introducing OBE, the educational environment is transformed by involving all team players in decisions on structured patient care and management, thereby making the resident part of the system.

Student selection is named last (Harden 2007a:670) but not least as another criterion for evaluating the progress of OBE implementation within an institution. Harden (2007a:670) argues that, because most students admitted to an undergraduate medical programme will qualify in the end (the same principle applies to postgraduate residents), it is very important to select the best candidates to enter the programme. The selection of the ideal candidate is usually based on academic criteria and the personal opinion of the interviewer or selection committee. Traditionally, a candidate is interviewed by one or a panel of interviewers prior to selection into a training programme (Eva & Reiter 2004:165), but the validity of this method has been proven by several studies to be poor (Eva & Reiter 2004:166).

In an OBE approach, suitability for a resident post will be based on the applicant achieving specified outcomes prior to acceptance in the postgraduate training programme; these outcomes include communication skills, decision making, behaviour and practical skills (Harden 2007a:670).

For the purpose of this study, the researcher tried to identify all the outcomes that should be achieved by every radiology candidate in South Africa to successfully complete the training programme. These outcomes were divided into critical cross-field outcomes, exit-level outcomes and learning outcomes.

2.4.1 Critical cross-field outcomes

According to the South African Qualifications Authority (SAQA), "Critical Cross-field Outcomes are those outcomes that are deemed critical for the development of the capacity for life-long learning" and are not specifically linked to the area of study (SAQA 2000:18). SAQA adopted the following critical cross-field outcomes (SAQA 2000:18):

- *Identify and solve problems in which responses display that responsible decisions, using critical and creative thinking, have been made.*
- *Work effectively with others as a member of a team, group, organisation, community.*
- *Organise and manage oneself and one's activities, responsibly and effectively.*

- *Collect, analyse, organise and critically evaluate information.*
- *Communicate effectively using visual, mathematical and/or language skills in the modes of oral and/or written presentation.*
- *Use science and technology effectively and critically, showing responsibility towards the environment and health of others.*
- *Demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation.*
- *In order to contribute to the full personal development of each learner and the social and economic development of the society at large, it must be the intention underlying any programme of learning to make an individual aware of the importance of:*
 - *Reflecting on and exploring a variety of strategies to learn more effectively;*
 - *Participating as responsible citizens in the life of local, national and global communities;*
 - *Being culturally and aesthetically sensitive across a range of social contexts;*
 - *Exploring education and career opportunities, and*
 - *Developing entrepreneurial opportunities.*

Without the above-mentioned skills it is unlikely that a physician will become a lifelong learner.

Sim, Zadnik & Radloff (2003:100) argue that the rapid technological advancements that are happening within the radiology profession dictate lifelong learning amongst radiologists. The authors conclude that an inquiring mind, the capability to "inter-relate fields of knowledge", information literacy ("where and how to access information"), the capacity to critically assess information, a positive opinion of oneself, possession of a good scope of learning agility and valuable interpersonal skills are all characteristics that are needed by a competent radiologist if s/he is to adapt to a continuously changing work environment (Sim *et al.* 2003:100).

Lecturers in radiology have the responsibilities of motivating and guiding students to acquire critical-thinking skills as well as developing problem-solving abilities with the aim to "prioritize, anticipate, troubleshoot, communicate, negotiate, reflect, and make decisions" (Mishoe 2003:500).

2.4.2 Exit-level outcomes

The South African Safety and Security Education and Training Authority (SASSETA) (2014:Online) define exit-level outcomes as, "those defined points of learning in a qualification at which a learner may leave the programme with recognition of learning achieved".

To follow the model as identified by the principles of constructive alignment, the researcher investigated and familiarised himself with the exit-level outcomes for South African radiology as published by the CR (CMSA) (2013:3-4) (cf. Table 2.4).

TABLE 2.4: SOUTH AFRICAN RADIOLOGY EXIT-LEVEL OUTCOMES
(From CR (CMSA) 2013:3-4) [Table continues on next page]

1. Interpret and communicate radiological findings <i>The candidate specialist should be able to:</i> • Detect and interpret radiological signs using all forms of imaging. • Accurately report radiological findings orally and in writing. • Succinctly define clinical-radiological problems and formulate a working diagnosis or suitable differential diagnosis. • Tender appropriate advice to health practitioners/clinicians on the selection of appropriate imaging modalities that will maximise the potential for accurate diagnosis and optimally benefit patient management and care.
2. Manage patients and the service in a radiology department <i>The candidate specialist should be able to:</i> • Select and, where needed, perform appropriate radiological investigations. • Competently and safely perform radiological procedures. • Be aware of risks and complications of all radiological and related procedures and appropriately manage general emergencies and specifically those that might arise from radiological procedures. • Educate and counsel patients concerning the risk/benefit of radiological investigations and procedures. • Practice radiological protection and equipment safety. • Keep adequate radiological records of all practice activities. • Effectively communicate with healthcare workers in verbal and written format. • Without derogating from the universally accepted prescripts that guide patient care, treat patients in their care with respect and dignity at all times.
3. Manage a radiological/clinical imaging service provision <i>The candidate specialist should be able to:</i> • Identify key elements of a radiological service. • Broadly determine and be able to manage the resources required to sustain a radiological service. • Manage radiology-specific inventory. • Determine the type of radiological and related equipment required and manage them through their life cycle. • Determine and implement appropriate performance measures that will contribute to the efficient, effective and economic use of resources. • Acquire general competence in management, including service delivery-oriented management.
4. Acquire new information and critically evaluate its quality and utility <i>The candidate specialist should be able to:</i> • Access information using electronic and traditional methods.

- *Engage in continuing professional development activities.*
- *Critically appraise the quality, relevance and utility of new information.*
- *Appropriately apply newly acquired information to the benefit of their competence specifically and to the radiological services generally.*

5. Engage in research and personal professional development

The candidate specialist should be able to:

- *Produce a fully evaluated (which may include external evaluation) mini-dissertation of between 5 to 10 thousand words, or position papers, or action research papers, on relevant radiological topics of their choice. In the case of papers, acceptance and publication by a peer-reviewed journal would be preferred; AND*
- *Have completed formally structured and evaluated coursework as determined by their training centre as part of formative learning.*
- *Manage and produce a completed 'Critical Performance Portfolio' (as determined by the CMSA) as part of meeting examination entry requirements, as well as a record for continuous professional development.*
- *Continuously pay attention to their personal professional development (attributes), including leadership development, by engaging relevant learning opportunities and interactive forums that will shape their behaviour befitting their profession.*

6. Advise on matters pertaining to health promotion and disease prevention

The candidate specialist should be able to:

- *Educate and advise patients regarding health promotion and disease prevention.*
- *Demonstrate an awareness of health promotion and disease prevention priorities and strategies.*
- *Tender appropriate advice regarding the usefulness of timely radiological investigations as part of health screening programmes, and the hazards of potential under-, mal- or over-subscription of radiological investigations or procedures.*

7. Play an active role in training other healthcare practitioners

The candidate specialist should be able to:

- *Regularly participate in academic teaching activities.*
- *Regularly participate in academic meetings.*
- *Render relevant in-service training to radiation and related practitioners.*

8. Function as an effective team member in the broad context of healthcare

The candidate specialist should be able to:

- *Treat all healthcare workers with respect.*
- *Recognise the roles other healthcare workers play; consult appropriately.*
- *Provide leadership when called upon to do so or when the situation demands it.*

The researcher also familiarised himself with the learning outcomes for South African radiology as published by the CR (CMSA) (2013:5-6).

A research project is a prerequisite for sitting the summative assessment in radiology for all candidates who started specialising in radiology since January 2011 (CR (CMSA) 2014a:Online) and was implemented to assist the universities to qualify for government subsidies (Andronikou 2012a:2).

TABLE 2.5: SOUTH AFRICAN RADIOLOGY LEARNING OUTCOMES
(From CR (CMSA) 2013:3) [Table continues on next page]

1. Knowledge	
<i>The candidate specialist should acquire knowledge of/in:</i>	
• A broad overview of the principles and applications of imaging in clinical practice. • Normal imaging anatomy of all organs and systems of the human body. • Understanding of the role that imaging plays in diagnosis and intervention of common clinical problems. • Radiation biology, protection and safety. • Radiological signs and findings of common clinical conditions and diseases found in South African hospitals and practices. • Indications, contraindications and complications of radiological procedures and interventions. • Human rights and the principles of medical ethics and good clinical practice. • Medico-legal aspects of healthcare in South Africa, with special emphasis on radiation medicine. • Principles of radiological audit, quality assurance and utilisation of radiological management information. • Principles of research methods, inclusive of statistical analysis. • The management of a radiological service to patients and health workers, including service delivery-oriented management. • Knowledge of implements, instruments and specific-ware used in diagnostic and therapeutic procedures.	
2. Skills	
<i>The candidate specialist should acquire and continuously refine the following skills:</i>	
2.1	<i>Specific skills - Investigative, deductive and logical decision-making</i> • observation, orientation and illustration • building a body of evidence and warrants • synthesis • guarded decisiveness • measured approach to taking action • framing, inquiring, advocating and reflecting
2.2	<i>Diagnostic and therapeutic interventional procedures</i> • above-average hand-eye coordination • synchronised application of sensory (visual and auditory) and motor (hands, arms and feet) functions • leveraging the capacity in radiological equipment and technology to derive the best results • choice of implements, instruments and supporting-ware used • observe and monitor multiple monitors simultaneously (visually and aurally), including the patient directly
2.3	<i>Communication</i> • oral: appropriate to patients, public, healthcare workers and academic audiences • written: report production, record keeping, referral letters, medical reports and academic writing
2.4	<i>Information management</i> • data access using traditional and electronic techniques • critical appraisal of information sources and information
2.5	<i>Research</i> • critical appraisal of research methods • analysis and interpretation of data • formulating a research report
2.6	<i>Teaching and training</i> • education of patients and communities • teaching and training of students and fellow colleagues
2.7	<i>General skills</i> • Leadership • Management

- *Interpersonal*

3. Attributes

These encompass professional and personal attributes, most of which are described broadly below and should be reflected in the performance portfolio through the continuous assessment process of the training institutions.

- i. Constantly learn and develop attributes that promote conduct that befits the highest order of professionalism.*
- ii. Respect for the rights and values of others; treat everyone with dignity.*
- iii. Open-mindedness, capacity for self-reflection and critical appraisal.*
- iv. Insight into personal strengths and recognition of personal limitations.*
- v. Ability to recognise and deal effectively with personal stress.*
- vi. Ability to care for oneself, including seeking healthcare when needed.*
- vii. Discipline and insight to continue learning to maintain a high level of clinical competence.*
- viii. Dedication to serving the interests of patients at all times.*
- ix. Promotion of justice and equity in the healthcare system.*
- x. Maintenance of integrity and honesty in professional practice.*

2.5 ASSESSMENT

The next step, after identifying the relevant outcomes, involves assessing whether the candidate has successfully achieved the outcomes and can be deemed a competent radiologist. The purpose of the assessment is to determine whether s/he fulfils the criteria set out by the CanMEDS Framework. This may be a challenging task.

Shumway and Harden (2003:571) note that, although there has been a transformation in medical education outcomes, from acquiring mainly knowledge and facts, to a more inclusive curriculum that requires the acquisition of learning outcomes, such as "problem solving, clinical judgement, communication skills, attitudes and professionalism", these transformations have not been implemented effectively in the evaluation process.

The authors' (Shumway & Harden 2003:571) critique is that, in the United States, MCQs, OSCEs and standardised patients are commonly used as assessment tools, while there is a need to assess residents' professional behaviour and characteristics that cannot be ascribed to limited assessment instruments.

Several assessment methods are needed to measure the different levels of the cognitive domain.

Bloom (as cited by Brown 2001:8) (cf. Table 2.6) described six levels of cognitive development:

**TABLE 2.6: BLOOM'S TAXONOMY OF EDUCATIONAL OBJECTIVES
(From Brown 2001:8)**

6	<i>Evaluation</i>	<i>The ability to judge or critique something.</i>
5	<i>Synthesis</i>	<i>The ability to combine separate elements into a whole, put materials together to create something new.</i>
4	<i>Analysis</i>	<i>The ability to separate material or a concept into its constituent parts and establish the relationships among the parts to gain a better understanding.</i>
3	<i>Application</i>	<i>The ability to apply rephrased knowledge in novel situations or to use information.</i>
2	<i>Comprehension</i>	<i>The ability to rephrase knowledge or obtain meaning from the information.</i>
1	<i>Knowledge</i>	<i>That which can be recalled, or simply remembering information.</i>

Brown (2001:8) is of the opinion that the "lower three levels are surface learning and the higher levels are deep learning".

The purpose of assessment is threefold: to prove competence to proceed to graduation (licence to proceed), to quantify the levels of competence in rank order, and to improve future learning (Brown 2001:6). To ensure quality in assessment, the process should be proven to be fair, valid, reliable and practical (SAQA 2001:16).

Assessments should be linked to learning and not be isolated events (Boursicot *et al.* 2011:371). This can be achieved by incorporating formative assessment that is workplace-based and driven by appropriate learning objectives, practice standards and assessment criteria throughout the training period.

ANTA (2001:6) explains that the assessment system is a controlled environment that aims to ensure that the assessment is valid, fair and reliable. This is accomplished by, first, providing a policy on how the assessment should be performed and setting policy for further development of assessors. Second, procedures for record keeping and the issuing of qualifications should be clear. Third, sufficient resources should be available to support the candidates and the assessors. Lastly, quality assurance of the assessment should be efficient (ANTA 2001:6).

The assessment process as defined by ANTA (2001:7) entails the different steps the candidate needs to complete during an assessment. The steps should be as simple as possible, and economical.

ANTA (2001:7) advises that the collection of evidence should be valid, current, sufficient and authentic. The final judgment should be valid and reliable. If this requirement is not

met, confidence in the recognition of qualifications is lost. Valid, reliable judgements build credibility and improve consistency in assessment outcomes (ANTA, 2001:8).

A reliable examination will identify competent radiologists consistently (Augustine *et al.* 2010:326).

Geyser and Gravett (2004:92-99) identify the following principles for ensuring that the assessment is credible:

- Assessment is an essential part of learning development and should motivate deeper learning, with the aim of developing higher cognitive thinking.

The student prepares for the assessment by only studying that which s/he thinks will be assessed. Therefore feedback regarding the assessment is important for guiding the future learning process. Deeper learning is fundamental for the development of critical thinking.

- Assessment is an integral part of curriculum, programme and module planning.

Assessment should be aligned with the learning outcomes. All lecturers involved in the training programme should be involved in the assessment planning. Assessment influences learning as learning guides assessment.

- The purpose of the assessment determines the techniques and methods that should be used.

The methods, instruments and tools to be used will be determined by the type of assessment, whether it is diagnostic, formative or summative.

- The relevant assessment criteria should be identified and communicated.

"Assessment criteria are statements that describe the standard to which learners must perform the actions, roles, knowledge, understanding, skills, values and attitudes stated in the outcomes" (SAQA 2001:21). These criteria should be precise, linked to the outcomes and communicated to the student in a clear manner. The criteria should be aligned with the learning outcomes (University of Tasmania 2011:9).

The assessment criteria arise from the learning outcomes and the latter are proof of the learning process and competence achieved by the learner (Geyser & Gravett 2004:95-96). Outcomes always consist of a verb, a noun and a specific condition and should, like the assessment criteria, be understood well by all relevant parties. Criteria will consist of a verb, a noun and a specific standard.

- The assessment should be reliable.

Reliability is achieved by absence of assessor bias, achieving the same standard of assessment, being consistent, briefing learners in the same manner, moderation of the assessment and having consistent administration processes.

- The assessment should be valid.

This is only achieved if the assessment methods and instruments are relevant to what they are supposed to assess.

- The assessment should be transparent.

Everyone involved in the process should understand what is expected of him/her. This is achieved by communicating the standard of outcomes to be reached as well as the weight of every outcome. This also includes study guidelines, failure communication and regulations.

- The assessment should be fair.

Assessment should be unbiased. This can be achieved if the learner is anonymous. Moderator guidelines should be in place. All learners should receive the same guidance and support.

- The assessment process should be practicable.

The assessment should be doable within a certain time frame, keeping in mind the number of learners versus teachers, available facilities and resources.

- The assessment workload should be realistic.

Unrealistic workloads and overassessment should be prevented by spreading the study material over predefined schedules. Proper feedback and administrative support should be given.

- The assessment should include a variety of methods.

Assessment methods should be in keeping with the outcomes to be assessed. Different methods prevent boredom among assessors and measure different levels of cognitive achievement as well as different skills.

- Feedback should be given to the learner to encourage further learning.

For summative assessment this will be in a more formal manner while for formative assessment this will be more informal. Feedback should be constructive.

- Assessment should be integral to quality-assurance procedures.

The assessment process is subdivided into the preparatory phase and the assessment itself (SAQA 2001:49) and comprises choosing the different methods and instruments to be used in the assessment, the structuring of the assessment and making use of integrated assessment where multiple learning outcomes are assessed simultaneously.

The preparatory phase of the assessment process is as important as the assessment phase. SAQA (2001:49) explains that, during preparation for the assessment, the assessor must familiarise him/herself with the unit standards of the qualification to be assessed. The learning outcomes, critical cross-field outcomes and criteria measuring competence should be clear as they will influence the design of the assessment. During the preparatory phase the assessor will decide on the methods, instruments and activities to be used, as well as the nature and quantity of evidence required to make a judgment. The assessment design should guarantee that the assessment is fair, valid, reliable and practicable throughout the assessment (SAQA 2001:50).

The assessor should meet with other assessors participating in the assessment process to discuss the interpretation of the unit standards, and the nature and quantity of evidence needed to prove competency (SAQA 2001:50). These discussions will facilitate the planning of the assessment, and, in future, moderation and new approaches for upcoming assessments. The assessor needs to familiarise him/herself with the curriculum as well as previous performance and assessments (formative and summative) of the candidate. Available resources should be discussed, as well as the timing of the assessment, so that service delivery is not influenced negatively (SAQA 2001:50).

During the assessment phase of the process the learner is informed about the requirements for the assessment and provided with detail about the way the evidence must be presented and how it will be collected. The assessor also must verify that the learner understands his/her roles and responsibilities during the assessment, with special reference to any activities that the candidate has to carry out, the level that is required for delivering such evidence of learning, including the nature and quantity of such evidence (SAQA 2001:51-52).

The principles of constructive alignment should be followed, according to which the outcomes to be assessed should be in line with the methods and instruments used for the assessment (Hurter 2013:54).

SAQA prescribes that the candidate and the examiner should be comfortable with the timing of the assessment process and comfortable with sufficient assessment opportunities in a suitable environment. Once the above-mentioned criteria have been met, the assessor can then assess the candidate and collect the evidence in an appropriate and non-threatening setting, and follow it up by judging the evidence against the unit standards/criteria. The assessment is completed by giving feedback to the learner (SAQA 2001:52).

The last steps of the assessment phase involve performing the relevant administration as required by the relevant Education and Training Quality Assurance Body (ETQA) and re-evaluating the assessment process (SAQA 2001:53).

2.5.1 Different types of assessment

According to Lum and Zaleski (2010:16), educational assessment and evaluation are two different terms that should not be used interchangeably. The authors argue that **educational assessment** is a process that is formative in nature and that guides the teacher towards understanding what students know prior to starting the learning process, further review and development of the curriculum and continuous evaluation of the student's progress through the teaching programme.

The authors point out that **evaluation** is summative, and should be used to measure the performance of the candidate "at the end of the training period", after continuous assessment has already been completed and feedback has corrected any problem areas against specified standards and criteria. This process leads to completion of the programme and the requirements for progression (Lum & Zaleski 2010:16).

For this study the researcher decided to cite the Council on Higher Education, Higher Education Quality Committee (CHE HEQC), which defines three types of assessment: diagnostic, formative and summative (2004:134).

2.5.1.1 *Diagnostic assessment*

Diagnostic assessment is needed to establish a candidate's prior knowledge and preparedness for admission to a specific training programme. In the South African radiology context this means that a candidate should have qualified as a general medical practitioner and must be registered with the HPCSA. Furthermore, the candidate may also be required to complete the CR (CMSA) Part 1 (primary examination) prior to admission into the radiology training programme, although this is not a prerequisite of all South African academic radiology departments.

Gunderman, Shuman and Moore (2010:213) state that the quality of the resident recruitment and selection programme has a considerable influence on the functioning of the radiology department. They argue that good candidates will improve the successes of the department, compared to bad candidates, who may "bring it down". Human resources is one of the most important building blocks of a good department and therefore of the outputs of the training programme. The authors continue by stating that the success of a

radiology department is measured by more than just the resident pass rate at the national exit exam or the fellowships and job placements that graduates attain. The department is also measured by the "work ethics, camaraderie and morale" of the residents (coming from different intellectual backgrounds, geographical locations and cultures), which joins them together as an effective machine. The future of radiology depends on the quality and success of residents and training programmes (Gunderman *et al.* 2010:213).

Green, Jones and Thomas (2009:362) note that little literature exists about the criteria that selection committees or educators regard as important in selecting candidates for a residency programme.

Gunderman (2008:847) raises several facts regarding the selection process. The author points out that interviews can be helpful, but are less valuable than past performance because the interviewee tends to put his/her best foot first. Curricula vitae may contain incorrect information and letters of reference may be less than candid. Past performance is the most reliable indicator, but one has to keep in mind that people can change. Furthermore, the author states that physical attractiveness and mutual similarity may influence the interviewers psychologically (Gunderman 2008:847).

Gunderman *et al.* (2010:214) guide us through several general factors that should be considered during the selection process (without ignoring factors such as the institution's culture, the interests of contributors and the availability of resources). These practices are described as "a chain which can only be as strong as its weakest link".

Highlight **positive factors** (Gunderman *et al.* 2010:214), such as,

- The public image of the residency programme (by making use of electronic resources, such as a regularly updated webpage about the strengths of the training programme and any associated documentation and information that may be sent to applicants).
- Evidence of previously acquired medical knowledge. (Boyse, Patterson, Cohan, Korobkin, Fitzgerald, Oh, Gross and Quint (2002:437) proved that undergraduate marks strongly predicted success in the written exit-level examination.)
- Communication skills.
- Past performance in the clinical setting.
- Consistency of performance.
- Evidence of leadership and/or creativity (e.g. research).

- Frequency and intensity of contact between the applicant and the programme director, coordinator and other lecturers in the department. This shows meaningful interest in the programme.
- Balanced salesmanship of the candidate (marketing him/herself) during the interview.
- Interpersonal skills and habits (e.g., making appropriate eye contact, shaking hands, memorising the name of the interviewer, speaking in a professional manner, proper conduct towards non-medical personnel).
- Feedback from current residents conveying details of their programmes.
- Good recordkeeping of each interview, including a photo.
- Ranking the qualifying applicants.

Prevent **negative factors** (Gunderman *et al.* 2010:216), such as:

- Favouritism.
- Unfair selection decisions.
- Unkind remarks towards the competition by deliberately disparaging another programme.
- Leaking confidential information.
- Not knowing the applicants by name and their educational backgrounds.
- The interviewer failing to provide appropriate feedback.

According to Gunderman *et al.* (2010:217), future benefits of selecting the best candidates for radiology residency will include improvement of the quality of service delivery rendered by the radiology department, as well as better morale among the individual team members. It will also contribute to the future recruitment of top-level residency candidates, who will motivate everyone working in the department to improve performance, leading to an increase in work satisfaction.

2.5.1.2 Formative assessment

A study by Fatehi (2011:59) compared two subgroups (one group received formative assessment and the other group did not) in 2010 and found that applying formative assessment improved the learning of radiology students during the teaching programme, with a subsequent increase in their summative assessment marks.

Van der Vleuten (1996:62), echoed by authors like Shepard (2000:5), concludes that learning is the key purpose of assessment.

Formative assessment is done regularly all the way through the learning programme. It strengthens learning and continues to develop the candidate through teaching. This is achieved by means of continuous feedback, making clear the progress of the student on the road to summative assessment. It also informs the candidate of weak points that may be present in his/her development, which can be addressed in an appropriate manner (CHE HEQC 2004:134).

Formative assessment is more informal and can be done by peers and lecturers, or it can be self-assessments, for example utilising computer software. This possibility was confirmed by Driessen and Van der Vleuten (2000:244), who concluded from their own review of changes that had been implemented in their assessment processes, that self-assessment can function effectively as a form of formative assessment.

To utilise formative assessment effectively, Norcini and Burch (2007:856) suggest workplace-based assessment as an alternative method of continuous assessment that will improve feedback to residents. Burch, Seggie and Gary (2006:430) proved that workplace-based assessment (WPBA), as a model of formative assessment, can be implemented successfully in a resource-limited setting and that it effectively changes student behaviour about learning activities.

All of these findings sound promising, but Norcini and Burch (2007:857), after citing several studies, conclude that direct observation of both pre- and postgraduate students' performance takes place too infrequently and, in the majority of studies, was deficient. The authors also conclude that, "the quality of feedback, when given, may be poor" (Norcini & Burch 2007:857).

Even more worrisome is a study published by Holmboe, Yepes, Williams and Huot (2004:559), which found that, in the vast majority of cases, feedback did not lead to the implementation of a definite action plan to improve student performance. Consequently Norcini and Burch (2007:857) point to the possibility that some medical educators may not be sufficiently qualified to provide appropriate feedback.

Al-Kadri, Al-Kadi, and Van der Vleuten (2013:31) conclude that students and assessors may have "contradicting perceptions on the effect of WPBA on students' learning", and that better preparation and orientation may be needed to improve a student's learning through WPBA.

Ramsden (2014:161) completed a Ph.D. study on "The implementation of workplace-based assessment in the context of clinical radiology training" and commented that WPBA may sometimes be conceived as a "tick-box exercise". The author (Ramsden 2014:161) also concluded that time pressures make it difficult for some assessors to carry out WPBA and that WPBA may fail to identify poorly performing trainees because "assessment scoring forms were too generic in nature". Finally, Ramsden (2014:210) points out that assessors are not prepared and trained for WPBA.

2.5.2.3 Summative assessment

Summative assessment is a formal assessment and occurs at the end of the candidate's training programme (CHE HEQC 2004:134).

Within the current radiology context, summative assessment usually consists of written papers, case reporting, rapid reporting of radiological images and orals in the Royal College of Radiologists (RCR 2015a:Online), American Board of Radiology (ABR 2015:Online), Royal Australian and New Zealand College of Radiologists (RANZCR 2014a:Online) and College of Radiologists of South Africa (CR (CMSA) 2015a:6) exams.

The summative assessment of the **Royal College of Radiologists** (RCR 2015a:Online), is split into two parts, A and B. Part A consists of single best answer multiple choice question (MCQ) papers that are divided into six modules, each of which have to be passed individually.

These modules are evaluated by presenting six papers written over three consecutive days and are divided as follows (RCR 2015b:1):

- *Module 1 Cardiothoracic, Vascular*
- *Module 2 Musculoskeletal and Trauma*
- *Module 3 Gastro-intestinal*

- *Module 4 Genito-urinary, Adrenal, Obstetrics & Gynaecology and Breast*
- *Module 5 Paediatric*
- *Module 6 Central Nervous and Head & Neck.*

Candidates must hold active radiology training posts and must have passed the first RCR examination to be eligible to sit the Part A of the final examination (RCR 2015b:1). Part B of the final RCR examination consists of a reporting session, a rapid reporting session and two oral examination sessions (RCR 2015a:Online). Both the reporting (long cases) and rapid reporting sessions are double marked (RCR 2015c:1-2). During the rapid reporting, candidates report on 30 images (each counting one mark) and need to attain 27 out of 30 to pass this component of the examination (RCR 2015c:3). The reporting component consists of six cases with a maximum of 8 marks per case calculated according to a prescribed rubric (RCR 2015c:2) (cf. Table 2.7). A candidate needs to acquire at least 34.5 out of the total of 48 to pass this module.

TABLE 2.7: RUBRIC FOR CASE REPORTING ASSESSMENT IN THE FINAL EXAMINATION FOR THE FELLOWSHIP IN CLINICAL RADIOLOGY (PART B)
(From RCR 2015c:2)

Candidate response	Mark
No answer offered	3
Fail: significant observations missed; correct diagnosis not made	4
Borderline: appropriate if there are two main diagnoses in the case but only one is mentioned; some observations missed	5
Pass: most observations made correctly; principal diagnoses correct	6
Good pass: additional relevant material included in a "pass" grade answer	7
Excellent: a perfect answer, clear and confident	8

The orals consist of two sessions. During each oral session the candidate is presented with several images by a pair of assessors. The candidate can achieve a maximum of 8 marks per session (pair of examiners). The candidate needs to achieve at least 6 marks per session (according to a prescribed holistic rubric) to pass this component of the assessment (RCR 2015c:3).

Finally, the candidate needs to achieve an overall total of at least 24 and has to pass at least two of the components (rapid reporting, case reporting and two orals) to be able to pass the Part B examination (RCR 2015c:4).

The **American Board of Radiology** (ABR) conducts their summative assessment in a slightly different way to their Royal colleagues. The ABR abandoned their orals in 2008

(Alderson & Becker 2008:708). The summative assessment is split into a "Core" Examination and a final Certifying Examination (ABR 2015:Online) (cf. Figure 2.5).

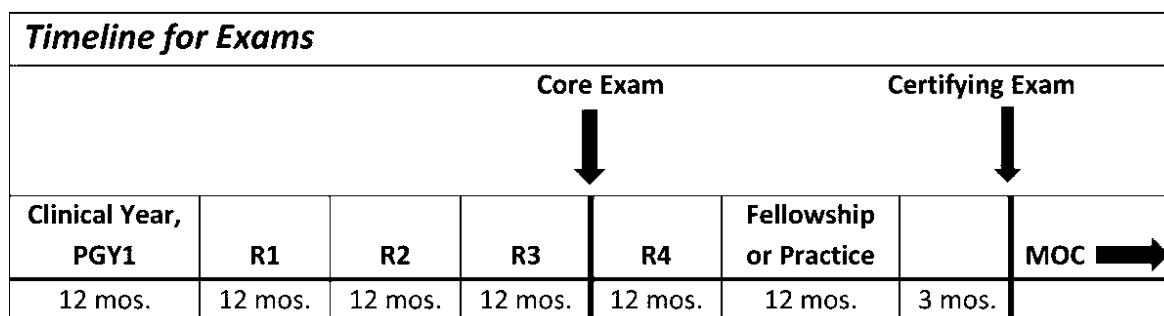


FIGURE 2.5: TIMELINE FOR THE ABR EXAMINATIONS

(From ABR 2015:Online)

(PGY – Postgraduate year; mos. – months; R1 to R4 – Residency years; MOC – Maintenance of Certification)

The Core Examination is an image-rich, computer-based examination, offered after 36 months of residency training; it covers 18 subspecialty and modality categories. The exam must be passed overall and in each category to receive a passing result (ABR 2015:Online).

The Certifying Examination, given 15 months after completion of diagnostic residency training, is also computer based and image rich, and it includes five modules. Three modules are clinical practice areas and may be chosen by the examinee to fit his or her interests, experience, and training. The other two modules, Essentials of Diagnostic Radiology and Noninterpretive Skills, will be taken by all examinees (ABR 2015:Online).

Content for the Radioisotope Safety Exam (RISE) is integrated into the Core and Certifying exams (ABR 2015:Online).

The **Royal Australian and New Zealand College of Radiologists'** (RANZCR) summative assessment is divided in three components:

two two-hour electronic multiple-choice question (e-MCQ) exams (radiology and pathology), a two-hour electronic Film Reading (e-Film Reading) exam and seven oral examinations, each of 25 minutes duration (RANZCR 2015a:Online).

The two e-MCQ examinations consist of 100 questions each and the candidate is not penalised for wrong answers (RANZCR 2015a:Online). The e-Film Reading consists of eight clinical cases that include all relevant imaging modalities and all cases are scored equally

(RANZCR 2015a:Online). Every oral examination (seven oral examination sessions in total) is conducted by two examiners and lasts 25 minutes per oral session (RANZCR 2015a:Online).

The candidate needs to pass all three components to finally pass the summative assessment (RANZCR 2015a:Online).

The current format of the **College of Radiologists of South Africa** (CR (CMSA)) summative assessment will be discussed by the researcher in Chapter 6 (cf. Point 6.2). The accredited sites for sitting the CR (CMSA) written part of the summative assessment is summarised in Table 2.8.

TABLE 2.8: LIST OF EXAMINATION VENUES
(From CR (CMSA) 2014b:Online)

City	Examination venue
Blantyre	University of Malawi
Bloemfontein	University of the Free State
Bulawayo	Mater Die Hospital
Cape Town	CMSA Cape Town
Durban	Nelson R Mandela School of Medicine
East London	East London
Gaborone	University of Botswana
Harare	Harare Medical School
Johannesburg	CMSA Johannesburg
Mthatha	Mthatha
Polokwane	Polokwane Provincial Hospital
Port Elizabeth	Livingstone Hospital
Pretoria	Pretoria University
Windhoek	Windhoek Central Hospital

2.5.3 Methods, instruments and tools of assessment

The collection of evidence can be done through different methods, instruments and tools.

SAQA names several examples of assessment methods: personal interviews, role play, simulations, peer assessment, self-assessment, projects, portfolios, practical exercises and demonstrations, logbooks, assignments and case studies (SAQA 2001:33-35).

Brown (2001:10) disagrees and argues that peer assessments and self-assessment should not be considered methods of assessment, but rather sources of assessments. He explains that a "method refers to the approach used to assess learning such as essays, problems,

multiple choice tests and so on." An assessment method is the interaction that the assessor follows to assess the candidate (Brown 2001:9).

The source is the person who applies the method and, depending on the type of method, may include, according to Brown (2001:9) the lecturer, tutors, demonstrators, mentors, peers and even the student him/herself.

The researcher concurs with Brown on the latter, and with his description of a method, but differs from him on his examples of methods. The researcher finds the explanation of Dent and Harden (2001:280) straightforward and intelligible.

Dent and Harden (2001:280) explain the difference between a "method" and an "instrument" by means of an analogy with intercontinental travel. Travelling by sea or by air is the method, while the ship or an aeroplane is the instrument that is used.

So, the "method" is the form of contact between the source (e.g. lecturer, assessor) and the learner. The contact usually includes direct observation or questioning of the candidate or evaluation of a final product that is presented by the candidate (SAQA 2001:27). The "instrument" refers to the specific nature of the task involved in the assessment, e.g. MCQs, assignments, written/oral tests, case studies, modified essay questions (MEQs), log books, practical exercises, demonstrations, portfolios, OSCEs, projects, simulations and role plays (SAQA 2001:29-36). An assessment tool is used to achieve the final measurement when evaluating the candidate, a hierarchy between "unsatisfactory" and "excellent" that is used to grade the candidate. It includes checklists (for the examination of a skill or the assessment of the end product), a rubric (for an oral test) or a marking scheme or memorandum (for a written question paper) (SAQA 2001:51).

Brown (2001:10) suggests that the success of the assessment method is connected to the learning outcomes. The assessment method that is used may be reliable but it may not necessarily be valid. The author suggests that different methods are used to assess different levels of cognitive learning; however, the method used should always be aligned with the outcomes that need to be assessed. Whatever method is used, it should encourage learning and thinking on a higher cognitive level.

Care should also be taken in selecting the correct instrument for the assessment. A holistic instrument (like a long essay question) saves time on preparing a question paper, but does not provide the learner with specific feedback, compared to a specific instrument (such as MCQs), which allow more detailed feedback but is very time consuming to prepare (Mertler 2001:3).

2.5.3.1 *Formative assessment methods, instruments and tools*

Many methods, instruments and tools are currently in use within the field of medical teaching globally, but the researcher only focused on those that are relevant to the radiological context.

The RCR requires, as part of their curriculum, a minimum number of satisfactory WPBAs of residents annually (RCR 2015d:Online). The RCR makes use of an electronic portfolio (ePortfolio) that should be signed off regularly by the supervisor when the resident has reached a specific competency in the training programme (RCR 2012:Online). The RCR ePortfolio is an online teaching tool: Residents log their training activities and assessments, and enjoy the benefit of lecturers monitoring the candidates' progress through the curriculum (RCR 2015e:Online).

The RCR uses audit assessment, teaching observation, Radiology Direct Observation of Procedural Skills (Rad-DOPS), Mini-Imaging Interpretation Exercise (Mini-IPX), research evaluation, and Multidisciplinary Teamwork (MDT) assessment tool as workplace-based assessment tools (RCR 2015d:Online).

The **audit assessment tool** assesses the resident's ability to complete an audit (RCR 2015f:Online):

The Audit Assessment should include a review of the audit process and may also include presentation of the audit at a meeting. If possible the trainee should be assessed on the same audit by more than one assessor. The process should be trainee-led.

Teaching observation assesses the resident's ability to teach, and can take place during any teaching occasion that has been observed by the assessor (RCR 2015g:Online).

The **Bristol Radiology Report Assessment Tool (BRRAT)** (Wallis, Edey, Prothero & McCoubrie 2013:1146) is a reliable tool for formative assessment that can be used to assess the quality of radiological reports (cf. Figure 2.6).

Bristol Radiology Report Assessment Tool (BRRAT) Pilot Study									
Trainee Code		Year		Report no					
Modality	Plain ☐	Fluoro ☐	US ☐	Int ☐	Complexity (your opinion)				
	CT ☐	MRI ☐	Nuc ☐		Low / Average / High				
System	Neuro ☐	Chest ☐	GI ☐						
	GU ☐	MSK ☐	O&G ☐						

	Not Applicable	Below expectation	Meets expectation	Above expectation
Technical Aspects				
1. Is there correct use of medical terminology?	☐	☐	☐	☐
2. Is the use of abbreviations accurate?	☐	☐	☐	☐
3. Is description of technique / procedure/ protocol accurate?	☐	☐	☐	☐
4. Is there accurate quantification (measurements / angles / ratios)?	☐	☐	☐	☐
5. When given, is the clinical question identified and recorded?	☐	☐	☐	☐
6. Are the quality and limitations of current study suggested?	☐	☐	☐	☐
Clarity and Structure				
7. Is the report clear?	☐	☐	☐	☐
8. Is the report easy to read?	☐	☐	☐	☐
9. Is there comparison with previous studies if available?	☐	☐	☐	☐
10. Does the report have a logical structure?	☐	☐	☐	☐
11. Are the observations described in a logical manner?	☐	☐	☐	☐
Conclusion				
12. Does the report answer the clinical question?	☐	☐	☐	☐
13. Is diagnostic confidence stated if in doubt?	☐	☐	☐	☐
14. Where appropriate is there a conclusion?	☐	☐	☐	☐
15. Is the differential diagnosis clear?	☐	☐	☐	☐
Consideration of clinical implications				
16. Where appropriate is there documented discussion with the referring clinician?	☐	☐	☐	☐
17. Does the report add clinical value to patient management?	☐	☐	☐	☐
18. Is further investigation/intervention/follow up suggested, and if so with clear purpose?	☐	☐	☐	☐
19. Where appropriate is adequate focus on response to treatment given?	☐	☐	☐	☐

Overall assessment

20. What is your overall assessment of the report?

1
2
3
4
5
6
7
8
9
10

Below
Expectation

Meets
Expectation

Above
Expectation

FIGURE 2.6: THE BRISTOL RADIOLOGY REPORT ASSESSMENT TOOL
(From Wallis *et al.* 2013:1148)

The **Radiology Direct Observation of Procedural Skills (Rad-DOPS)** (RCR 2015h:Online) is a focused observation of the resident applying skills that are needed to

complete a practical procedure successfully. Not all elements of the procedure need to be assessed at every given opportunity, but any relevant knowledge may be assessed when appropriate.

Skills that can be observed during a Rad-DOPS as summarised by Hibbert, Chhem, Van Deven and Wang (2012:93) include:

- Taking informed consent;
- Observation of sterility and no-touch principles;
- Radiation safety practices;
- Protocols of examinations;
- Understanding and appropriate use of imaging equipment;
- Selection and use of appropriate interventional devices; and
- Appropriate use of local anaesthesia and sedation.

The **research evaluation** (RCR 2015i:Online) evaluates and gives the resident feedback regarding his/her research project. It is not scored and does not lead to a pass or a fail, but it guides the supervisor on evaluating the ability of the candidate to engage with the research project, and evaluating his/her understanding of general research principles. The evaluation is based on a written report, a paper or a slide presentation of the research project.

The **Mini-Imaging Interpretation Exercise tool** (Mini-IPX, mini-individual patient exercise) (RANZCR 2015b:Online) assesses the resident's skills in interpreting radiological images for an individual patient. The purpose of the tool is providing immediate feedback to the resident within a specific imaging modality. For example, any patient is selected from the imaging modalities' running work list and the resident is assessed informally on the case. The trainee should lead the process by selecting the activity to be evaluated and a suitable person to do the assessment (RCR 2015j:Online).

The **Multidisciplinary Teamwork assessment tool** (RCR 2015k:Online) assesses the resident's capacity to contribute efficiently to a multidisciplinary team and to assume a leadership role in multidisciplinary meetings. The assessment involves the lecturer observing the resident and giving appropriate feedback. The assessment presents an opportunity to identify strong points and flaws in the resident's learning progress. The assessment should be led by the resident.

Self-assessment modules are now available online as a formative assessment tool for radiology physicians, and have been implemented by major radiological societies, such as the European Society of Radiology (ESR) (2015:Online) and the Canadian Association of Radiologists (CAR) (2015:Online).

The **Radiology-Integrated Training Initiative (R-ITI)**, developed by the RCR and adopted by the RANZCR (2015c:Online), is an online e-learning project that can be used to assess the progress of candidates through the prescribed radiology curriculum.

A **logbook** is an accepted assessment instrument in postgraduate radiology programmes. Because of the modern Picture Archiving and Communication System (PACS) and Radiology Information System (RIS) it is easy to collect the necessary records of investigations that were completed during residency (Augustine *et al.* 2010:326). Augustine *et al.* (2010:326) point out that logbooks only list completed investigations and do not assess the competency or performance of the resident, and are therefore not a reliable tool for assessing patient outcomes; nevertheless, the authors argue that logbooks are relevant in assessment because it proves that important procedures (necessary for radiological competency), were completed during the training period and it guides residents to what they are supposed to achieve in comparison to their colleagues.

Multi-source feedback (MSF), also known as 360-degree assessment, as described by Wood, Wall, Bullock, Hassell, Whitehouse and Campbell (2006:177), can be used to assess interpersonal skills and behaviour.

Duffy, Gordon, Whelan, Cole-Kelly and Frankel (2004:495) argue that interpersonal skills are naturally influenced by the relation between the parties involved and therefore by the relevant course of action in a scenario that will inevitably lead to the effect that one individual has on another and, finally, generate either trust or distrust during the interaction.

The authors suggest that:

- "checklists of observed behaviours during interactions;
- surveys of patients' experience in clinical interactions; and
- examinations using oral, essay, or multiple-choice response questions"

may be used to assess interpersonal skills. From this the authors (Duffy *et al.* 2004:504) conclude that assessment of interpersonal skills should be relevant to the teaching and assessment resources that are available, but should at least include the opinion of the user (e.g. patient, support staff, clinician) to improve reliability and validity. Therefore, in the researcher's opinion MSF, as a formative assessment instrument, is probably more practical in a radiology academic department to assess interpersonal skills.

Labuschagne (2011:86) states that simulation may also be a valuable tool for assessing interpersonal skills.

MSF was developed in 1994 by the Royal College of Obstetrics and Gynaecology and was originally called team observation (Wood *et al.* 2006:178).

MSF evaluates four domains (Wood *et al.* 2006:178):

- relationship with colleagues;
- relationship with patients;
- information gathering and note keeping; and
- time management and diligence.

Every domain is evaluated according to a grading scale (Wood *et al.* 2006:178):

- Needs serious attention.
- Some deficiency. Progress needed. This includes borderline candidates.
- Fine. No problem.
- Outstanding. Well done.

The authors conclude from their study that a minimum of eight evaluators is adequate to provide reliable results (Wood *et al.* 2006:181).

Wood, Collins, Burnside, Albanese, Propeck, Kelcz, Spilde and Schmaltz (2004:931) found that MSF is valid and reliable for assessing resident competence and that this may assist residents to improve their professionalism and interpersonal skills.

2.5.3.2 Summative assessment instruments

Although many instruments, such as MCQs, assignments, written/oral tests, case studies, log books, practical exercises, MEQs, demonstrations, portfolios, OSCEs, projects,

simulations and role plays (SAQA 2001:29-36), are available for assessment of residents, not all of them are currently relevant in the radiology summative assessment context.

The researcher focused on those instruments that are commonly used by radiology summative assessment.

No single assessment instrument is flawless, because intrinsic strengths and weaknesses are associated with each one (Epstein 2007:388). For this reason it is better to use multiple assessment methods, instruments and tools to compensate for any limitations, and to ensure that the candidate gets a fair, valid and reliable assessment (Epstein 2007:388).

Written papers are categorised, according to Epstein (2007:388), into MCQs and open-ended questions.

This is criticised by Schuwirth and Van der Vleuten (2004:974), who do not support categorising questions into open or MCQ types. The authors explain that this subdivision relates to the "answer format" of the question rather than the stimulus that the question tries to provoke from the candidate, and therefore the "stimulus format" transmits the content of the question instead of merely capturing the answer. Schuwirth and Van der Vleuten (2004:974) emphasise that the stimulus for determining knowledge is more important than the format.

Open-ended questions may prevent the "cueing effect" (where candidates may recognise the correct answer from a list of possibilities without actually applying their knowledge), that may be found in MCQs, but because open-ended questions tend to be time consuming to answer, this limits the number of questions that can be asked within the allocated time slot (Schuwirth & Van der Vleuten 2004:975). Schuwirth and Van der Vleuten (2004:976-977) furthermore recommend the use of "context-rich" questions, but advise that an assessor has to keep in mind that it may be very time consuming to create good clinical scenarios.

Epstein (2007:388) argues that questions that are "context rich" give more complete descriptions of the clinical context and will test the higher levels of the cognitive domain. On the other hand, "context poor" questions will only test the lower levels of the cognitive domain.

Short-answer questions (SAQs) are easy to formulate, prevent "cueing" and involve questions where competency must be proven by stimulus of a correct, spontaneous answer (Schuwirth & Van der Vleuten 2004:976).

Tests comprising **multiple-choice questions** (MCQs) are one of the assessment instruments that are most widely used (Schuwirth & Van der Vleuten 2004:976) in summative assessments, and it is currently the most commonly used instrument in radiology summative assessments (Collins 2006:543). However, preparing MCQs is a laborious process and almost a science in itself. MCQs are a valid assessment instrument to assess the resident's knowledge but would be inappropriate to assess practical skills (Augustine *et al.* 2010:326).

Collins (2006:544) summarises the disadvantages of MCQs as follows:

they test recognition (choosing an answer) rather than recall (constructing an answer), they allow for guessing, and they are difficult and time-consuming to construct.

Nevertheless, the author (Collins 2006:544) does recognise that, if MCQs are properly constructed, this will result in the objective and effective assessment of several levels of the cognitive domain, including knowledge, comprehension, application, and analysis.

Benefits of MCQs that are pointed out by Epstein (2007:388) include the fact that MCQs can assess the resident's knowledge over a wide range of topics within a short assessment timeframe. MCQs also contribute to standardising the assessment if large numbers of candidates take part in the assessment. Epstein (2007:389) states that, generally, assessments require candidates to pick "the best answer from a list of possible answers".

Frederiksen (1984:201) argues that, because time-efficient assessments (regarding the collection of data) such as MCQs may in future replace less efficient assessment instruments, it opens the door to the possibility of deficient assessments that do not evaluate important competencies, such as ethical behaviour, professionalism and teamwork.

Schuwirth and Van der Vleuten (2004:976) describe two types of MCQs that are commonly used: single best option MCQs, and true/false questions (TFQs). TFQs are also referred to as multiple true-false questions (MTFs) (Downing, Baranowski, Grosso & Norcini 1995:187).

Downing *et al.* (1995:195) report that MTFs are more time efficient than single best option MCQs because MTFs are more reproducible within a set examination timeframe, but both MCQs and MTFs can be used to measure the same levels of cognitive skills.

However, Downing *et al.* (1995:195) point out that MCQs tend to be more appropriate for assessing the higher levels of the cognitive domain than MTFs, which are better at assessing the lower levels of the domain (knowledge).

Schuwirth and Van der Vleuten (2004:976) explain that TFQs usually comprise two elements: a stem, which is the correct component, followed by a statement, which may be correct or incorrect. Creating TFQs is easier said than done and the resident may easily choose the correct answer based on incorrect knowledge (Schuwirth & Van der Vleuten 2004:976).

Some experts argue that MCQs may promote "memorization and factual recall" and run the risk of testing only lower-level cognitive processes (Eijsvogels, Van den Brand & Hopman 2013:253). This criticism led to the development of extended matching questions (EMQs), which consists of a list of possible correct answers that need to be matched with a list of different clinical scenarios. Some options may apply to several scenarios or to none at all (Schuwirth & Van der Vleuten 2004:977).

Eijsvogels *et al.* (2013:252) conclude from their research that single best option MCQs identified weaker candidates, while EMQs identified stronger (excellent) candidates. Therefore, the purpose of the assessment should be considered when selecting the instrument to be used in the assessment.

Another type of MCQ, which is advocated by Farmer and Page (2005:1188) and Farmer and Hinchy (2005:1059) is the key feature (KF) approach, which uses a context-rich clinical scenario leading to a list of several KFs from which the candidate should select a single, several or no correct answers. Although key features may also be challenging to compile, it has the benefit of testing many cases within a limited timeframe and is specifically aimed at assessing medical problem-solving skills (Schuwirth & Van der Vleuten 2004:977).

The compiler of the MCQs must take note of the components of a MCQ as summarised by Nedeau-Cayo, Laughlin, Rus and Hall (2013:53) (cf. Table 2.9).

The **item** is the entire test question, which consists of a stem and several options. The **stem** is the question, statement, or lead-in to the possible answers. The possible answers are called **options**, alternatives, or choices. The correct option is called the **keyed response**. The incorrect options are called **distractors** or foils (Collins 2006:546).

TABLE 2.9: MULTIPLE CHOICE QUESTIONS DEFINITIONS
(From Nedeau-Cayo *et al.* 2013:53)

Term	Definition
<i>Item</i>	<i>A statement of a problem followed by a list of possible solutions or answers.</i>
<i>Stem</i>	<i>The statement of the problem, usually consisting of 1-2 sentences, that poses the question to the learner.</i>
<i>Options</i>	<i>A list of alternative answers or solutions.</i>
<i>Distractor</i>	<i>Options that are intended to distract the test taker from the correct response. The best distractors are often common mistakes of learners.</i>

Collins (2006:546) discusses several guidelines for writing MCQs:

- The stem should be written first and preferably "as a complete sentence or question".
- "A stem can incorporate maps, diagrams, graphs, or radiologic images, but these should be accompanied by a complete statement."
- The "stem should contain all relevant information" and should be the main body of the item.
- Words that are used in "the stem should not be repeated in the options".
- The stem should be as concise as appropriately feasible.
- The stem should be easy to understand and should be written in simple, straightforward language.
- Any one item should be answered within less than one minute.
- The stem should be written such that the keyed response should be indisputably the only option.
- If there is more than one correct option, the stem should contain the words "of the following".
- If there are multiple possible correct options, the stem should include selecting the "best" option.
- Negatively phrased questions should be avoided and, if used, the negative term (word) should be emphasised with a different font.
- "Absolute terms, such as *always*, *never*, *all*, or *none* should not be used in the stem or distractors."
- The words *may*, *could*, and *can* are clues for the correct answer and should be avoided.

- Vague "terms such as *seldom*, *rarely*, *occasionally*, *sometimes*, *few*, and *many*" may be misinterpreted and should also be avoided.
- It is better to utilise absolute numbers (e.g., "In less than 15% of the population") than using words such as *rarely*.
- "The best number of options is three to five."
- Every distractor should be conceivable but clearly incorrect.
- Distractors should ideally be mistakes that are commonly made by learners.
- Both the keyed response and distractors should fall in the same category e.g. diagnoses, investigations, management or outcomes.
- The distractors should have a similar appearance to the key response in terms of syntax, the length of the phrase and the convolution of the phrase.
- Do not use "*none of the above*" or "*all of the above*" phrases.
- Do not use acronyms, eponyms or abbreviations unless they are followed by a qualification or explanation.
- References to gender and race should only be made if it is clinically fitting.
- Options should follow in sequence e.g. numbers (from smallest to largest) or dates (chronologically). Ranges of values should not overlap.
- Look out for "cueing", where answers or options in one item may guide the candidate to the correct answer or keyed response in another item.
- Also be on the lookout for "hinging", where a candidate knows the keyed response to a single specific correct item, enabling him/her to select the answer to a second correct item.
- "Vary the position of the correct answer" between A, B, C, D and E randomly.

Collins (2006:544) argues that a fundamental principle in writing MCQs is that every item should be aligned with a learning objective (outcome). The author suggests that, if any debate exists around a specific medical fact, avoid using this topic as an item in the MCQ. Sentences that summarise the core knowledge or principles and ideas taken from the medical literature may suffice as questions (Collins 2006:544).

Again, this discussion on the writing of MCQ's illustrates the principle of constructive alignment, namely, that the lecturer should consider the assessment process and instrument prior to planning the curriculum and writing the intended learning outcomes.

A study by Jozefowicz, Koeppen, Case, Galbraith, Swanson and Glew (2002:156) found that, if assessors lack training in writing examination questions (and they therefore do not follow prescribed principles), it definitely contributes to lower quality assessments.

Collins (2006:549) quotes Downing *et al.* (1995:187), who reported that flawed MCQ items cause candidates (especially borderline candidates) to fail notably more often than unflawed items.

Nedeau-Cayo *et al.* (2013:55) evaluated 2 491 MCQs and measured the incidence of 19 of the most common flaws found in writing medical MCQs. The authors' results are remarkable in showing that the vast majority of MCQs (85%) had at least one flaw. Even more amazing was one of the conclusions of this study, which suggests that educating lecturers about the way to write MCQs and by eliminating the phrase "all of the above", would eliminate 29% of flaws.

To calculate the difficulty level of MCQ items, norm-referenced testing can be applied to calculate the number of students who answered a specific item correctly; or standards-referenced testing if one wants to evaluate how well the assessment assessed a specific skill or competence that all the candidates were supposed to have achieved (Davis 1993:398).

Davis (1993:398) suggests that, in norm-referenced testing, 5% of the items should be answered correctly by 90% of the candidates, 90% of the items should be answered correctly by 50% of the candidates and 5% of the items should be answered correctly by 10% of the students.

Collins (2006:550) points to "item discrimination" as a measuring tool that can be utilised to evaluate the "quality of items" that are used in MCQs. Item discrimination is calculated by measuring the variation (between -1.0 and +1.0) in the marks finally achieved (percentages) of the top 25% of candidates and the lowest 25% of candidates who all answered the specific item correctly (Collins 2006:550).

The author (Collins 2006:550) explains that if the ratio calculates to 60% (0.6) or more, the item is a very good item, and if the ratio calculates to 19% or less, it is a poor item and it should therefore be reviewed. Any item with a negative discrimination ratio (less than

zero) reveals that weaker candidates selected the correct keyed response on that specific item more often than the stronger candidates, and it subsequently identifies a poor item that should be removed from future assessments (Collins 2006:550).

Essay questions aim to stimulate the candidate to analyse or evaluate his/her knowledge and to elicit a higher-level response in the cognitive domain, thereby assessing deeper learning; essays do not assess the reproduction of surface knowledge (Schuwirth & Van der Vleuten 2004:976). Disadvantageous to this instrument is poor correlation between candidates and time constraints, because only few essay questions can be set and therefore reliability becomes limited. This can be counteracted by structuring the marking process with a memorandum or marking scheme (Schuwirth & Van der Vleuten 2004:976).

Simulations of a real-life scenario may be used in summative assessment. A simulation needs at least 10 stations (scenarios or cases) to confer high reliability (Epstein 2007:392) and it may be time and resource constraining. Within the radiology summative assessment context, case-reporting sessions may be seen as a form of simulation although it is not performed within the "real world" environment.

Script-concordance type questions assess the organisation of knowledge and confirms links between topics that are needed to perform clinically related tasks (Brailovsky, Charlin, Beausoleil, Cote & Van der Vleuten, 2001:430). The authors argue that different "networks of knowledge" called "scripts" exist and are better developed in more skilled or experienced physicians (or residents), who are more capable of linking different diagnoses, methods of investigation and management options in their daily practice (Brailovsky *et al.* 2001:431). This hypothesis led to the development of script-concordance type questions as a form of written simulation questions that measure how well these "networking" (script) skills, as an element of competence, have been developed.

The question consists of a possible diagnosis (diagnostic hypothesis), with an associated sign, symptom or new information (cf. Table 2.10) that may confirm, not influence or reject the possible diagnosis (Brailovsky *et al.* 2001:431). The candidate therefore needs to decide the extent to which the new information may or may not influence the likelihood of the specific diagnosis (Epstein 2007:389).

TABLE 2.10: AN EXAMPLE OF A SCRIPT CONCORDANCE QUESTION
(From Brailovsky *et al.* 2001:431)

You are thinking of the following hypothesis	And you find	It has the following effect* (Please encircle your answer)
1. Breast cancer	A patient more than 50 years old	A B C D E F G
2. Fibroadenoma	A patient younger than 30 years	A B C D E F G
3. Fibroadenoma	A very mobile breast mass	A B C D E F G
4. Cyst	An important inflammatory reaction	A B C D E F G
5. Cystic illness	Bilateral mass	A B C D E F G
*A = It can only be that hypothesis		
D = There is no effect on the hypothesis		
G = It definitely rejects the hypothesis		

Brailovsky *et al.* (2001:435) suggest that, if assessment of organisation of clinical knowledge is done properly, this correlates well with future clinical performance.

A **portfolio** (Augustine *et al.* 2010:326) is a compilation of work that was done by the resident, e.g. presentations, teaching assessments, publications and other learning activities that were gathered by the resident with the purpose of demonstrating the continuous process of development and learning that s/he completed during the training programme. It has the potential of motivating the resident to reflect what s/he has done over the training period and it is flexible enough to accommodate different curricula (Augustine *et al.* 2010:326).

Because of divergent opinions by experts on the usefulness of portfolios, notably those of Driessen (2008:513) and Norman (2008b:514), the researcher points to an article, "Portfolios in medical education: why do they meet with mixed success? A systematic review", by Driessen, Van Tartwijk, Van der Vleuten and Wass (2007:1224) in which the authors identify the factors needed to promote the effective utilisation of portfolios (cf. Table 2.11).

TABLE 2.11: SUMMARY OF FACTORS PROMOTING PORTFOLIO SUCCESS
(From Driessen *et al.* 2007:1230) (Table continues on next page)

Factor	Recommendation
<i>Goals</i>	<i>Introduce the goals of working with a portfolio clearly. Combine goals (learning and assessment).</i>
<i>Introducing the portfolio</i>	<i>Provide clear guidelines about the procedure, the format and the content. Be cautious about problems relating to information technology.</i>
<i>Mentoring/interaction</i>	<i>Provide mentoring by teachers, trainers, supervisors or peers.</i>

<i>Assessment</i>	<i>Use assessment panels of 2-3 assessors, depending on the stakes of the assessment. Train assessors. Use holistic scoring rubrics (global performance descriptors).</i>
<i>Portfolio format</i>	<i>Use a hands-on introduction with a briefing on the portfolio's purpose and the procedures. Keep the portfolio format flexible. Avoid being overly prescriptive about the portfolio content. Avoid too much paperwork.</i>
<i>Position in the curriculum</i>	<i>Integrate the portfolio into other educational activities in the curriculum.</i>

McMullan, Endacott, Gray, Jasper, Miller, Scholes and Webb (2003:284) claim that it is important for a portfolio to include a reflective component, where the resident has the opportunity to analyse the learning process and all the work that has been done.

Within the radiology context the "Portfolio of Learning for the Fellowship of the College of Radiologists of South Africa" (CR (CMSA) 2014c:4) acts as a record to prove the training experience for radiology candidates. Furthermore the portfolio guides the teaching staff during formative assessment of the candidate and may encourage the student to continuously self-assess whether s/he is on track with the curriculum by developing a training plan and objectives (CR (CMSA) 2014c:4). Lost portfolios are deemed to be incomplete and therefore making backup copies is advised (CR (CMSA) 2014c:4).

The portfolio layout is as follows: the personal and work contact details of the candidate, any prior qualifications and work experience, including any undergraduate medical qualifications, internships and community service details. This is followed by any additional postgraduate qualifications and experience not necessarily related to radiology. Self-directed learning activities, such as attendance of lectures, conferences and congresses, are also to be included, but not any lectures and tutorials that form part of the in-house training programme (curriculum) of the radiology department. Papers and poster exhibitions are also to be included and noted under this category. Any medical journal publications or dissertations are to be uploaded under this category, showing the first page of the article or the front page of the dissertation. Finally, the candidate may add any other extracurricular learning not covered in the above-mentioned descriptions that s/he may deem relevant to their radiology learning and development (CR (CMSA) 2014c:9).

The **oral examination** is sometimes the most feared part of a resident's exposure to summative assessment. During teaching (the researcher's perspective), we concentrate on

simulated examination conditions; the intention is to condition (desensitise) residents so that they become less anxious about the real-life oral.

The aim of the oral examination is to assess knowledge, professionalism and the candidate's clinical and diagnostic reasoning skills (Epstein 2007:390). This is usually assessed by the interpretation and following discussion of several images from different imaging modalities related to specific cases (Jaovisidha, Suwatanapongched & Siripornpitak 2010:166).

An example of a time schedule for the oral part of the CR (CMSA) summative assessment is presented in Table 2.12.

TABLE 2.12: TIME SCHEDULE FOR THE FC RAD DIAG (SA) PART 2, ORAL EXAMINATION, SECOND SEMESTER 2014
(From CR (CMSA) 2014d:email)

		ROOM 1 A&B	ROOM 2 C&D	ROOM 3 E&F	ROOM 4 G&H
START	END	CANDIDATES		CANDIDATES	
08:00	08:30	9141200	9141201	9141202	9141204
08:35	09:05	9141204	9141200	9141201	9141202
09:10	09:40	9141205	9141206	9141208	9141210
09:45	10:15	9141210	9141205	9141206	9141208
EXAMINERS' TEA 10:15 - 10:35					
10:40	11:10	9141211	9141212	9141213	9141214
11:15	11:45	9141214	9141211	9141212	9141213
11:50	12:20	9141215	9141216	9141217	9141218
12:25	12:55	9141218	9141215	9141216	9141217
EXAMINERS' LUNCH 13:00 - 13:45					
13:50	14:20	9141219	9141220	9141221	9141222
14:25	14:55	9141222	9141219	9141220	9141221
15:00	15:30	9141223	9141224	9141225	9141226
15:35	16:05	9141226	9141223	9141224	9141225

Orals are more commonly used in exit-level examinations (summative assessments), and are not without limitations (Epstein 2007:390). The author identifies that gender and race biases, together with subjectivity of assessors have been reported as limiting factors (Epstein 2007:390). Epstein (2007:390) continues by pointing out that an oral may be time consuming, and explains that every oral examination session should be conducted by at least two, or ideally three, properly trained assessors (Epstein 2007:390).

Hibbert *et al.* (2012:83) argue that oral examinations lack reliability because only a limited number of cases are presented, and that in a very stressful environment.

A positive point relating to orals is that immediate feedback can be given by expert assessors (Epstein 2007:390), but this is unlikely to happen within the summative assessment setting (due to legal risks). Orals can also be used to clarify concepts that were not clear from the candidate's written papers (Hibbert *et al.* 2012:122), but because the assessors involved in the orals do not have insight in the candidate's written papers (to prevent bias), this is also unlikely to happen.

If oral examinations are to be used, the assessors should consider a structured oral examination rather than an unstructured oral, to improve reliability and validity (Anastakis, Cohen & Reznick 1991:67). This suggestion is echoed by Brown (2001:12), who states that standardisation of the oral examination is essential to improve reliability and validity.

At the turn of the century the RANZCR changed their oral examination format from two general oral examinations to six organ and system-based oral examinations, which now includes abdominal imaging, thoracic and cardiovascular radiology, head and neck radiology, breast imaging, neuroradiology, obstetrics and gynaecology, paediatric radiology and musculoskeletal radiology (Hibbert *et al.* 2012:97).

Interestingly, the ABR abandoned the oral component of their board examination in 2008 (Alderson & Becker 2008:708) (cf. Point 2.5.2.3).

2.5.3.3 *Summative assessment tools*

Assessments can be categorised into two groups (Bond 1996:1): *criterion*-referenced and *norm*-referenced assessments.

Norm-referenced assessments grade every student in relation to the achievement of other students in the same group with the aim of identifying stronger and weaker candidates (Huitt 1996:Online). This may be done to, for example, select students for a specific teaching programme (diagnostic assessment) (Bond 1996:1).

The purpose of criterion-referenced assessment is different, in that it grades the student against predetermined criteria to assess the extent to which (how well; relevant to the cognitive domain) the individual achieved the prescribed outcomes. The achievements of other students are irrelevant in this context (Huitt 1996:Online).

The preferred mode of assessment in OBE is criterion-referenced (Malan 2000:24), and decides "if" and "how well" a candidate achieved the prescribed learning outcomes that were identified at the beginning of the training programme, and whether the candidate is competent to progress further.

Because assessment methods, instruments and tools need to be aligned, as discussed under constructive alignment (cf. Point 2.2), summative assessment tools should be criterion based. If this prerequisite (alignment) is not met, the assessment tool is not necessarily valid for assessing the specific learning outcomes. For this reason the researcher investigated memorandums (marking schemes) and rubrics as examples of criterion-referenced assessment tools.

Competency-referenced assessment as part of criterion-referenced assessment identifies whether competency has been or has not been achieved leading to a "yes" or "no" answer with no grading of the criteria identified (Malan 2000:24).

A **memorandum (marking scheme)** is "a plan or guidelines used in the marking of students' written work by teaching staff" (Collins English Dictionary 2015:Online).

The purpose of compiling a memorandum is to ensure that the assessment tool is valid ("do the criteria match the assessment task and the intended learning outcomes"), reliable (is the self-consistency and inter-assessor consistency high) and feasible ("what is practical, given the time and resources available") (Brown 2001:16).

"The Assessment Handbook" of the University of Ulster (2013:151) presents a "Checklist for a High Quality Marking Scheme" that guides the assessor to the following questions, which should be answered when drafting a memorandum:

- Could anyone mark the assessment?

The memorandum should include clear, simple instructions for assessors who will mark the questions. The memorandum should be prepared so that any assessor should be able to mark the questions. Double marking (both intra- or inter-assessor double marking) will increase the reliability and fairness of the assessment, but this may be time consuming.

The questions should be available next to the correct answers.

- Does the memorandum allow acknowledgment of alternative acceptable answers?

The memorandum should include all the possible answers to a question to ensure that the assessor can allocate the marks appropriately, even though the memorandum has many more possible answers than the required marks allocated for this question.

- Does the memorandum allocate marks linked to the weight of each part of a good answer?

Because the memorandum may have many more possible correct answers than what is needed to achieve the required marks on some of the questions, it may happen that a candidate can achieve good marks by knowing only part of the work very well.

This can be resolved by balancing the assessment with questions on a higher cognitive level to prevent the candidate from guessing any answers. Again, it is important that the questions are aligned with the outcomes to ensure that the weight of every question relates to the importance of every outcome.

As an example within the radiology context the researcher (Hurter 2013:92) explains as follows in an unpublished portfolio:

On the question about classification of hyperparathyroidism, I allocated more marks on the memorandum to "secondary hyperparathyroidism" as I considered this as more common pathology in the radiological field and more important to know more detail. I followed this with the question on the radiological findings of hyperparathyroidism which carried the most marks in this paper as it was one of the most important outcomes to be reached with this module.

- Does the memorandum allocate marks when the candidate makes an early mistake that may negatively influence the rest of the answer?

Within the radiology summative assessment context this is unlikely to be relevant because a wrong diagnostic and clinical approach is unlikely to lead to the correct imaging and clinical findings and, finally, the correct diagnosis or differential diagnosis. Often, the

assessor is more interested in the approach and critical reasoning skills (this carries more weight) than the final diagnosis.

- Does the memorandum improve the efficiency ("quicker and easier") of marking the assessment?

The memorandum has to speed up the marking process and should make it easier to be consistent.

- "Is the standard of marking as close as possible to that which will apply in subsequent assessment events?"

According to the University of Ulster (2013:151) a memorandum is only useful if the assessments are consistent, so that a candidate can apply his/her new knowledge after feedback was given, to upcoming assessments.

In the radiological summative assessment context this is difficult to assess because we do not see the memoranda of our colleagues.

- Does the memorandum prevent candidates from hedging?

The University of Ulster (2013:151) states that,

Students should not gain marks by putting down all they know on a particular topic and hoping the examiner will pick out the right things and reward them while ignoring the inappropriate or wrong things.

Within the South African radiology assessment context the summative assessment is not marked negatively. The student attains marks for correct facts, so extra "wrong" facts will only be ignored.

- Do the questions point satisfactorily to the memorandum?

The questions should be clear and understandable with no ambiguity. The question papers and memoranda should be test read to check for format mistakes and possible mistakes in the action words during reprinting.

A **rubric** is a "criteria-rating scale" that can be created, adapted or adopted according to the requirements of the relevant assessment (Dikli 2003:14). The expected level of performance is matched to a value on a rating scale (University of the Free State 2015:5). Mertler (2001:1) differentiates between holistic and analytic rubrics.

A holistic scoring rubric may combine several criteria (addressing several outcomes) on a single scale to give a less specific, wider assessment of the quality (or cognitive level) of the candidate's response (Moskal 2000:Online).

According to Mertler (2001:2) a holistic rubric is more effective for assessing a response where there is no specific correct answer. Alternatively, it does not assess "if" the student achieved the learning outcome but rather "how well" or "to what degree" the outcome was achieved. A holistic rubric can also be used to assess a product e.g. portfolio or case study.

TABLE 2.13: TEMPLATE OF A HOLISTIC RUBRIC
(From Mertler 2001:2)

Score	Description
5	<i>Demonstrates complete understanding of the problem. All requirements of task are included in response.</i>
4	<i>Demonstrates considerable understanding of the problem. All requirements of task are included.</i>
3	<i>Demonstrates partial understanding of the problem. Most requirements of task are included.</i>
2	<i>Demonstrates little understanding of the problem. Many requirements of task are missing.</i>
1	<i>Demonstrates no understanding of the problem.</i>
0	<i>No response/task not attempted.</i>

In an analytic scoring rubric each criterion (that addresses a specific learning outcome) is evaluated separately according to a specific explanatory scale (Moskal 2000:Online).

Analytic rubrics are used when the assessment instrument requires a more specific reply to the questioning and the standard is quantified as a value on every criterion that is finally calculated to a total score (Mertler 2001:2).

A disadvantage of analytic scoring rubrics is the fact that it may be time consuming, mainly because it assesses several different learning outcomes during the assessment, necessitating the assessor to read through the rubric more than once during the assessment (Mertler 2001:3). Furthermore, the construction of analytic scoring rubrics is also time

consuming (Mertler 2001:3), because every criterion should be linked to a learning outcome.

TABLE 2.14: TEMPLATE OF AN ANALYTIC RUBRIC
(From Mertler 2001:3)

	<i>Beginning 1</i>	<i>Developing 2</i>	<i>Accomplished 3</i>	<i>Exemplary 4</i>	Score
Criterion #1	<i>Description reflecting beginning level of performance</i>	<i>Description reflecting movement toward mastery level of performance</i>	<i>Description reflecting achievement of mastery level of performance</i>	<i>Description reflecting highest level of performance</i>	
Criterion #2	<i>Description reflecting beginning level of performance</i>	<i>Description reflecting movement toward mastery level of performance</i>	<i>Description reflecting achievement of mastery level of performance</i>	<i>Description reflecting highest level of performance</i>	
Criterion #3	<i>Description reflecting beginning level of performance</i>	<i>Description reflecting movement toward mastery level of performance</i>	<i>Description reflecting achievement of mastery level of performance</i>	<i>Description reflecting highest level of performance</i>	
Criterion #4	<i>Description reflecting beginning level of performance</i>	<i>Description reflecting movement toward mastery level of performance</i>	<i>Description reflecting achievement of mastery level of performance</i>	<i>Description reflecting highest level of performance</i>	

Mertler (2001:3) points out that one of the major benefits of analytic rubrics is that it enables the assessor to give more specific feedback to the candidate and it creates the opportunity to identify strengths and weaknesses.

From the above-mentioned perspectives the researcher concludes that holistic rubrics are more likely to be used in summative assessment, and analytic rubrics are likely to be used more often during formative assessment. This is confirmed by Mertler (2001:3).

2.5.4 The roles of the assessor

SAQA (2001:40-58) describes the roles and responsibilities of assessors together with the steps to be followed in the assessment process extensively. SAQA defines an assessor as the individual who validates the successful achievement of the learning outcomes as prescribed throughout the curriculum. This person may be anyone involved in the teaching

process and includes the facilitator, teacher, lecturer, supervisor or external assessors. The assessor must be registered with the applicable ETQA, be able to show proof of experience in assessment and should be trained to assess candidates (SAQA 2001:45).

Jozefowicz *et al.* (2002:157) argue that, although most faculty members who are involved in resident teaching may believe that they develop satisfactorily good assessments, very few have been formally trained to prepare questions for assessments. Jozefowicz *et al.* (2002:157) note that many excellent lecturers set up assessments that are left open to debate and are of doubtful quality.

Van Deven and Hibbert (2010:4) argue that it may be challenging for an assessor who has not been trained in educational methods to teach candidates everything that is needed to become medically competent. As long ago as the 1800s it was recognised that, because of the work load and time constraints often experienced by academically appointed physicians, they may neglect teaching even though it is supposed to be an important component of the physician's daily activity (Van Deven & Hibbert 2010:4). On the basis of their own experience the authors identified the need for professional teachers in medicine, and for the application of educational research to curriculum development and assessment (Van Deven & Hibbert 2010:4). They conclude that collaboration between medical and educational departments do not exist in all institutions, or still remain at the very early stages of development (Van Deven & Hibbert 2010:4).

SAQA (2001:45-46) summarises the "roles and responsibilities of the assessor" as follows:

- *inform the learner about what is needed to become a radiologist;*
- *provide support and direct the student in the gathering of evidence of learning;*
- *assist the student in planning and preparing for the assessment;*
- *notify the learner of the time of the assessment;*
- *perform the assessment and provide constructive feedback;*
- *be knowledgeable about the curriculum and the prescribed outcomes and standards that s/he will be assessing;*
- *plan and design the assessment using appropriately selected methods and instruments;*
- *gather proof of the student's performance during the assessment;*
- *assess the evidence;*
- *validate the evidence;*
- *make an assessment judgment;*

- *document and record the assessment according to prescribed requirements;*
- *send the marks to the ETQA for official recognition; and*
- *re-evaluate the assessment procedure and apply changes where necessary.*

2.5.5 Guidelines and training for assessors and conveners

According to ANTA (2001:7) competency of assessors is vital in assessment and needs to be reviewed regularly. This document from ANTA posits that an assessor can only be deemed competent if s/he has assessment expertise, has up-to-date knowledge of the field to be assessed and has good interpersonal skills, plus the ability to be fair and reasonable. Therefore, ANTA emphasises that the selection, training and ongoing development of assessors are crucial to ensure high-quality assessment (ANTA 2001:7).

Because of the assessment principles mentioned above (cf. Point 2.5), clear guidelines for assessors, moderators and candidates on how the assessment should be conducted, as well as guidelines for assessor and moderator training, should be readily available.

In countries such as the United Kingdom (RCR 2014:Online), Australia and New Zealand (RANZCR 2014a:Online), and the United States of America (ABR 2014:Online), guidelines and procedures for examination candidates and guidelines for appeals are accessible on the respective websites. The RANZCR (2014b:Online) states in its guidelines for application as an assessor that the applicant should be willing to undertake training to become an assessor.

A person can only be considered a competent assessor if s/he has acquired certain skills (SAQA 2001:46-47). SAQA states that the assessor should have good interpersonal skills, which enable him or her to speak to the candidate in an effective and credible manner to ensure that the assessment is done with integrity and that it is fair, confidential and aligned with the values of good assessment.

SAQA explicates that the assessor should be an expert in the body of knowledge of the qualification that s/he is registered to assess (subject-matter expertise) and should be qualified at a higher level than the learner who is being assessed (SAQA 2001:46).

According to SAQA (2001:46) the assessor should also have assessment expertise, as demonstrated by knowing the unit standards of the assessment and being comfortable using the assessment guides to plan and design the assessment process properly. Hurter (2013:52) concurs that the assessor should "follow the process, record and report on the assessment, participate in the moderation, review the assessment and make any relevant changes".

The researcher searched for guidelines regarding training requirements for assessors and moderators of CR (CMSA) Part 2 examinations, but was unable to find any on the CR (CMSA) or CMSA websites. The researcher did find the Code of Conduct for Examination Candidates and the CMSA Appeals Mechanism on the CMSA website (CMSA 2015:Online), as well as the CMSA General Examiner Guidelines (CMSA 2014b:1-44), after requesting the latter from the CMSA.

Within the CMSA General Examiner Guidelines document, the researcher identified limited non-specific training requirements: "Examiners should all have been observers for at least one examination before their inclusion in the full examining panel. They should be experienced, competent and with good academic reputation" (CMSA 2014b:3).

The CMSA General Guidelines document states that one of the assessors for each candidate should represent a different institution than that of the candidate. The guidelines stipulate that, if applicable, an assessor who originally did not take part in the marking of scripts should be appointed for remarking. The CMSA furthermore provides guidelines for an appeals mechanism for candidates (CMSA 2014b:4), as well as general examination instructions for candidates (CMSA 2014b:5) and claim forms for assessors (CMSA 2014b:7). The code of conduct for candidates is also discussed - offences, complaints and the functioning of the Disciplinary Subcommittee of the CMSA as well as appeal procedures are explained (CMSA 2014b:13).

Assessors selected to mark papers are directed by the CMSA to submit the memorandum with the paper containing the questions that they have set. Marking is by percentages only, with a pass mark of 50% indicating that the candidate is a safe medical specialist (CMSA 2014b:27). The percentage weight of every section (e.g. paper 1, paper 2, oral, MCQs, etc.) is calculated to reach a final mark, including any specified sub-minimums for any section (e.g. clinical cases) (CMSA 2014b:27).

The CMSA (2014b:28) provides a marking guide to assessors of clinical cases that would be relevant to an oral assessment of clinical cases in radiology. The document stipulates the format of examination papers as it relates to the use of abbreviations, font, grammar and spelling, nomenclature, the use of numbers, punctuation, symbols, Greek characters and table styling (CMSA 2014b:30).

According to the CMSA General Examiner Guidelines (CMSA 2014b:3), for every constituent of the CMSA assessments, a convenor is identified to lead and organise the examination event. The convenor does not participate in the assessment of the particular examination but is an experienced assessor and/or moderator. This is usually the head of the department that is hosting the examination in the constituent college. The convenor submits a report to the CMSA after the assessments have been completed; the report deals with "the quality of the questions set, the conduct of the examinations, the performance of the candidates and what improvements need to be effected in the teaching" in the future (CMSA 2014b:3).

The CMSA states that the convenor should be guided by his/her college on the weighting of questions in papers, providing "a copy of the draft written paper" to the appointed moderator, providing sub-minimums for papers required to qualify for invitation to oral/practical/clinical examinations, make or address requests to alter any examination numbers for a specific examination, sending provisional results to the president of the college for final approval, timeous submission of the oral timetable and submitting "a written report to the CMSA after each examination, outlining the examination process, marks achieved, success rates, problems identified and recommendations for future examinations" (CMSA 2014b:24).

The CMSA explains the process to be followed in the case of intimidation of assessors or candidates, as summative assessment can be a stressful experience for candidates (CMSA 2014b:20). The CMSA states that the final paper must be moderated and that the convenor must request memorandums from all the assessors, but does not explain the process of moderation in detail (CMSA 2014b:21).

To ensure the continued quality of assessment, the relevant constituent colleges are advised by the CMSA to update their guidelines for candidates and assessors so that it may be published on the website of the CMSA in the future. Assessors are advised to follow the

reports on training workshops for assessors that are regularly provided by the CMSA (2014b:21).

Candidates have the right to answer written and oral questions in English or Afrikaans (CMSA 2014b:28).

2.6 MODERATION

This "re-evaluation" of the assessment process leads to the process of moderation that takes place as an integral part of summative assessment. Brown (2001:17) states that the role of a moderator is to make sure that the assessor is consistent.

SAQA (2001:60) points out that every moderator should be able to answer whether the assessment is "fair, valid, reliable and practicable", whether the assessment needs to be redesigned, if an appeal procedure is in place for dissatisfied candidates, how assessors are evaluated for competency and if procedures are in place to deregister substandard assessors.

Moderation is categorised as internal and external moderation (SAQA 2001:60). The internal moderator must confirm that the design of the assessment is relevant to the unit standards for the qualification. S/he then has to implement moderation by confirming that the assessment has been done correctly according to assessor guidelines and that the assessors have met to discuss any problems and improvements. Finally, the internal moderation itself has to be reviewed to identify any possible improvements (SAQA 2001:61).

SAQA (2001:61) explains that the internal moderator should standardise the assessments, verify the consistency of the assessment records, check the evidence of candidates and consistency of the assessments, organise meetings with assessors, give support and guidance to assessors and liaise with external moderators, if relevant.

External moderation is required if multiple providers of different training programmes need to deliver the same standards of training and teaching. The purpose is to ensure that the assessors from different training facilities are informed about the requirements of the relevant ETQA. External moderators should be experienced specialists, trained in moderation, possess good interpersonal skills, be qualified assessors themselves and be accepted by their peers (SAQA 2001:62).

According to a document of the Faculty of Health Sciences, University of the Free State (UFS), called Guidelines for the Implementation of External Moderation, an external moderator is an individual who is not permanently employed by the University, who certifies that the assessment is aligned with the specific learning outcomes and who has to pass judgement on whether the required level of competence has been achieved (UFS 2009:Online). The UFS (2009:Online) document explains that internal moderation should be done before the assessment takes place, so that there is enough time to make changes to the assessment if necessary. The University (UFS 2009:Online) advises that, ideally, at least 10 per cent of the evidence (students' examination papers, etc.) should be externally moderated.

The University of Ulster (2013:15) in the United Kingdom guides moderators by stating that, during moderation, one should ascertain that the formulation of questions is appropriate and clear, that the curriculum is covered in the assessment, that the questions are at the appropriate level of Bloom's Taxonomy for the specific summative assessment, that there are no discriminatory questions, that no questions have been asked in previous papers, that the methods and instruments are appropriate for the time allocated to the assessment, that a blueprint is available to show proper weighting of the questions, that the marks for each question are clearly indicated and that the assessment tool that is used is accurate. Ulster University also requires that papers be proofread to check for formatting and typing errors.

Moderating techniques that may be valuable to achieve consistency, according to the University of Ulster (2013:63), are "first and second marking (two markers assess different elements of an assessment)", monitoring (the first marker marks and the second person authenticates the mark awarded), double marking (each paper is marked by two markers with the second marker knowing the first marker's marks), double blind marking (the second marker does not know the first marker's marks), and double internal marking (a marker marks papers and, after a specific period has passed, remarks a selected number of answer sheets). The University advises that if double marking is used, all the papers should be remarked.

The Malta Ministry of Education (2007:3) advocates a test specification grid (blueprint) as very helpful for ensuring reliability and fairness of an examination paper. Such a grid would confirm that all the learning outcomes are assessed and creates a starting point to discuss the paper with other assessors for criticism, advice and comments on further improvement.

Test specification grid is defined by the American Board of Internal Medicine (ABIM) as a guide for developing the examination that also shows what topics are covered by the papers (ABIM 2014:Online).

Hift (2009:Online) explains that the blueprint begins with a general introduction to the examination by describing the purpose of the assessment (e.g. testing the knowledge and skills of the candidate to prove competency). He shows that an examination is not just a merger of the opinions of different assessors, but is based on a recognised pre-planned test grid that is regularly updated to remain current with new developments and improvements. The test specification grid is designed by experts in the field to be assessed, to ensure that it remains relevant to modern clinical practice (Hift 2009:Online). Hift continues that the test specification grid takes into account the context within which the candidate currently practices and thereby the grid aligns the assessment in line with his/her daily functions to ensure that the examination is authentic and relevant. The different cognitive levels of the assessment should be explained and it should be noted that questions testing the lower levels of the cognitive domain will be in the minority – the higher levels must be prioritised and tested more extensively.

The test specification grid then defines the constituent parts of the subjects to be covered by the assessment; this includes the weighting of each division (Hift 2009:Online). The number of questions that cover every outcome (part of the curriculum) should also be stated to show that all the content is covered without certain topics being emphasised. Test specification grids may also indicate the level of knowledge needed to be deemed competent. Furthermore, Hift (2009:Online) notes that the test specification grid cannot compensate for inappropriate or poor questions.

An example of a blueprint that is used by the CR (CMSA) for the written papers is presented in Table 2.15.

TABLE 2.15: BLUEPRINT FOR THE FC RAD DIAG (SA) PART 2, WRITTEN PAPERS
(From CR (CMSA) 2014e:2) (Table continues on next page)

WRITTEN EXAMINATION TOPIC	MARK ALLOCATION
Neuro-imaging (brain and spinal cord)	25
Head and Neck Imaging	25
Chest Imaging	25
Cardiac Imaging	20
Breast Imaging	15
Gastro-intestinal imaging	15
Hepato-biliary and pancreatic imaging	15
Genito-urinary tract imaging	15

Musculoskeletal imaging	25
Vascular/Therapeutic radiology and interventional radiology	20
Obstetric and gynaecological imaging	20
Paediatric imaging	25
Emergency and trauma imaging	25
Management of a radiological/clinical imaging service	15
HIV and TB (Infectious disease imaging)	15
Total	300
<i>(Physiological imaging and pathophysiology relating to imaging incorporated into relevant sections above)</i>	

The blueprint that is used by the CR (CMSA) for the case studies is presented in Table 2.16.

TABLE 2.16: BLUEPRINT FOR THE FC RAD DIAG (SA) PART 2, CASE STUDIES
(From CR (CMSA) 2014e:2)

LONG CASES TOPIC		MARK ALLOCATION
1	Central nervous system / neuro-imaging	12.5
2	Head and neck (including eyes/ears/sinuses)	12.5
3	Chest and cardiac	12.5
4	Paediatrics any system miscellaneous	12.5
5	Breast/Female imaging	12.5
6	Abdomen/pelvis/gastrointestinal/hepatobiliary/urogenital	12.5
7	Musculoskeletal/trauma	12.5
8	Rapid reporting	12.5
Total		100

The ABIM (2014:Online) reached consensus that essential topics should be weighted more heavily than less essential topics. The Board adds that assessment time dedicated to each topic should mirror the relative weight of the topic. Their document recommends that the sampling of evidence should be fully representative of the scope of knowledge and skills expected from the candidate.

Hift (2009:Online) argues that education should, like the practise of medicine, be evidence-based and not based on the past practices prescribed by tradition. Norman (quoted by Hift 2009:Online), posits that the assessment activities we use for students to prove their competence also should be proven to be effective.

After studying the literature, the viewpoint of the researcher is that assessment and moderation are not simple processes conjured by lecturers to prove to the outside world that candidates have acquired the necessary knowledge and skills and can be released into the real world to serve the public. To the contrary, assessment and moderation have become sciences in themselves, in which all parties involved need to be trained to select

the optimal combination of appropriate assessment methods, instruments and tools for students to ensure that the pre-identified outcomes have been reached.

Neither can assessment nor moderation be seen as the sole final judgment of the candidate's abilities – it should also function as a training opportunity to encourage a culture of lifelong learning. Feedback has been proven to be essential to ensure future learning. Although the CR (CMSA) adapted models from other colleges, the researcher is of the opinion that guidance specific to the CR (CMSA) is needed. Tools, such as blueprints (test specification grids), marking guides or memorandums have become essential to ensure that all levels of the cognitive domain are being assessed. Without this, quality of assessments will be very difficult to prove.

Augustine *et al.* (2010:326) confirm that a blueprint (test specification grid) contributes to the validity of the methods used in the assessment process ("content validity").

Gone are the days of using a single recently published article as a memorandum for an essay question in a final paper. Assessments should cover as much of the curriculum as possible in a just and relevant manner.

2.7 FEEDBACK

According to Sadler (1989:120) feedback is a central part of conducting formative assessment and defines how effectively or accurately something has been completed. Branch and Paranjape (2002:1185) refer to it as the "heart of medical education". Hattie and Timperley (2007:81) call feedback "a consequence of performance", and continue that feedback should be considered to be part of a continuous teaching process that becomes intertwined with assessment and training, rather than a separate educational entity.

Norcini and Burch (2007:856) declare that feedback encourages student learning by informing residents of their progress on the programme. It gives an opinion to residents concerning their observed learning deficiencies and advises them on resources available to assist with their learning. Furthermore, it encourages residents to make use of appropriate learning activities (Norcini & Burch 2007:856).

Hattie (1999:Online) presented, as part of his inaugural lecture as professor of education at the University of Auckland, a very interesting meta-analysis of 1 800 studies that involved approximately 25 million students, and concluded that feedback is "the most powerful single moderator that enhances achievement".

Closer to home, in the medical field, Veloski, Boex, Grasberger, Evans and Wolfson (2006:127) investigated the role of feedback in clinical performance of physicians by evaluating 41 studies. The authors found that feedback does improve clinical performance.

Assessment feedback is crucial for planning and guaranteeing future training programmes. Feedback may be done while conforming to the SAQA and the National Qualifications Framework (NQF) guidelines to integrate all the principles for good assessment practices into one model.

Feedback is identified by Geyser and Gravett (2004:92-99) as one of the criteria of ensuring credibility of the assessment process. It is an integral part of authentic assessment, especially for unsuccessful candidates, but also for those still preparing for summative assessment. A negative feedback system may develop when students learn only what is needed to pass the assessment (Hurter 2013:3). Hurter echoes Geyser and Gravett's (2004:90) opinion that it is important to distinguish between "learning for assessment" and "learning from assessment". This negative feedback effect can be turned into a positive tool if proper feedback is given to students to guide them in developing skills to reach the defined outcomes of the curriculum.

Within the South African context the researcher found a summarised curriculum for the final-year radiology candidate, as well as a list of suggested resources, on the CR (CMSA) website (CR (CMSA) 2014a:Online), but no guidelines for feedback specifically for the CR (CMSA).

Regarding feedback to students, the CMSA notes that all scripts are returned to their offices in Johannesburg, where they are stored for five years before being destroyed (CMSA 2014b:21). The breakdown of results is available to candidates (on request) and can be supplied to the relevant teaching departments.

2.8 CURRICULUM

Most European countries (including the United Kingdom) have a curriculum running over five years, with general diagnostic radiology being taught in the primary three years of the teaching programme, followed by "specific interest" radiology training in the last two years (Ming Wang *et al.* 2010:133).

The Australian and New Zealand curriculum runs over five years, starting with general radiology "training in the first 4 years and the option for subspecialty training in the fifth year through appointment to an advanced training position" (Ming Wang *et al.* 2010:133).

The United States curriculum is four years, with the opportunity for subspecialisation after completing the training period (Ming Wang *et al.* 2010:133).

Within the South African context candidates should complete at least 36 months of general radiology training in a numbered registrar training post as accredited by the HPCSA within an accredited academic radiology department (CR (CMSA) 2015a:5). Furthermore, the candidate should successfully complete Part 1 (anatomy and physics) of the CR (CMSA) examination (CR (CMSA) 2015a:5). After successfully completing the CR (CMSA) examination Part 2, a candidate may apply for an accredited subspecialisation post.

Traditionally, the RANZCR curriculum has relied on several textbooks prescribed for residents. Historically, a resident could study from one major textbook while supplementing his/her knowledge by reading referenced texts and review articles (Ming Wang *et al.* 2010:131). With the explosion of knowledge over the past 20 years, together with the vast amounts of available literature on radiological imaging, it has become impractical, if not impossible, to reflect on all the teaching material currently available on radiology (Ming Wang *et al.* 2010:132). For this reason the RCR has created a number of online educational radiology resources that are widely known as "the Radiology-Integrated Training Initiative (R-ITI)", which includes 750 e-learning sessions covering the complete radiology curriculum, "through an instantly accessible, interactive electronic learning platform" (e-Learning for Healthcare 2015:Online) that is currently the most inclusive e-learning source in radiology education globally. It is unlikely to be reproduced in the near future by any other country (Ming Wang *et al.* 2010:132).

2.8.1 Teaching and learning activities

The next step of constructive alignment (planning backwards) would be to identify TLAs that can be used in radiology training. Within the South African context, all TLAs form part of the portfolio that a candidate needs to present to the CR (CMSA) after completing the curriculum or training period.

According to Lum & Zaleski (2010:13), learning radiology includes three fundamentals: Perception (the ability to see the pathology), interpretation (the ability to understand the notable finding) and diagnosis (the ability to give a diagnosis or a differential list of potential diagnoses).

Different approaches have been utilised in the past for training residents in radiology e.g. rotations through the different imaging modalities, case-based small-group sessions and academic days (Lum & Zaleski 2010:12).

Regardless of the TLAs that may be utilised by a specific department, Collins (2004:1488) suggests that the following principles should be followed during teaching of residents (adult learners) to encourage them to become lifelong learners.

- *New accumulated knowledge should be "immediately applicable to real-life contexts".*
- *The resident should "have control over or influence the educational experience".*
- *Learning skills and activities should be created onwards from past and current experiences.*
- *The resident "should be actively involved in the learning process".*
- *The resident should work and learn within a safe, respectful and comfortable atmosphere.*
- *The resident should be given the opportunity to develop his/her own self-directed learning.*
- *The resident should get the opportunity to build inter-professional relationships within the learning environment between colleagues and lecturers.*
- *Residents learn better if they are successful in reaching their outcomes (boosts motivation).*
- *Residents learn better if they receive feedback.*

Teaching methods that elicit a variety of learning responses from residents are crucial for the development of their critical thinking skills (Chabeli 2010:71).

2.8.1.1 *Journal clubs*

A journal club is a group of individuals who meet regularly to discuss critically the clinical applicability of articles in the current medical journals (Linzer 1987:475).

Journal clubs have been around since the first formalised club was founded by Sir William Osler at McGill University in Montreal during 1875 (Linzer 1987:475). According to Linzer (1987:475) journal clubs have evolved into an integral part of CME, including pre- and postgraduate medical teaching over the last 100 years. Journal clubs are currently used to teach residents critical appraisal skills throughout all the medical domains and specialities (Linzer 1987:475).

The goals of a journal club have remained the same since its conception and are noted by Linzer (1987:477) and echoed by Cook (2011:Online) as: "to keep up with the literature, to impact on clinical practice and to teach critical reading skills". For these reasons journal clubs are essential for identifying and updating new trends in radiology, as well as answering relevant clinical challenges. Furthermore, it stimulates critical analysis of articles that are presented and guides candidates on future research.

Hatala, Keitz, Wilson and Guyatt (2006:538) acknowledge that resident-centred journal clubs form an integral part of practising evidence-based medicine, but the authors are of the opinion that additional teaching and learning activities may be needed to compliment journal clubs. Hatala *et al.* (2006:540) argue that evidence-based medicine should not be limited to journal clubs, but should be integrated with learning activities happening throughout the residents' working environment, including the assessment processes.

This is reiterated by Cook (2011:Online), who notes that didactic sessions, formal assessments and integrated evidence-based medicine teaching all contribute to a well structured curriculum.

An interesting editorial by Richard Smith (Smith 2010:1281) gives a bird's eye view of the challenge of keeping up with medical literature. Smith's answer to this challenge, after reviewing the literature on this topic, is simple: "It is impossible to be an expert." Smith

(2010:1282) suggests that only a machine (with attributes that do not currently exist) can keep up to date.

2.8.1.2 *Academic days*

Academic days are usually structured and may include didactic learning or critically appraised topics in accordance with the selected relevant content.

Within the researcher's personal radiology context, didactic learning is presented by registrars to their peers and lecturers. In the researcher's department this functions as an alternative learning opportunity for candidates and as didactic learning for their peers. It also forms part of the formative assessment process, which includes informal assessments by peers and lecturers and, finally, forms part of the end-year mark that is included in the portfolio. In the researcher's department the curriculum runs over four years and is module driven, with a lecturer assigned to each module.

Didactic learning in the form of lectures are useful for conveying a large amount of data to groups of different sizes (Dowd & Hulse 1996:109). The authors advise that the presenter should regularly confirm that the audience understands what is being said, because of differences in the absorption of facts (Dowd & Hulse 1996:110), and advise that one should not try to convey too much knowledge within a limited timeframe. The presenter should vary his/her tone of voice as well as physical gestures and know the topic well but convey it in a simple manner (Dowd & Hulse 1996:111). Finally, there should be sufficient occasions to allow questions (Dowd & Hulse 1996:112).

Dowd and Hulse (1996:111) quote unpublished research by Whitman and explain that residents may develop through "four levels of competency":

- unconscious incompetence (the learner is unaware that he cannot do a task);
- conscious incompetence (the learner is aware of the task, but cannot do it);
- conscious competence (the learner is able to think through a task step by step and do it); and
- unconscious competence (the learner can do the task without thinking about intermediate steps).

The authors (Dowd & Hulse 1996:111) state that conscious competence is the preferred level of competence when presenting lectures. Although the highest level may be reached, the presenter should consciously apply the third level to convey knowledge optimally.

The **critically appraised topic (CAT)** can be included in academic days within the radiology context and (from the researcher's own experience) usually consists of a literature review on a diagnostic approach to a specific clinical question.

CATs can help learners to identify relevant clinical challenges, search for, evaluate, categorise, and recapitulate the facts to practise evidence-based medicine (Sauve, Lee, Meade, Lung, Farkouh, Cook & Sackett 1995:398).

The purpose of a CAT, according to Wyer (1997:639), is to produce a one- or two-page document that may be used within the department as quick reference of an evidence-based protocol document that summarises a relevant clinical or diagnostic topic with the aim of closing "what has been called the evidence transfer gap."

2.8.1.3 *Practicals*

Practicals include day-to-day in-service training opportunities, but also the practical evaluations in every radiological modality, structured to be completed at specific intervals throughout the training period. This forms part of formative assessment.

2.8.1.4 *Interdepartmental meetings*

The purpose of an interdepartmental meeting (as practised in the researcher's department), is primarily to discuss interesting cases, and the meeting leads to an academic discussion between radiology and clinical colleagues, which offers a learning opportunity for all participants, especially attending junior doctors, to review the past, present or future management of a specific patient. The senior registrars lead the meetings and are exposed to questions from clinical colleagues, peers and lecturers.

Within the radiology context interdepartmental meetings may also include **discrepancy meetings**, which are similar to morbidity and mortality meetings within the surgical context (Augustine *et al.* 2010:330).

The aim of discrepancy meetings is to "acknowledge, discuss and learn from errors in an open, constructive and blame-free environment" (Holt & Goddard 2012:Online). Holt and Goddard suggest that the images should be reviewed jointly by the clinician and the radiologist (or resident) "prior to the meeting" to identify discrepancies between the radiology report and the clinical findings. This will assist in fostering an academic atmosphere without mud-slinging or intimidation of the reporting doctor.

2.8.1.5 *Online databases*

Online databases, such as Radiopaedia.org (2015:Online), Learning Radiology (2015:Online), STATdx (2015:Online), Amirsys (2015:Online), Up-to-Date (2015:Online), IMAIOS (2015:Online) and AuntMinnie.com (2015:Online), provide registrars with instant online access to reviewed clinical literature and radiology cases, which can assist them in doing their day-to-day work.

2.8.1.6 *Simulation laboratory*

Radiological simulation should be developed within a radiological context to mimic real-world scenarios without negatively impacting on service delivery (RCR 2010:Online) while focusing on a specific skill or modality that the resident should master.

Issenberg *et al.* (2005:10) conclude that simulation complements medical teaching and therefore it is essential to identify areas where simulation may be implemented successfully in radiology by teaming up with partners (e.g. an existing simulation laboratory) to harness its benefits (RCR 2010:Online).

Didactic teaching may not provide sufficient training for proper management of an acute anaphylactic contrast reaction (Tubbs, Murphy, Mainiero, Shapiro, Kobayashi, Lindquist, Smith & Siegel 2009:582). This gap may be filled by utilising high-fidelity medical simulation to teach and assess radiology residents in a safe and controlled environment (Tubbs *et al.* 2009:582).

Within the researcher's department, registrars have to complete a mammography course structured as simulated real-life scenario cases in the simulation laboratory before they are allowed to report on live cases.

2.8.1.7 Conferences

In the South African radiology context, registrars are encouraged to attend regular radiology conferences presented by the Radiological Society of South Africa (RSSA), but because of the financial implications (travelling, accommodation and conference expenses) this is not optimally achieved by residents.

2.8.1.8 Research meetings

Research meetings differ from journal clubs. In the researcher's department research meetings are conducted every fortnight to identify possible research topics. Registrars have to present their protocols for departmental evaluation prior to submission to the ethics committee, report back on the progress of their research studies, present the research prior to submission for publication and report back on lessons learned after the publication of their articles.

2.8.1.9 Tutorial sessions

During tutorial sessions case studies are presented by a consultant (or colleagues) and the candidate is exposed to a simulated examination oral, with the aim of reviewing the candidate's knowledge and systematic diagnostic approach to different imaging challenges. This is resident driven but is always tutored by a radiology consultant, who constantly provides immediate feedback. Tutorial sessions differ from case-based small-group sessions.

2.8.1.10 Case-based small-group sessions

According to Lum and Zaleski (2010:14) case-based small-group sessions can take place when interesting cases are encountered daily during the normal workflow; these cases are discussed within a small group in the presence of a radiologist during a limited teaching period set aside for this event (e.g. an allocated half an hour daily). By routinely exercising this teaching tool, a collection of these cases facilitates teaching and learning activities throughout the curriculum (Lum & Zaleski 2010:14).

Benefits of case-based small-group sessions (Dowd & Hulse 1996:127) may include:

- exposure of residents to an experienced radiologist, especially on challenging cases;

- correcting misinterpretation of clinical data and diagnostic findings;
- giving insight into how a qualified radiologist systematically approaches a diagnostic challenge and thereby improves the residents' critical-thinking skills through learning from observation;
- guiding residents from a student paradigm to professional thinking and reasoning; and
- improving skills for handling criticism.

Dowd and Hulse (1996:128) stress that, because case-based small-group sessions are not necessarily systematically structured, this may be seen as a limitation and they therefore admit that this tool should only be considered as an adjunct to teaching and learning.

Gosnell (2010:42) reiterates that interacting small-group members may become motivated to learn through positive peer pressure, and therefore achieve the intended learning outcomes. The author further argues that students tend to learn from one another during informal interaction, which leads to a wider knowledge of radiology concepts (Gosnell 2010:42).

2.8.1.11 *Quarterly assessments*

Within the researcher's department quarterly assessments are formative assessments during which every candidate is exposed to a simulated examination scenario that involves 20 rapid reporting short cases, one long case study and a 20-mark written question that may be in the form of an essay, short questions and/or MCQs. A tutorial feedback session follows as a teaching activity after every quarterly assessment.

Another example of how formative assessments can be used for learning during the training programme is mentioned by Jippes, Van Engelen, Brand and Oudkerk (2010:971) of the Netherlands, where a national knowledge progression test is used to evaluate the resident's progress throughout the training programme.

2.8.1.12 *Rotations (including quality control sessions)*

Adusumilli, Cohan, Korobkin, Fitzgerald and Oh (2000:920) report that residents who progressed favourably during their rotations are likely to do well in their written assessments.

Rotation is a form of problem-based learning called case-based learning (Lum & Zaleski 2010:12), where registrars rotate through all the different radiological imaging modalities while working in a radiology department. Residents are confronted with imaging studies that are viewed independently and then reviewed by a qualified radiologist to ensure quality control (Lum & Zaleski 2010:12). This is also known as **quality-control sessions** (researcher's department) or **individual reviewing time** (Lum & Zaleski 2010:13).

Quality control sessions are conducted on every case during the day and give the registrar the opportunity to review the findings of each case, to research any questions and make his/her own diagnosis before review with the radiologist. The registrar can also review laboratory results, previous reports and previous imaging available on a PACS. This is a very effective way of learning radiology, considering that rotation objectives will differ according to the level of residency training (Lum & Zaleski 2010:12).

Within the researcher's context quality-control sessions often lead to **Socratic questioning** (Wikipedia 2015:Online) aimed at exploring the registrars' cognitive processes, identifying any learning problems or issues and analysing the residents' understanding of radiology concepts and logical reasoning.

Gosnell (2010:41) reports that Socratic questioning is a well-known teaching method aimed at initiating logical thinking and motivating critical analysis. Through this method the lecturer will gain insight into the resident's cognitive and reasoning skills that are needed for everyday practice (Gosnell 2010:41). Furthermore, once recall, evaluation and analysis of knowledge has been assessed, feedback can be given immediately, which, in turn, will improve motivation.

2.8.1.13 The Zeigarnik effect

Harper (2003:4) states that, "motivation is fundamental to cognition, behaviour, and communication".

According to Dowd and Hulse (1996:34), Bigge and Hunt reported that student motivation increases when they find a situation puzzling. The authors continue that once the situation has been resolved, motivation diminishes.

The Zeigarnik effect causes an individual to recall uncompleted tasks better than completed tasks (Dowd & Hulse 1996:34). These authors suggest that, instead of dishing out all the

answers, it is better to have residents (within certain limits) leave the teaching environment with a few unanswered questions (Dowd & Hulse 1996:34). Doing so will create a controlled puzzling situation that will lead to an increase in motivation and better recall of knowledge once it has been learned.

The researcher, in his teaching environment, uses the Zeigarnik effect with great success. During quality-control sessions several questions may be asked by the resident. Some of these questions are bounced back to the registrar in the form of a directive to read a specific text or article on the topic in question. The registrar then has to report back the next day with the correct answer. This is only aimed at the specific answer and it is not a case study.

2.8.1.14 *Departmental digital library*

The departmental library is not restricted to hard-copy textbooks and digital textbooks but consists of radiology cases that were identified by registrars and consultants as interesting or rare cases.

The collection also includes imaged cases that demonstrate good examples of specific radiological or radiographical signs. The image library is useful for training junior residents in basic radiological signs, but also proves to be very valuable to senior registrars preparing for the summative assessment. The collection of cases can furthermore suffice as a data pool for future research topics and form part of the portfolio of contributing residents.

2.8.1.15 *Visiting professors, webinars, podcasts and teaching opportunities*

Although this is a form of didactic teaching, **visiting professors** and experts from other institutions can present lectures outside of the academic day. Presenters could include outstanding residents from other radiology or clinical departments. This scenario is known as a **teaching opportunity** for the visiting presenting resident.

Teaching opportunities also include didactic lectures presented by the residents to undergraduate medical students.

A **webinar** is a familiar teaching activity commonly used in the South African radiology context. Registrars, together with consultants, can sit in the lecture room of the department while listening and sometimes actively participating in an online lecture that is presented

from anywhere in the world. A major benefit is giving registrars the opportunity to be exposed to international experts on related topics.

Podcasts are digitally recorded teaching videos that can be watched online. These may include several "episodes" on a specific topic that can be followed or viewed by the residents when convenient. It may include didactic sessions or a demonstration of procedures and practical skills exercised in the radiology department.

2.8.1.16 *On-call*

Junior residents do their after-hours work as part of a dual on-call or "buddy-call" system. The system is aimed at teaching the junior registrar all the necessary knowledge and skills needed for future after-hours work, which is done with limited or no direct supervision. The junior registrar "shadows" with a senior registrar, who is responsible for the on-call work and who is able to guide the junior registrar properly. This functions as an effective learning opportunity.

2.8.1.17 *Concept maps*

Concept maps are not commonly used in radiology in the context of writing down information on paper or digital platforms, but it is a very important educational tool throughout radiology teaching, especially when it comes to diagnostic approaches.

Concept maps encourage critical thinking and facilitate immediate feedback during the teaching process (Passmore, Owen & Prabakaran 2011:287).

A concept map is a graphic compilation of interlinked ideas, which is based on the assertion that knowledge can be recalled from memory on the basis of how these collections of data (concepts) are tied together (Passmore *et al.* 2011:285).

The map would start off with one concept and it is then developed further by the resident by linking related ideas and thoughts while s/he is being guided by the lecturer.

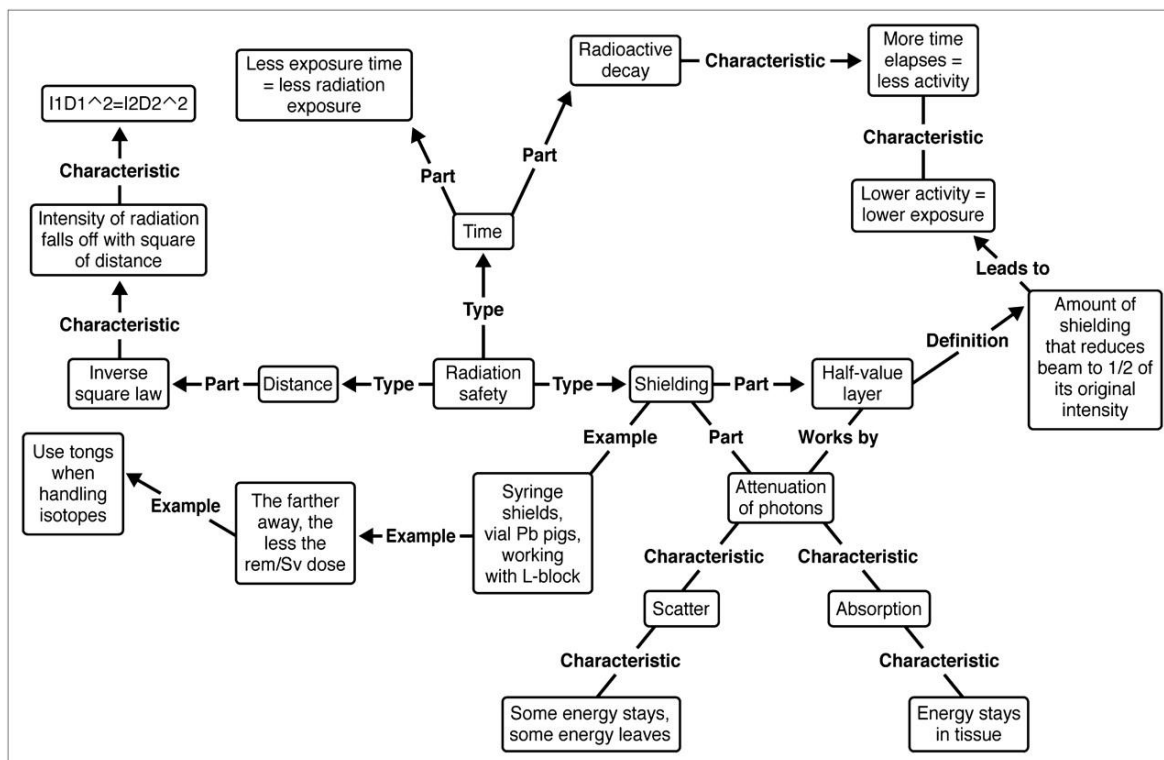


FIGURE 2.7: STUDENT CONCEPT MAP DEPICTING BASIC CONCEPTS OF RADIATION (From Passmore *et al.* 2011:286)

Figure 2.7 shows a student concept map. It shows the basic concepts involved in radiation protection, namely, time, distance and shielding. "Note complexity and linking relationships between concepts and between clusters, indicating meaningful understanding of components of radiation protection and how they work together" (Passmore *et al.* 2011:286).

2.8.1.18 Learning contract

The concept of a **learning contract** was created by Knowles, who also coined the term "andragogy", and who is seen as the originator of the study of adult learning (Collins 2006:1484).

Knowles (1970:28) argues that one of the roles of the educator is to guide the student in creating self-directed learning skills to comprehend the paradigm of lifelong learning. The author explains that the learner should be involved in setting formal learning goals that include the needs of the learner, the lecturer, the institution and society, with the aim of letting the learner recognise that the set goals are his/her own goals (Knowles 1970:57). A learning contract is the result of a committed learner who is involved and accepts

responsibility for planning and executing his/her own teaching and learning process (Knowles 1970:57).

Within the researcher's context, a learning contract is signed with every resident annually.

2.8.1.19 *Clinical debriefing*

Clinical debriefing is another effective resident-centred learning method that can be utilised for teaching and learning.

"Debriefing allows students to raise questions, share their rationale for the actions they took and elaborate on their thinking in planning" (O'Connor 2006:92) the further management of patients, the workflow in the department or any radiologic related challenges within the work and learning environment.

Residents can meet as a group at the end of the day to express feelings and experiences arising from challenging diagnostic scenarios, with the aim of solving any problems through input from their peers' experiences, knowledge and problem-solving skills (Gosnell 2010:47). Residents learn that, by consulting the group, problems become solvable (O'Connor 2006:177). Such group meetings stimulate the development of an atmosphere of collaboration among team members, by motivating enquiring minds rather than accusing any involved parties (O'Connor 2006:179). Furthermore, it contributes to building good morale between residents and also among the rest of the staff within the department.

If no answer is found during the discussion, it provides the opportunity for further literature research or constructive critical interaction among staff, to find solutions and answers that, in the end, shift the focus from the resident to the patient by identifying more effective patient-care and diagnostic management skills (O'Connor 2006:179).

Within the researcher's context this is achieved by a weekly joint briefing and debriefing meeting with all residents in the department. This event is in the process of developing further, into weekly debriefing group sessions at every imaging modality, involving every team member (resident, consultant, radiographer and professional nurse), to identify and solve any imaging-modality-related challenges.

Furthermore, in a wider context, every resident in the researcher's department attends a debriefing interview when they leave the department, at which challenges that need further attention are discussed, and where the resident can provide suggestions that can be implemented to improve teaching and learning. This interview is followed by a three-month follow-up interview to enquire about new lessons learned within their new working environment; these lessons could possibly contribute to more effective teaching and learning in the radiology department.

As identified (cf. Point 2.7), "feedback" is the most powerful moderator for achievement (Hattie 1999:Online).

2.9 CONCLUSION

Chapter 2 provided an overview of the theoretical perspectives relevant to the research.

The researcher described from the literature the roles that a radiology candidate must fulfil to be deemed competent. This was followed by a discussion of the relevance of learning outcomes that the radiology candidate needs to achieve to become competent.

From this flowed perspectives gained from the literature on the assessment events that may be relevant to radiology to assess competency in a radiology candidate; it was followed by an investigation into the moderation of such assessments. Feedback was discussed as an integral component of planning the training programme and optimising TLAs that constitute the curriculum.

This completes constructive alignment of the curriculum, the associated learning outcomes, and the assessment and moderation processes through continuous feedback.

In the next chapter, Chapter 3, entitled ***Research design and methodology***, an overview of the research methodology involved in the study and the procedures that were followed will be reported and discussed.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

In this chapter the researcher elaborates on the research design as well as the research methodology that was pursued. The researcher first explains the reasons for gaining theoretical perspectives on the study and then continues by describing perspectives on the methodologies and procedures applied in conducting this study.

This explanation also includes the theoretical perspectives on the research design, identification of the target population and defining the unit of analysis and sample size within each interview group. The researcher also explores the exploratory interviews, the data collection, and the data analysis relevant to both groups. The chapter continues with a discussion on the concepts of validity, reliability and trustworthiness relevant to this study design, after which the ethical considerations, with specific reference to approval of the study, informed consent that was obtained from all the individual participants and every interviewee's right to privacy, is explained. A discussion of the minimising of potential misinterpretation of the findings follows before the chapter is concluded.

3.2 THEORETICAL PERSPECTIVES ON THE RESEARCH DESIGN

The researcher followed a qualitative research design. To define qualitative research, the researcher refers to a monograph originally published by Egon Guba in 1978 and cited by Merriam (2009:7): "A study was naturalistic if it took place in a real-world setting rather than a laboratory, and whatever was being observed and studied was allowed to happen naturally". Therefore it is important that the researcher does not have authority over the interviewees and cannot influence their responses and thereby manipulate the topic under discussion.

Merriam (2009:15) notes that one of the features of qualitative research is that the data are collected and analysed by the same person; Merriam calls the researcher as "the primary instrument". Advantages of this approach include expanding an understanding of verbal and nonverbal communication, the ability to process data immediately, clarifying and summarising data, confirming accuracy from respondents and exploring unexpected

responses. However, she warns that researcher bias may have a negative impact on the study and should be identified and monitored (Merriam 2009:15).

According to Noyes, Popay, Pearson, Hannes and Booth (2011:Online) qualitative research involves a naturalistic approach to the data, so that the researcher is given the opportunity to interpret answers with the purpose of identifying and prioritising key points that contribute to finding solutions for the research questions and/or existing information.

Creswell and Plano-Clark (2011:40) identify four common though not all-encompassing worldviews or paradigms that may bring the different methods of researchers up to date: post-positivism, constructivism, participatory worldviews and pragmatism.

According to these authors it is clear that these research paradigms share some fundamentals but differ in standpoints toward these basic elements. With further investigation the researcher found that Creswell and Plano-Clark (2011:41) identified these elements as the "nature of reality (ontology), how we gain knowledge of what we know (epistemology)", the relevancy of values (axiology), the procedures and course of actions followed throughout the study (methodology), and the terminology and expressions that are used in research (rhetoric).

Creswell and Plano-Clark (2011:40) argue that, in a post-positivistic paradigm, the researcher bases his/her collection of data (knowledge) on determinism that implies "cause and effect", e.g. "What caused the tsunami? Something must have caused it." From this follows reductionism, by focusing and narrowing down on certain variables that may be related to the data, e.g. "Maybe it was caused by an earthquake or by some divine intervention." This leads to detailed observations and measurements of the different variables to finally test the different theories with the aim of identifying the most likely theory. Therefore, post-positivism is commonly associated with quantitative research and leads to theory verification. For the post-positivistic researcher there is only one reality and therefore the researcher's ontology is singular, involving the theory being accepted or rejected by the research study. The researcher's epistemology (how s/he gathers knowledge or data, relationship to that which is being observed) is objective, secluded and unbiased and the methodology of this research approach is deductive in nature – the researcher tests prior theory. From this flows the use of formal language and specific definitions, the rhetoric of the research study. The axiology (role of values) of this research design is unbiased.

A constructivist will have a qualitative approach: the researcher will try to grasp the fundamental nature of an experience by interviewing individuals who are involved in the topic at hand to gather their subjective views, which originate from their own life experiences, e.g. "What is your opinion on the recent tsunami?" This research paradigm constructs from the base upwards, from individual opinions to, ultimately, a broad understanding of reality and therefore generation of theory (Creswell & Plano-Clark 2011:40). The ontology (nature of reality) is multiple, because the researcher should consider every response by the participant as reality and therefore as a true reflection of the individuals' thoughts, feelings and experiences. For the researcher in this paradigm, his/her epistemology (relationship, how data are gathered) is much closer to the individual that is being studied. The researcher will visit the participants in their own environments to collect data, e.g. a semi-structured interview that takes place in the interviewee's own office, or the researcher could live among and study a specific cultural group in Africa. The research is inductive and much more informal, as it identifies patterns that are grouped together (categorised), and eventually evolves into theories. For a constructivist the axiology needs to be actively discussed and the interpretation of data should be explained to reduce bias. This will be discussed later on in this chapter, under validity, reliability and trustworthiness of this study (cf. Point 3.4).

In the participatory paradigm the focus is on political concerns, and leans more to a qualitative research approach with a view to improving society through empowerment, by breaking down barriers that are marginalising groups. The researcher will work together with participants experiencing injustices to improve their social circumstances so that they will be less marginalised (Creswell & Plano-Clark 2011:41), e.g., research done on apartheid, gay-marriage etc. The findings (ontology, reality) is negotiated by actively involving (epistemology, how we gather data) all role players through collaboration and repeated reviews of the process and using rhetoric (language) that will bring about change. The aim of this research is to bring about transformation and build partnerships.

Pragmatism is another paradigm that is usually associated with both quantitative and qualitative research – it is also known as "mixed methods" research. In this paradigm the focus is on the findings that emerge from the research (Creswell & Plano-Clark 2011:41). Thus, at first, theory is generated and then this theory is tested against another method to confirm what is successful in a real-life scenario and what not, e.g., data are collected through a Delphi-technique (quantitative research) and tested through semi-structured interviews (qualitative research). Therefore, the ontology of this paradigm may include

multiple realities or a singular reality, depending on whether a qualitative or a quantitative research design, or both, are followed. The epistemology is one of practicality, where the researcher collects quantitative and qualitative data (methodology) to answer a specific research question. The rhetoric may be formal or informal.

Creswell and Plano-Clark (2011:46) clarify that the selection of the paradigmatic approach will be determined by the type of scholarly community that is to be studied. Through the literature review and paradigmatic perspectives it will become clear what questions and answers are relevant to the specific study design.

Creswell and Plano-Clark (2011:47) continue by stating that scholarly communities (participants to be studied, interviewees) should include individuals who share identities, who are confronted with similar research problems, connected along the same social or professional networks and who possess the same knowledge development or groupings.

In this Ph.D. study's research design, the researcher predominantly followed the elements of a constructivist paradigm while, to a lesser extent, venturing into the realm of pragmatism. The researcher conducted a literature review and reviewed several paradigmatic perspectives to gain insight into the conceptualisation and contextualisation of summative assessment in radiology.

Semi-structured interviews with open-ended questions were conducted in a naturalistic manner to answer the research questions. This research method was valuable to enhance triangulation, *"to check out bits of information across informants"*, as phrased by Van Maanen (quoted by Shenton 2004:66).

The benefits of exercising a semi-naturalistic approach during the semi-structured interviews, as set out by Wisker (2007:195), were that opportunities arose to ask follow-up questions if greater clarity was needed. During the course of the interviews opportunities arose that led the researcher to ask follow-up questions, but ultimately, the researcher repeatedly returned to the interview guide to address the core questions.

3.3 RESEARCH METHODS

3.3.1 Paradigmatic perspectives – theoretical background (literature review)

The purpose of identifying the theoretical background is to contextualise the problem in the light of related published work on the topic and to ensure that the researcher gains an understanding of the purpose of investigating the phenomenon at hand scientifically and in an educated fashion (Singleton & Straits 1999:544).

Prior to conducting research, the researcher should do extensive reading on the specific topic, to become knowledgeable about what has been written in the past, to note shortcomings in current knowledge and new tendencies, and to identify possibilities for future research (Bowen 2005:210). By reviewing the literature, the researcher can contextualise the research project and endow the reader with insight, enabling the reader to understand the need for further investigation into current, existing knowledge on the topic better (Bowen 2005:210). Bowen (2005:210) advises as follows: "Even during the fieldwork phase of your study, keep reading."

The Writing Centre of the University of Cape Town (Writing Centre 2015:Online) suggests that:

A literature review is not merely a summary of existing literature. It aims to firstly test the ability of the writer to construct and source information in a systematic way. Secondly it aims to test the skills of critically analyzing information and identifying gaps in the literature, which require further research.

Hurst (2011:36) argues that a literature review should provide a background of what has been addressed by previous researchers pertaining to the specific topic and should guide the reader towards limitations in such previous research. The author suggests that the researcher should highlight the significance of the proposed research by addressing the gaps in current knowledge about the topic in question (Hurst 2011:36).

Therefore, the researcher studied the literature to gain theoretical perspectives on the research design and to broaden his understanding of training and assessment in general. By gaining these perspectives, the researcher was able to decide how to conduct this research study effectively and to remain relevant within the context of current summative assessment in radiology.

3.3.2 Semi-structured interviews with assessors and moderators

Because of the relatively limited number of experts available within the academic radiology community involved in summative radiology assessment, the researcher decided to use semi-structured interviews as a qualitative research approach to gather as much reliable data as possible to answer the research questions.

By interacting with individuals who are currently functioning as experts in the field that was being investigated, the researcher was able to gain a much better understanding of summative assessment in radiology.

An interview involves the transfer of information. This is different from a conversation, which entails the sharing of information. According to Shank (2002:42), an asymmetrical pattern is followed during an interview, as the interviewer seeks information and the interviewee provides the information.

An interview is defined by Newton (2010:1) as, "a managed verbal exchange" and he states that the usefulness thereof is greatly reliant on the communication skills of the interviewer. The author explains that an interviewer should be able to structure questions in a clear manner, listen carefully, pause, probe or prompt fittingly, encouraging the interviewee to talk without restraint by making it easy for the interviewee to respond to questions and showing interpersonal skills to establish trust.

Newton (2010:1) summarises the thoughts of Gillham, Ritchie and Lewis, namely, that an interview is suitable where the depth of meaning is important and the purpose of the research is primarily aimed at gaining insight and understanding.

Another stance on interviews is that of Wisker (2007:193), who directs the researcher to realise how significantly sensitivity to posture, dress code, acknowledgement of the culture of the interviewee and the institution, gender and the socio-economic standing of the interviewee may influence the interview. Wisker (2007:193) advises that the interviewer should be perceptive to all these factors. Therefore, the researcher decided to interview the assessors and moderators in person.

3.3.2.1 *Target population*

Within a quantitative research design a target population, as defined by Sim and Wright (2002:111), is "the collection of cases in which the researcher is ultimately interested and to which he or she wishes to make generalizations."

In contrast, the aim of qualitative research is to construct a better understanding of specific phenomena, through which the researcher will be enabled to answer specific research questions and ultimately fill a knowledge gap in our current understanding of the world (Creswell 2012:206).

The researcher concludes from the above that the naturalist concept of "random sampling" may be slightly different from the post-positivistic paradigm and rationalistic (quantitative) research. The qualitative researcher does not sample individuals to make deductions or "build theories" about the population, but is interested in the opinions of a few individuals who can give a better and true understanding of the phenomenon under study (Creswell 2012:206). This sample group will therefore include individuals with sufficient knowledge, experience and understanding of the research phenomenon. Creswell (2012:206) describes this concept as "purposeful sampling".

Some rationalists may disapprove of this notion of "purposeful sampling", by arguing that the reliability and trustworthiness of the study may be impaired, but Creswell (2012:210) counters this argument by extrapolating that, by increasing the number of interviewees, the reliability of the sampling is increased. Creswell (2012:209) also argues that sampling individuals from different institutions or geographic sites (all within the same context of the researched phenomenon) contributes to the reliability of the sample.

The researcher may sample both the users and providers of a service (or phenomenon) as another form of triangulation to increase the sampling reliability and therefore the credibility of the study (Shenton 2004:66).

The target population in this interview group consisted of assessors and moderators in radiology, academic radiologists in departments as well as private radiologists who act as assessors or moderators.

The number of possible interviewees in this group was aimed to be at least 10, but varied, depending on whether more data were needed. Interviewing ceased when the data collection became saturated. The interviewees included radiologists with experience of assessing and moderating for the radiology summative assessment.

The survey population consisted of the above-mentioned participants, who gave informed consent to take part in the semi-structured interviews.

3.3.2.2 *Unit of analysis and sample size*

The sample population consisted of subgroups. These subgroups were compiled according to criteria such as experience as assessors and moderators, government employed or in private practice.

The sample size could not be determined exactly beforehand – interviews continued until data saturation (no new or relevant data emerging) was reached.

Inclusion criteria were that interviewees had to:

- be qualified radiologists (M.Med. or College fellows);
- be registered with the HPCSA as independent practitioners;
- possess at least five years post-exit-examination experience;
- possess experience as assessors and/or moderators of the M.Med. or CR (CMSA) summative assessment;
- be currently practising in South Africa (private or public sector); and
- have given informed consent.

The following served as exclusion criteria:

- the person was not a radiologist;
- the person was not registered with the HPCSA;
- the person possessed fewer than five years post-examination experience;
- the person had no experience as an assessor or moderator;
- the person was practising outside of South Africa; and
- the person had not given informed consent.

3.3.2.3 *Exploratory interviews (pilot study)*

Singleton, Straits, Straits and McAllister (1988:290) suggest that a research measurement tool should first be tested by "trying it out on a small number of persons having characteristics similar to those of the target group of respondents".

The Terminology Committee for Social Work (1995:45) defines a pilot study (exploratory interview in the case of qualitative research) as "the process whereby the research design for a prospective survey is tested".

Exploratory interviews were conducted to ensure that the questions were clear and unbiased, that the interview guide was well structured, and to determine how much time was needed for completion of the interview. Two participants who comply with the inclusion criteria were used for the exploratory interviews. These participants were originally not part of the final study but the sample population was small and questions did not change drastically, therefore, the exploratory interviews were included in the final analysis.

3.3.2.4 *Data collection*

Wisker (2007:196) suggests that the interviewee should be contacted by email or telephone to explain to the participant the reasons for undertaking the research project and to identify suitable circumstances (time, location and environment) in which the researcher can conduct the interview. Even if all the interviews are recorded, the author advises the researcher to transcribe the responses or to make field notes soon after the interviews to contextualise and clarify responses, instead of taking extensive notes during the interview and therefore missing gestures, pauses or sensitive non-verbal communication (Wisker 2007:196).

It was clear to the researcher that a balance had to be found between making notes and relying on memory over the short term.

Written informed consent was obtained from all participants. All the semi-structured interviews were carried out by the researcher and were scheduled on an appointment basis. An interview guide was given or sent to the participant once the appointment had been confirmed by the interviewee. The interview guide was given to the participants to give them adequate opportunity to prepare for the interviews and to consider the questions that

would be asked. The individual interviewees were informed of the time that was required to complete the interview.

The researcher constantly followed the guidelines of Wisker (2007:198) for optimising the interview:

- "honesty";
- "do not appear threatened or bored";
- do not ask "long questions" or "multiple questions packed into one";
- ask questions in ordinary, plain language;
- do not ask questions that may "lead or suggest bias";
- "stay in control" and remain "friendly and responsive";
- "use prompts and probes" like nodding or "repeating part of what has been said" within the context of the discussion;
- allow time for answers to develop but move on if answers are not focused;
- return to or rephrase important questions if they are ignored; and
- finish the interview with simple, "straightforward questions".

All interviews were conducted, recorded and transcribed by the researcher. The transcriptions were checked by the researcher and forwarded to his promoters together with the coded data in order to ensure that no coding errors had been made. Transcription and analysis were started after each interview. When no new themes or data appeared, data saturation had been reached and data collection was stopped.

3.3.2.5 *Data analysis*

The data analysis was done according to qualitative research principles as described by Creswell (2012:237), who identified six steps in data analysis:

- organise and prepare the data;
- develop a general sense of concepts;
- code the data;
- describe and identify specific themes;
- present the findings; and
- interpret the data.

Analysis was done manually by the researcher with the aid of electronic systems. Any trends, patterns or themes that appeared were identified and coded.

3.3.3 Semi-structured interviews with candidates who were within one year of post-summative assessment

The researcher decided to use semi-structured interviews because of the relatively small number of individuals (users) available for sampling within the specific context of summative radiology assessment. Furthermore, the interviews with the candidates who were assessed had to be conducted within a specific time frame to increase the validity, reliability and trustworthiness of the study.

Wisker (2007:192) suggests that, although interviews may be very time consuming, it would be the preferred research method if the researcher is trying to obtain a better understanding of the phenomenon by eliciting:

- *information based on emotions, feelings, experiences;*
- *information based on sensitive issues; and*
- *information based on insider experience, privileged insights and experiences.*

The researcher was aware of and understands the reasoning of Wisker (2007:193) regarding "sensitivity" of conducting qualitative interviews (cf. Point 3.3.2) and therefore endeavoured to do the interviews in person and face to face, but the availability of the candidates and the sample size of this interview group would have lead to time and financial constraints. For these reasons four of the candidates were interviewed via Skype (online), three were interviewed in person and three via landline telephone.

3.3.3.1 Target population

The target population of this group consisted of candidates who had completed the CR (CMSA) Part 2 examination within the last year, regardless of whether they had passed the examination.

The intention was to approach at least six possible interviewees, but the number varied, depending on whether more data were needed or if data collection had become saturated.

The interviewees included post-summative-assessment candidates within one year post assessment.

The survey population consisted of the participants described above and who had given informed consent to take part in the semi-structured interviews.

3.3.3.2 *Unit of analysis and sample size*

Inclusion criteria were that the interviewees:

- had completed the CR (CMSA) Part 2 examination required to qualify as radiologists in South Africa within the past year, regardless of whether they had passed or failed;
- had done research in a radiology department if the candidate started specialising radiology since January 2011;
- had not been required to do research if the candidate had started specialising radiology prior to January 2011;
- were currently practising in South Africa (private or public sector);
- were registered with the HPCSA as independent practitioners; and
- had given the required informed consent.

Exclusion criteria were that the person:

- had sat for the CR (CMSA) Part 2 examination more than a year ago;
- observed as an assessor or moderator in the M.Med. or CR (CMSA) exit examination; and
- had not given informed consent.

3.3.3.3 *Exploratory interviews (pilot study)*

The same procedure was followed as described in Point 3.3.2.3.

Exploratory interviews were conducted to ensure that the questions were clear and unbiased, that the interview guide was well structured, and to determine how much time was needed for completion of the interview. Two participants who complied with the inclusion criteria were used for the exploratory interviews. These participants had not originally been part of the final study but the sample population was small and questions did not change drastically, therefore, the exploratory interviews were included in the final analysis.

3.3.3.4 *Data collection*

The same procedure was followed as described in Point 3.3.2.4.

Written informed consent was obtained from all participants. The semi-structured interviews were carried out by the researcher. Semi-structured interviews were scheduled on an appointment basis, after which an interview guide was given or sent to the participant. This was done to give the interviewees adequate opportunity to prepare for the interviews and to consider the questions that would be asked. The individual interviewees were informed of the time that would be required to complete the interview.

All interviews were conducted, recorded and transcribed by the researcher. The transcriptions were checked by the researcher and his promoters in order to ensure that no transcription errors had been made. Transcription and analysis were started after each interview. When no new themes or data appeared, data saturation had been reached and data collection was stopped.

3.3.3.5 *Data analysis*

The same procedure was followed as described in Point 3.3.2.5.

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- organise and prepare the data;
- develop a general sense of concepts;
- code the data;
- describe and identify specific themes;
- present the findings; and
- interpret the data.

Analysis was done manually by the researcher with aid of electronic systems. Any trends, patterns or themes that appeared were identified and coded.

3.4 VALIDITY, RELIABILITY AND TRUSTWORTHINESS

3.4.1 Validity

According to the SAQA (2001:17), in the context of assessments, an assessment tool (e.g. a rubric) is valid if it measures what it purports to measure, "be it knowledge, understanding, subject content, skills, information" or behaviour.

Within the context of research methodology, validity is a post-positivistic concept that is commonly used in a rationalistic research design; it is defined by Waltz, Strickland and Lenz (2010:163) as, "the degree to which evidence and theory support the interpretation entailed by proposed use of tests". These authors argue that validity can only be proven if the findings were collected from a preselected group of respondents by making use of a specific measuring tool that was developed for a single purpose – this means, in a post-positivistic paradigm, there is only one reality that exists for the researcher (Guba 1981:77).

Bowling (2014:205) differentiates between external and internal validity. Internal validity is a property of the measurement instrument, and internal validity is achieved if the instrument really measures what it is supposed to measure (Shenton 2004:64). External validity, also known as "generalisability", on the other hand, refers to the applicability of the research findings "to the wider population" (Bowling 2014:205).

From the above it becomes clear that "validity" is a term that is not regularly used in naturalistic research, because many realities (all gathered data are real) exist (Guba 1981:77) for the qualitative researcher (naturalist). Therefore, "**credibility**" is a more appropriate term for the naturalist to use than "internal validity", which is used in rationalistic research (Shenton 2004:64).

Credibility (internal validity) cannot necessarily be proven and the researcher can only accept in good faith that the interviewee is not telling what s/he thinks the interviewer wants to hear (Newton 2010:5).

Selecting individuals who have an interest in the subject and who are experts in the field that is being researched will increase the credibility (internal validity) of the measuring tool (Goodman 1987:729). This view is echoed by Van Wyk (2014:39), who maintains that

credibility (internal validity) is ensured by representing the experience of the participants accurately.

Credibility (internal validity) can also be described as a measure of the degree to which the responses obtained from the interviewees are a true reflection of their thoughts and opinions on the research topic (Schensul, Schensul & LeCompte 1999:275). This view is confirmed by Pitney and Parker (2009:62), who state that the aim of internal validity in qualitative research is to "capture what really happened and what participants truly meant and believed about a situation".

With the concept of credibility in mind, Merriam (as quoted by Shenton, 2004:64) asks the question: "How congruent are the findings with reality?" Guba (1981:80) explains that the truthfulness of the collected data or response of the interviewee can be improved by making use of "member checks", where the researcher, as the instrument, confirms the gathered information with the interviewee.

Shenton (2004:64) further argues that credibility can be ensured by following proven research methodology, familiarising oneself with the culture and mechanisms of the population or organisation that forms part of the phenomenon that is researched and by applying "triangulation" through making use of several methods. The author continues that credibility can furthermore be enhanced by selecting a sample group that is representative of the target population, even in the setting of purposeful sampling which is a familiar concept in qualitative research.

Shenton (2004:66) also suggests that the data gathered from interviews may be compared with collaborative documentation as well as direct observation by the researcher.

The researcher can guarantee honesty from the interviewee if the latter is given the opportunity to refuse the interview; thereby the interviewer selects only those participants who are really willing to participate (Shenton 2004:66). Iterative questioning, by returning to previously mentioned topics or by rephrasing questions, may also contribute to confirming true answers given by the interviewee (Shenton 2004:67).

Guba (1981:83) also identifies "member checks, prolonged engagement, persistent observation and triangulation" as ways to ensure credibility, but furthermore includes "peer review" and the review of data by the researcher, superiors or experts to check the data

for contradictions that may negatively influence the "structural coherence" of the study. The researcher should finally confirm the authenticity of the data, such as documentation or any audio/video recordings that may have been gathered.

3.4.2 Reliability

Franzen (2000:16) explains that reliability is the ability of a measuring tool to produce similar findings from the subject being studied under constant conditions without any outside influences. This view is echoed by Pitney and Parker (2009:62) as the "consistency of measures".

Schensul *et al.* (1999:275) argue that a measuring tool is only reliable if the findings can be replicated when another researcher uses the same methodology. Within the realm of quantitative research this is achievable but in qualitative research the answers of interviewees will not necessarily be replicable.

Merriam acknowledges that, due to the existence of multiple realities, there may also be different interpretations of a reality (Merriam 1995:54). It is because of this possibility of different interpretations of data that the naturalist is still concerned about consistency in the collection of data, as noted by Guba (1981:81). For the data to be credible, the researcher should be vigorous about applying consistency in the gathering of such data.

This shift of focus, from asking whether the findings are reproducible towards evaluating if the findings are consistent with the gathered data, is termed **dependability** by the naturalist (Guba 1981:81).

Shenton (2004:71) alludes to the fact that the interpretation and observation of data are unique in context to a specific study and the phenomena that are investigated. The author elaborates by suggesting that, to increase dependability, the research report or thesis should describe the design and methodology of the study clearly and should include a detailed description of how the data were gathered (Shenton 2004:71). The researcher should also give his/her own reflection on the effectiveness of acquiring the data (Shenton 2004:72).

Van Wyk (2014:37) argues that the researcher can limit the number of data gatherers and needs to take full responsibility for the coding and analysis of data, to increase the

consistency and therefore the reliability of the data (Van Wyk 2014:38). Van Wyk points out that it is unlikely that the same responses will be elicited during multiple rounds of semi-structured interviews, and therefore a semi-structured interview plan will improve reliability of the research method (Van Wyk 2014:38).

Reliability (dependability) can be ensured if it is minimally affected by external influences (Carmines & Zellar 1979:16) and can be enhanced by making use of a pilot study (explorative interviews), by compiling inclusion and exclusion criteria for selecting the sample population, and by constructing the questions for the semi-structured interviews carefully (Louw 2010:93).

Hift (2009:Online) surmises that the more samples are taken (e.g. asking more questions), the more reliable a research study becomes. He warns that the sampling should be universally spread (not concentrated on one topic) to give a proper assessment of the subject studied.

Collecting "more samples" will ensure consistency through improved triangulation and peer examination and by enabling an audit trail on how the data were gathered, categorised and interpreted (Merriam 1995:56).

3.4.3 Trustworthiness

Shenton (2004:63) maintains that, in the research community, many scientists are critical about the trustworthiness of qualitative research.

Lincoln and Guba, as quoted by Polit and Beck (2004:36-44), discuss four criteria for trustworthiness in qualitative research, namely, credibility (in preference to internal validity/the data that was collected by the researcher and the researcher's interpretation of the data, as the truth), transferability (in preference to external validity/generalisability, the extent to which the findings of the research method can be applied in other settings), confirmability (the objectivity of the researcher) and dependability (evidence that is consistent and stable over a specific period).

The concepts of **credibility** and **dependability** were discussed by the researcher above (cf. Points 3.4.1 & 3.4.2).

The data and findings of qualitative research should always be seen in the context of the phenomenon that is being studied, which makes the data unique to the scenario and surroundings within which the study or data collection takes place (Guba 1981:83). Therefore, the responses and findings cannot necessarily be generalised to other situations.

Merriam (1995:58) states that it is not the qualitative researcher who needs to decide on the generalisability of the findings, but the reader, who needs to decide the extent to which the research study would be applicable to his/her own scenario ("user generalisability"). The author points out that concepts learned from one scenario may be applicable to other, similar situations ("concrete universals") (Merriam 1995:58). Furthermore, the qualitative research findings may form part of a "working hypotheses" in the current situation-specific context, which will contribute to future research developments and findings.

To improve the generalisability (**transferability**) of the study, thick (detailed) description is needed, to give the reader the opportunity to decide about the extent to which the study resembles his/her own situation (Guba 1981:83; Merriam 1995:58). By collecting more data from different sites, participants and scenarios, transferability to other situations may be improved further (Merriam 1995:58).

Shenton (2004:72) makes it clear that, to guarantee **confirmability** (the objectivity of the researcher), the naturalist has to ensure that the findings of the study are a true reflection of the thoughts and reasoning of the individuals participating in the study. The author continues that triangulation is a very important research tool to reduce researcher bias (Shenton 2004:72).

Furthermore, Shenton (2004:72) quotes Miles and Huberman, who point out that the investigator needs to acknowledge any preconceptions s/he may have towards the interviewees and/or the data that are gathered. While doing this the researcher also needs to explain why certain methods were followed and why certain conceptions were made, as well as point out possible flaws in reasoning and execution of the research (Shenton 2004:72). Guba (1981:87) calls this concept "practising reflectivity".

Guba (1981:88) furthermore suggests that a "confirmability audit" should be done by an external person to evaluate possible researcher bias and to improve confirmability.

Wisker (2007:195) warns researchers that they should be careful to avoid antagonising or flattering interviewees – doing so may influence the objectivity of the researcher and the confirmability of the data.

In this study:

Credibility of this study was ensured by:

- the researcher undergoing training in interview techniques to conduct interviews expertly (he learned the skill of interviewing for research purposes); and
- making audio recordings of interviews, then making transcriptions that were validated by an independent person who was not part of the study.

Transferability of this study was ensured by:

- documenting clear and detailed descriptions of the research process; and
- relevant selection of participants for the analysis unit.

Confirmability of this study was ensured by:

- the researcher acting “in good faith and without personal bias”; and
- the researcher being audited by the promoters to ensure neutrality.

The validity of semi-structured interviews should not be threatened by using leading questions or by the researcher possessing preconceived ideas of discussion topics (Newton 2010:4).

Dependability of this study was ensured by:

- conducting interviews with several experienced participants within a specific time frame; and
- describing the methodology of the study.

3.5 ETHICAL CONSIDERATIONS

3.5.1 Approval

Creswell (2012:210) advises that the researcher should obtain approval prior to commencing the research from the institution through which the study will be conducted, as well as from any "gatekeepers" that may be relevant.

Approval to execute the research was obtained from the faculty management of the Faculty of Health Sciences, from the vice-rector: Academic Planning, as well as from the Ethics Committee of the Faculty of Health Sciences, UFS (ECUFS No. 121/2014).

The researcher also applied to the CR (CMSA) to obtain access to the contact details of the candidates who took part in the summative radiology assessment (who were within one year post summative-assessment). The CR (CMSA) volunteered to send the relevant questionnaires to the candidates on behalf of the researcher.

3.5.2 Informed consent

Wisker (2007:195) advises that the researcher should make it clear to all interviewees that the interviews are being captured in detail on record. Furthermore, Wisker (2007:195) posits that the interviewees should be informed of what the interview records may be used for. Finally, an interviewee should be given the opportunity to review his/her interview records if s/he wishes to do so (Wisker 2007:195).

All the respondents in the empirical study were asked to give consent to take part. This was done by means of written consent. The forms were made available in English before executing the research. The researcher sent a description of the study via email to all the interviewees. The email provided information about consent, withdrawal from the study, the expected duration of the interview as well as a demographic questionnaire that the participant had to complete prior to the interview. It was clearly stipulated that participation was voluntary and that all information would be handled as confidential. The researcher's contact details were also included in the email and were clearly visible on all documentation. Participants were also made aware that the findings of the research study will be published and that they will have access to the publication.

3.5.3 Right to privacy

All data collected before, during and after the semi-structured interviews were handled as strictly confidential and the interviewees' names, personal details, and demographic information were only known to the researcher. None of the respondents' names appeared on any public document – only code numbers were used.

3.6 CONCLUSION

In this chapter, Chapter 3, a detailed description of the research methodology and all the procedures that were followed throughout this study was presented to the reader, to provide a broad perspective.

In the next chapter, Chapter 4, entitled, ***Findings of the semi-structured interviews with assessors and moderators: analysis and discussion***, the findings of the semi-structured interviews will be reported and discussed.

CHAPTER 4

FINDINGS OF THE SEMI-STRUCTURED INTERVIEWS WITH ASSESSORS AND MODERATORS: ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

This chapter deals with the findings of the semi-structured interviews that were conducted by interviewing assessors and moderators of the summative radiology assessment. The aim of the researcher was to interview at least 10 consultants who are involved in the radiology summative assessment. Interviewees were randomly selected according to the geographic representation of the radiology training departments, their availability and willingness to partake in the study.

In total, 11 semi-structured interviews were conducted to investigate the factors that play a role in the assessment of postgraduate students in radiology, to determine the criteria for directive documentation for summative assessment in radiology, to determine guidelines for assessors and moderators and to identify principles and purposes of assessment to ensure quality in assessment instruments, methods and tools used for the radiology summative assessment. Interviews were conducted by the researcher until no new themes, categories or subcategories emerged and the data were deemed to be saturated.

All the interviewees had experience of working in the public health sector. Interviews with the moderators involved two individuals who are experienced in the South African radiology context. Assessors and moderators were interviewed in Polokwane, Pretoria, Johannesburg, Durban, Bloemfontein, Stellenbosch and Cape Town. None of the interviewees had experience of assessment at international level. The interviewees were representative of Black, Indian, White and Coloured ethnic groups.

By interviewing assessors and moderators from different geographic locations and ethnic groups as well as different levels of assessment experience, the researcher was exposed to different perspectives, which enabled the researcher to observe the various realities involved in radiology summative assessment in greater depth.

All the interviewees fulfilled the inclusion criteria (cf. Point 3.3.2.2), as all:

- were qualified radiologists (M.Med. or College fellows);
- were registered with the HPCSA as independent practitioners;
- possessed at least five years post-exit-examination experience;
- possessed experience as assessors and/or moderators of the M.Med. or CR (CMSA) exit examination;
- were, at the time of the interview, practising in South Africa (private or public sector); and
- had given informed consent.

A summary of the background information of the interviewees is presented in Table 4.1.

TABLE 4.1: NUMBER OF SUMMATIVE ASSESSMENTS AND MODERATIONS, AND RADIOLOGY EXPERIENCE OF INTERVIEWEES

Code	Number of summative assessments	Number of summative moderations	Years post radiology training	Highest qualification
GROUP 1: ASSESSORS WORKING FULL TIME IN THE PRIVATE HEALTH SECTOR				
AR1	2	0	12	FC Rad Diag(SA)
AR2	3	1	26	FC Rad Diag(SA)
GROUP 2: ASSESSORS WORKING FULL TIME IN THE PUBLIC HEALTH SECTOR				
AU1	2	0	5	M.Med.(D.Rad.); FC Rad Diag(SA)
AU2	5	0	10	M.Med.(D.Rad.); FC Rad Diag(SA)
AU3	8	0	20	M.Med.(D.Rad.)
AU4	5	2	13	FC Rad Diag(SA)
GROUP 3: ASSESSORS IN THE PUBLIC HEALTH SECTOR, LIMITED PRIVATE PRACTICE				
AUR1	5	0	8	M.Med.(D.Rad.)
AUR2	12	0	11	FC Rad Diag(SA)
AUR3	15	0	15	FC Rad Diag(SA)
GROUP 4: MODERATORS WORKING FULL TIME IN THE PRIVATE HEALTH SECTOR				
MR1	10	10	33	FC Rad Diag(SA)
GROUP 5: MODERATORS WORKING FULL TIME IN THE PUBLIC HEALTH SECTOR				
MU1	18	8	16	FC Rad Diag(SA)

The data gathered were analysed and interpreted according to the principles that were described in Chapter 3 (cf. Point 3.3.2.5). This involved categorising the data into themes, then identifying categories coupled with subcategories and, finally, discussing the correlation between the data and the interview questions that were put to the interviewees. The data for this study were gathered by interviewing assessors from seven academic radiology departments in South Africa who have experience of radiology summative assessments and were involved in conducting the College of Radiologists of South Africa, CR (CMSA), Part 2 summative assessment during the second semester of 2014. The nine

assessors included three individuals who work in the public health sector and practice privately on a part-time basis, four individuals who work in the public health sector full time, and two individuals who work in the private health sector full time.

4.2 DATA ANALYSIS OF THE SEMI-STRUCTURED INTERVIEWS

Data was gathered according to the principles and methods identified and explained in Chapter 3 (cf. Points 3.3.2.4 & 3.3.2.5). The principles and methods can be summarised as follows:

- interviewees were contacted by email to take part in the interviews;
- the email included an invitation letter (cf. Appendix A1), informed consent (cf. Appendix A2) and a demographics questionnaire (cf. Appendix A3);
- all interviews were conducted in person by the researcher;
- all interviews were recorded and transcribed for reference and coding; and
- a semi-structured interview guide was used in all the interviews to contribute to the dependability of the study (cf. Appendix A4) and it was emailed to all the interviewees in advance to give them the opportunity to organise their thoughts and opinions on some of the questions prior to the interviews.

Some responses given during the interviews were investigated further by asking follow-up questions to gain a better understanding, and these follow-up questions were noted as such. These follow-up questions were repeated in every interview if it was possible that the follow-up questions could increase the dependability (cf. Point 3.4.2) of the study. The data originating from the interviews were examined by the researcher according to the principles mentioned in Chapter 3 (cf. Point 3.3.2.5).

The researcher organised the recordings into different interviewee groups. The recordings were transcribed to prepare the data for analysis. The researcher made notes while listening to the recordings to get a general sense of concepts and to confirm the accuracy of the transcriptions. The transcriptions and notes were used to systematically arrange the data into themes, categories and subcategories. The findings were coded to ensure confidentiality and were presented in table format. The next step was discussing each theme and category to interpret the findings. This was done meticulously to guarantee truthful reporting of the responses, thereby ensuring dependability of the study and preventing bias.

All the transcriptions were typed by two independent typists. These transcriptions were read and quality controlled by the researcher prior to being handed over to his promoters, who confirmed the correctness and authenticity of the coding of the gathered data, thereby enhancing the trustworthiness of the study further. By following this procedure the researcher employed the analysis approach explained by Labuschagne (2011:58), which involves categorising the qualitative data into themes, identifying categories within these themes and demonstrating the relationship between the data and the interview questions. This process was concluded through analysis control by the researcher's promoters. The researcher assigned numbers to all the interviewees to simplify the reporting process (cf. Table 4.1).

Although the numbers were assigned randomly to the interviewees according to the availability of the interviewees and timing of the interviews, the researcher did categorise the interviewees into:

- assessors working full time in the private health sector [AR1-2];
- assessors working full time in the public health sector [AU1-4];
- assessors working in the public health sector and involved in limited private practice [AUR1-3];
- moderators working full time in the private health sector [MR1]; and
- moderators working full time in the public health sector [MU1].

Although it was clear that all the moderators were experienced assessors, it should be noted that their responses varied because of the different responsibilities and experiences the interviewees had had as convenors, assessors and moderators of the summative assessment in the past. Furthermore, it was likely that assessors and moderators working in the private health sector would give different responses than assessors and moderators working in the public health sector. For this reason the researcher coded the different groups in a way that enables the reader to track remarks by interviewees from similar backgrounds easily throughout the report. The same coding number was applied for the same interviewee throughout the report. Direct quotes are often given, where applicable, to augment the trustworthiness of this study. All the findings are tabulated to abridge the analysis of data into themes, categories and subcategories.

4.3 REPORTING, DATA ANALYSIS, DESCRIPTION AND DISCUSSION OF THE FINDINGS OF THE SEMI-STRUCTURED INTERVIEWS

With the aim of simplifying the analysis and the reporting of the data, each question that was put to the interviewees will be discussed separately. This discussion will follow the chronology of the interview guide that was used during the semi-structured interviews.

4.3.1 Identifying readiness of a candidate for the summative assessment in radiology

The first question that the researcher asked all the interviewees, in accordance with the interview guide, was: "When, in your opinion, is a candidate ready for the final examination?"

The responses of all the interviewees were analysed and arranged into themes, categories and subcategories. The themes that were identified were as follows:

- Theme 1: Knowledge;
- Theme 2: Skills;
- Theme 3: Aptitude and attitude;
- Theme 4: Roles to fulfil;
- Theme 5: Formative assessment;
- Theme 6: Systematic approach; and
- Theme 7: Diagnostic assessment.

The themes, with the related categories and subcategories, are presented in Table 4.2 and each category will be discussed separately. Each subcategory is followed by the coding of the respondent to simplify the reporting. Some of the responses will be given as direct quotes to enhance the credibility, dependability and confirmability (cf. Point 3.4) of the study.

Some of the interviews were conducted in Afrikaans and therefore the researcher translated any relevant direct quotes into English. Care was taken by the researcher to express the meaning of the original response. Direct quotes of untranslated responses are presented in the tables as normal text, enclosed by double quotation marks. Translations of direct quotes are presented

similarly, but in italics. For example: "Must realise that something's going wrong" is the interviewee's own words, but "*Should be able to interpret*" is a translation of a response. In tables and text the themes are numbered, the categories are indicated in bold and the subcategories are underlined.

TABLE 4.2: IDENTIFYING READINESS OF A CANDIDATE FOR THE SUMMATIVE ASSESSMENT IN RADIOLOGY [Table continues on next pages]

THEMES	CATEGORIES
1. Knowledge	What should be known? <u>Demonstrating knowledge of general radiology</u> • Show basic radiology, clinical, anatomy, physiology and physics knowledge. [AUR2] • Should know the basic curriculum. [AU1] • "You need a certain baseline of knowledge." [MR1] • "The amount of knowledge in radiology has been exploding." [MU1] <u>Demonstrating knowledge of the subspecialties</u> • One needs to know basic knowledge of every speciality. [MR1] <u>Interpreting and understanding radiological imaging</u> • "<i>Should be able to interpret.</i>" [AUR1] • "Must realise that something's going wrong." [AUR3] <u>Integrating knowledge</u> • Critical thinking. [AUR1] • Need to have insight to work out what is relevant in a particular case scenario. [MR1] • Should be able to integrate knowledge. [MU1] <u>Making a relevant diagnosis</u> • Make (create) a diagnosis. [AUR1] • Should give a good differential diagnosis and be able to support it. [AU1] • An extensive list of differential diagnoses showing off knowledge does not help if it is not clinically relevant. [AU4]
2. Skills	Observation skills <u>The observation of findings</u> • "<i>should be able to observe</i>" [AUR1] • Must have good observation skills. [MU1] • Should be good. [AU4] • Observation skill is essential. [AUR1] • "They should be able to assess a study, pick up the major findings." [AU1] • "shouldn't be missing what a radiologist is supposed to pick up" [AU1] • May miss irrelevant findings. [AUR2] <u>The identification of abnormalities</u> • "can they identify pathology, first of all" [AU2] • "If they don't see the pathology they won't be able to make a diagnosis." [MR1] <u>The time frame of accomplishing an observation</u> • Be able to identify common conditions without being prompted. [AUR3] • "Assess how quickly one is observing and you want them to be succeeding in their descriptions." [AR1] • Is important and is quickly picked up especially during after-hours work when the candidate is working more independently. [AU3] Clinical skills <u>Demonstrating clinical insight</u> • "Clinical knowledge, clinical insight is highly relevant." [AU1] • "should understand the clinical question" [AUR3] • Important to realise if there is dissociation between the clinical history and the radiological findings. [AUR3]

	• Clinical insight is very important to be a safe radiologist and comes with experience. [MU1] • Clinical skills are important to understand the clinical contexts and cannot be made up if missed prior to specialising radiology. [AR1] • "Without understanding the clinical context, you will make all kinds of mistakes." [AR1] • "Examination and history will give you 70% of the diagnosis, not special investigations." [AR1] • Need to understand the clinical context. [AR2] <u>Giving a relevant differential diagnosis</u> • To give clinically relevant differential diagnosis. [AUR2] • Differential diagnoses should be relevant. [AUR3] • Should give a clinically relevant differential diagnosis. [AU1] • "can they make good differential diagnoses" [AU2] • Clinical experience is important to help the candidate make clinically relevant diagnoses and give relevant guidance to clinicians. [AU3] • Clinically relevant diagnoses are more important than a list of irrelevant findings. [AU4] <u>Demonstrating clinical skills</u> • "They have to demonstrate clinical skills." [AU1] • Clinical skills are important. [AUR1] • Radiologists need to be competent clinicians to understand all aspects of basic clinical medicine. [MU1] • Should be able to independently do a clinical assessment of the patient if the clinical referral is inadequate. [AU2] • Resuscitation skills are also important. [AU4] <u>The quality of previous clinical exposure</u> • The quality of previous clinical experience is important. [AU4] • Two years clinical experience prior to specialisation is ideal. [AUR3] • At least one year quality clinical experience. [MR1] • Community service is accepted as clinical experience. [MR1] • You need clinical experience to decide what practical skills to apply. [MR1] Interpersonal skills <u>The importance of interpersonal skills</u> • Should have good interpersonal skills. [AUR1] • Interpersonal skills and problem solving skills are very important. [AU1] • Should have good interpersonal skills to interact with their patients, colleagues and referring clinicians. [MU1] • Interpersonal skills are crucial. [AU2] • Interpersonal skills form part of the biannual consultant discussion of every individual candidate. [AR1] • "Positive attitude is important." [AUR2] Practical skills <u>The relevance of practical skills</u> • Practical skills are relevant. [MR1] • Basic practical skills are essential. [AR2] • Practical skills are important for radiological practice. [AU1] <u>The level of skill needed to be safe</u> • Safe towards patients and environment. [AUR2] • It becomes a problem if the practical skills are not very good. [AR2] <u>Quality control, teaching and supervision of registrars</u> • Ideally should be taught by a consultant but challenges exist due to the limited number of consultants. [AUR3] • Should be quality controlled by a consultant but the candidate also needs to learn to work independently. [AU2] • Should be observed by a consultant. [AU4] • Are assessed during the training period by individual consultants. [AR1]

	<u>Factors contributing to practical skills</u> • Book knowledge contributes to practical skills. [AU1] • Depends on the enthusiasm of the candidate to seize opportunities to learn practical skills. [AU4]
3. Aptitude and attitude	How well the task should be completed <u>The level of performance</u> • "in all the modalities" [AUR1] • "That's supported by the amount of reading that they have done." [AU1] <u>Personal drive</u> • "There's no struggle without casualties." [AU2] • Regardless of challenges, always try to improve. [AU2] <u>Work ethics</u> • Weaker candidates pay their colleagues to do their after-hours, on-call work and subsequently the ones not doing the work miss out on valuable radiological exposure. [AU3] • End of block assessments include assessment on punctuality and attitude. [AR1]
4. Roles to fulfil	Communicator <u>Communication with clinicians</u> • Communication with clinicians important. [AUR1] • Communication with clinicians is vital. [AR1] • "Meetings with clinicians are extremely helpful to learn on both sides." [AR2] <u>Communication via different modalities</u> • It is very important to communicate effectively with the clinicians at meetings and through the radiological report. [AU1] • Communication skills are important, especially telephonic communication. [AUR3] • "You need to be able to communicate, written, verbal and on an interpersonal level with your teachers and your patient." [MR1] • Should have good verbal skills to present cases at interdepartmental meetings. [AU2] <u>Inductive communication</u> • "should be able to discuss a case" [AUR1] • Ask relevant questions to plan the investigation if sometimes inappropriate requests are made. [AUR3] <u>Deductive communication</u> • "should be able to advise clinicians" [AUR2] • Answer the clinical question. [AUR2] • "Answer the clinical question first and foremost." [AUR3] • "can they advise the clinician" [AU2] <u>Factors influencing communication</u> • Personalities differ, introvert versus extrovert. [AUR3] • Language may be a challenge if not English speaking. [AUR3] <u>Quality control of communication</u> • Miscommunication leads to confrontation and likely inappropriate patient management. [AUR3] • Should not mumble. [AR1] • The language of radiology becomes important." [MR1] • Use proper radiological terminology. [AU2] • "Understand their (radiology) language." [AR1] • Consultant input is important to train the candidate in proper communication skills by writing a good radiology report. [AU3] <u>The timing of communication</u> • Communicate emergency case findings without delay to the clinician. [AU2] • Should be able to communicate with junior and senior colleagues as well as communicate urgent findings telephonically. [AU4]

	Collaborator <u>The importance of teamwork</u> • Teamwork is important. [AUR1] • Team player role fundamental in selecting a candidate. [AUR2] • Teamwork is very important. [MU1] • "In radiology, you got to work as a team." [AR2] • Need to take care of a unit and be able to work in a team, regardless whether they agree or disagree. [AU4] • Very important to be a successful member of the team that includes clinicians, nursing staff, radiographers, porters, clerks, typists. [AR1] • Radiology is a referral centre; we do not work in isolation. [AR2] • "We do not function in silos." [AUR2] <u>Contributing to the correct diagnosis and patient management</u> • Contribute to correct clinical decisions and management of patients. [AUR2] <u>The assessment of collaborator skills</u> • Clear line of communication from support staff if candidate is not doing well. [AUR3] • Reports about the candidate should be in writing. [AUR3] • Collaborator skills are developed and assessed during interdepartmental meetings. [AU3]
5. Formative assessment	Written papers <u>The relevance of written papers</u> • Quarterly written tests important. [AUR1] <u>Ensuring objectivity</u> • Formal objective assessment necessary to prove unsatisfactory performance. [AUR3] • Quantitative methods of continued assessment important to prevent accusations of consultant bias. [AU4] <u>Reliability as an assessment instrument</u> • Quarterly assessments, last 5 years, always correct in identifying readiness for final assessment. [AUR2] • Quarterly assessments confirm consultant opinion. [AUR2] <u>Assessment intervals</u> • May be done after every rotation block depending on academic planning. [AUR3] • Should be assessed 3 monthly throughout the training period. [MR1] • May be done at the end of every rotation block on the specific imaging modality. [AR1] <u>Giving feedback</u> • Important to give immediate feedback on formative assessments to learn from their mistakes. [AU2] Long cases, rapid reporting and orals <u>The relevance of the assessment</u> • Quarterly rapid reporting assessments important. [AUR1] <u>Conducting a mock assessment</u> • Formal assessment includes short cases. [AUR3] • Forms part of the mock examination. [AR1] • The mock examination, hosted by consultants with previous summative assessment experience, is vital. [AR1] <u>The purpose of the assessment</u> • Aim is to assess knowledge, confidence and examination technique. [AR1] • Candidate completes a mock examination to confirm readiness and train examination skills. [MU1] Practical evaluations <u>Continuous evaluation by a consultant</u> • Regular close observation by a consultant in the day-to-day setting is ideal. [AUR3]

	• "It is on-site continuous assessment and supervision that will tell you when this candidate has the necessary practical skills." [AU1] • "It should be an ongoing assessment during their training." [AR2] • Isolated practical assessments feel artificial. [AUR3] <u>Modality-based assessment</u> • Practical evaluations at each modality. [AUR1] • "We have a post-rotational assessment." [AU1] • Practical assessments should be done by the consultant during the rotation blocks. [AR2] • Important to have a modality-specific block rotation system to train practical skills. [AR2] <u>Time allocation for practical assessments</u> • Time should be reserved to assess practical skills. [AU4] Logbook <u>The relevance of a logbook</u> • Essential in a big system. [AUR2] <u>The logbook's value as a quantitative instrument</u> • Number of investigations done (logbook). [AUR1] • Gives an idea of baseline requirements. [AUR3] • Important to examination body. [AUR2] • Logbooks offer guidance to ensure enough exposure to all imaging modalities. [AU2] • A logbook presents proof of the candidate's exposure to a sufficient number of cases while rotating through the imaging modalities. [AU3] <u>Learning from repetition</u> • One principle of a logbook is that, through repetition, one should acquire the practical skills of performing a procedure. [AR1] • "Gary Player: The more I practise the luckier I get." [AU1] • We also learn through repetition, especially practical skills. [AR2] <u>Standardisation needed to ensure reliability</u> • Should be standardised with minimum requirements. [MU1] • Should be a subminimum of cases for all modalities. [AUR1] • Ideally specify body regions and supervised or unsupervised. [AU2] • Logbooks may be inaccurate if radiograph reports are signed off on the PACS without an accompanying report. [AU3] <u>Not assessing quality</u> • Logbooks do not assess the quality of the reports, only the numbers. [AUR3] • "The logbook is no replacement for good training." [MR1] • Does not prove quality of reports. [AUR2] • The logbook proves that they have worked but it does not reflect the quality of the candidate. [AU1] <u>Time consuming</u> • Logbooks are time consuming. [AUR3] • "It's cumbersome and doesn't guarantee that the candidate has undergone supervised procedures." [MR1] <u>Quality control intervals</u> • Checking prior to summative assessment is too late. [AUR3] • Should be reviewed regularly to ensure adequate exposure to all modalities. [AR1] • Should be done monthly and checked biannually. [AUR3] • Checked biannually to initiate remedial action when needed. [AUR2] • Logbooks should be checked and discussed at least twice a year. [MU1] • Should be reviewed regularly, at least twice a year or at the end of a modality block. [AU2] • Logbooks should be checked at least every six months to pick up challenges that may need remediation. [AU3] • Logbooks should be checked six-monthly to standardise the exposure to imaging modalities and radiological procedures. [AU4]

	Annual progress report <u>The relevance of an annual progress report</u> • "I think an annual progress report would be very good." [AU1] • Not practical in a big department, maybe in smaller departments. [MU1] <u>Assessing progress</u> • Visible improvement. [AUR1] • <i>"the graph must go up"</i> [AUR1] <u>Assessing continued performance</u> • Constantly correct diagnoses. [AUR2] • Include summary of all assessments. [AUR2] <u>Giving bidirectional feedback</u> • Candidate is interviewed annually to discuss everything that affects any aspect of the training or behaviour. [AUR3] • Candidates are discussed by consultants and get biannual or annual feedback. [AR1] Consultant general impression <u>The time frame for developing an impression</u> • Continuous personal daily impression and observation during training period. [AUR1] • Consultant develops an impression of the candidate's level of theoretical knowledge during the training period. [AU3] • Continuous interaction with the candidate throughout the training period. [AU4] <u>The purpose of an impression</u> • All the different roles of a radiologist cannot be assessed at summative assessment. [AUR1] • Handover rounds and quality control sessions identify weaknesses. [AUR2] <u>The collection of evidence</u> • Impression based on direct observation, checking reports and quantitative assessment. [AUR3] • Continued assessment through tutorials and long case sessions to identify weaknesses to improve. [AU2] • Develops an impression during the tutorial sessions as well as during the imaging modality block rotation. [AU3] <u>The forum for discussion</u> • Should be decided at a broad forum of the radiology consultants involved. [AUR3] • Discuss the candidate with other consultants to identify readiness for the summative assessment. [AU2] • Candidates' progress is discussed at a monthly joint consultant meeting. [AU3] <u>Criteria to be assessed</u> • Once the candidate completed all modality rotations and was evaluated by all consultants, the consultant body decides on knowledge, quality of reporting, dependability and safety towards patients, staff and self. [AU4] • Discussion may include theoretical knowledge, observation skills, practical skills, interpersonal skills and work ethics. [AU3] <u>Challenges of giving an impression</u> • Difficult to get to know every registrar within a big circuit. [AR1] • Be careful that personality clashes do not lead to a candidate becoming a "scapegoat". [AUR3] <u>Giving feedback</u> • Important to give constructive feedback to a registrar. [AR1] Opinion of the head of department (HOD) <u>The relevance of the HOD's opinion</u> • The HOD must finally decide the candidate's readiness for the assessment and advise him/her accordingly. [AUR2] • The HOD signs the candidate off as ready. [AUR2]

	• "Only be allowed to sit the final examination once he has been assessed by his teachers, and deemed to be fit." [MR1] • The HOD may advise the candidate to stay in the department for a period of time regardless of passing the assessment. [AU2] <u>The reliability of the HOD's opinion</u> • "The HOD's advice hasn't been wrong for the last five years." [AUR2] • Some candidates do not follow the advice of the HOD to postpone and not one of them has passed. [AU4] <u>Reasons for becoming unreliable</u> • In the not-ideal situation, due to lack of time and resources, one may be forced to present somebody for the final assessment. [MU1] • HOD advises candidates to postpone if they fail the mock examination but sometimes they complete the training period and attempt the assessment regardless. [AR1] • It often happens that candidates sit the examination regardless of the HOD's advice that they should postpone because they want to gain "experience" although they are likely to fail. [AU3] <u>The ideal scenario to ensure a reliable opinion</u> • In the ideal situation the candidate needs to spend adequate time in the academic department. [MU1] • Quality training time compasses different facets: practical service delivery training rotating through different modality blocks, theoretical knowledge academic time training and finally research training. [MU1] • Therefore, somebody needs to be assessed continuously throughout his/her training period regarding practical and theoretical knowledge, to be ready for the final assessment. [MU1] • Objective testing should be done to assess presentation, reporting and communication skills (verbal and written). [MU1] • Research training should be tested by presentation of a supervised dissertation. [MU1]
6. Systematic approach	Way of reasoning <u>Demonstration of logical thinking</u> • Should think logically. [AUR1] • Need to show logical thinking. [AR1] • "They have to be demonstrating some common sense." [AU1] <u>Demonstration of a systematic and structured approach</u> • Should have a structured approach to pathology. [AUR2] • "what he is saying makes sense and there is structure to it" [AU1] • The candidate needs to show a clear, systematic approach to the pathology and remain relevant. [AR2] • Should demonstrate pattern recognition and the ability to convey knowledge in a structured manner. [AUR3] <u>Demonstration of integration, interpretation and insight</u> • Should be able to put the theoretical knowledge into a clinical context. [AUR3] • "The kinds of words they use show insight." [AU1] • Should have good interpretation skills, identify patterns. [MU1] <u>The collection of reasoning evidence</u> • Is assessed during the individual interaction with the consultant during the rotation block. [AU4] • The structured approach is assessed during tutorials and interdepartmental meetings to see if the candidate shows insight. [AU3]
7. Diagnostic assessment	Admission criteria for the training programme <u>The identification of clear criteria</u> • It is very important to have clear criteria for admission of the correct candidate to the training programme to have successful completion in the end. [AU4]

	<u>Proof of continued performance</u> • Proof of continued previous performance is an important criterion. [AU4] <u>The quality and quantity of previous experience</u> • The quality of previous experiences (e.g. radiology, emergency medicine, anaesthesiology, life support courses, clinical diplomas) is more important than the amount of experience. [AU4] • General practitioners of five years and more are not doing well in radiology. [MR1]

4.3.1.1 Theme 1: Knowledge

In the first theme that emerged, namely, **Knowledge**, one category named **What should be known** (cf. Table 4.2) was identified.

What should be known?

Data analysis and description: In this category, six assessors and both moderators participating in the interviews made several comments on the level of knowledge that candidates must have achieved, as well as what the candidate needs to know in the ideal setting before s/he can be presented for the summative assessment. Five subcategories were identified, namely, Demonstrating knowledge of general radiology, Demonstrating knowledge of the subspecialties, Interpreting and understanding radiological imaging, Integrating knowledge and Making a relevant diagnosis.

Discussion: From the responses given by the assessors and moderators the researcher concludes that candidates are required to achieve several levels of the cognitive domain. It became clear that a candidate should possess a basic general knowledge of radiology to be able to identify anatomical anomalies, anatomical abnormalities and pathology. This does not only apply to general radiology but also to a broad basic knowledge of all clinical subspecialties, which would enable the candidate to identify related clinical scenarios and syndromes. *"The amount of knowledge in radiology has been exploding"* [MU1]. From this wide knowledge base the candidate should be able to interpret all the given information, apply critical thinking, show a clear understanding of the scenario, and integrate all information provided with the acquired imaging findings to, finally, create a diagnosis or a range of possible relevant diagnoses in a specific order, from most likely to least likely, in order to give advice that is relevant to the specific clinical scenario. This has become a challenging task because radiology has become a speciality with a vast knowledge base.

4.3.1.2 Theme 2: Skills

The following theme that became obvious, namely, **Skills**, identified the wide range of skills that should be acquired prior to and during the training period before the candidate would be deemed ready for the summative assessment. These skills were categorised as **Observation skills**, **Clinical skills**, **Interpersonal skills** and **Practical skills** (cf. Table 4.2).

Observation skills

Data analysis and description: In this category ten of the 11 interviewees made comments referring to the candidate's ability to observe an abnormal finding. It became evident that good observation skills are very important. Three subcategories were identified, namely, The observation of findings, The identification of abnormalities and The timeframe of accomplishing an observation.

Discussion: Many of the respondents were of the opinion that the candidate should be able to identify abnormalities independently, *"should be able to observe"* [AUR1], at least findings that would not be missed by a general radiologist. *"Shouldn't be missing what a radiologist is supposed to pick-up"* [AU1]. This emerged as an essential skill that must be identified prior to the candidate sitting the summative assessment. This skill presents a threshold and if observation has not been mastered as a skill, the candidate would not be able to achieve the higher levels of the cognitive domain. Missing clinically irrelevant findings that do not have repercussions for the patient's future morbidity or mortality is considered to be unimportant. Furthermore, observations skills refer not only to the ability to observe a finding but also the time taken to accomplish an observation. A candidate should be capable to perform observations within the time set for completion.

Clinical skills

Data analysis and description: Multiple comments from all the interviewees in this interview group led to the understanding that clinical skills are another important keystone of a candidate's professional development. Four subcategories were identified, namely, Demonstrating clinical insight, Giving a relevant differential diagnosis, Demonstrating clinical skills and The quality of previous clinical exposure.

Discussion: Clinical skills form an integral part of the candidates' ability to interpret, understand and suggest relevant radiological diagnoses. *"Clinical knowledge, clinical insight is highly relevant"* [AU1]. The candidate should work in a clinical setting for at least one year, during which time s/he had been exposed to quality clinically scenarios, planning and interventions. Without this skill, the candidate will not be able to assess a patient independently, and consequently prevent mistakes when the radiological findings and the clinical history do not cohere.

Furthermore, the emphasis is on the quality of this previous clinical exposure, rather than on the number of years experience. It is important because a lack of quality clinical exposure cannot be rectified during the radiology training period. The candidate may be required to make quick decisions in a life-threatening situation, where, in most cases, clinical examination and history will guide him/her to a correct diagnosis. *"Examination and history will give you 70% of the diagnosis, not special investigations"* [AR1]. The researcher was informed by one of the more experienced interviewees that a junior candidate who had gained clinical skills while working in a tertiary or secondary-level institution under the guidance and supervision of specialists may have better clinical insight and experience, relevant to the practice of general radiology, than a more mature candidate who had worked as a general practitioner delivering primary-level medical care in a rural setting for a longer period of time.

Interpersonal skills

Data analysis and description: Five assessors and one moderator identified interpersonal skills as a quality that had to be present in all candidates. Of these six interviewees, only one was a full-time private radiologist. One subcategory was identified, namely, The importance of interpersonal skills.

Discussion: A *"positive attitude is important"* [AUR2] for good interpersonal skills and problem-solving qualities in relation to interacting with patients, colleagues, staff and referring clinicians. Such skills are difficult to assess during the summative assessment and should therefore be evaluated and addressed during the training period through regular discussion and consultation between the consultant body and the individual candidates.

Practical skills

Data analysis and description: Eight interviewees noted that practical skills were important for ascertaining the readiness of a candidate for the summative assessment. If the candidate has not mastered the necessary practical skills, it is possible that s/he would not be able to safely perform interventions needed in daily radiology practice. Four subcategories were identified, namely, The relevance of practical skills, The level of skill needed to be safe, Quality control, teaching and supervision of registrars and Factors contributing to practical skills.

Discussion: First and foremost, the candidate should react in a safe manner towards patients, him/herself, fellow staff members and the environment. A candidate should be knowledgeable about the theory that forms the basis of all interventional procedures. If a candidate is not enthusiastic and does not seize opportunities to practise his/her skills, challenges may arise in future practice if s/he is not provisioned and confident about performing basic interventions. Practical skills should ideally be taught under direct consultant supervision and be assessed or quality controlled by a consultant.

4.3.1.3 Theme 3: *Aptitude and attitude*

The third theme that came to light, namely **Aptitude and attitude**, guided the researcher towards understanding the candidate's attitude as a measure of motivation to be successful during the training period. The candidate's attitude plays an important role in setting a certain acceptable level of continued individual performance and, therefore, led the researcher to note one category, namely, **How well the task should be completed** (cf. Table 4.2), which relates to how well the candidate should complete the task at hand, whether it is diagnostic work, practical procedures, theoretical preparation or academic input.

How well the task should be completed

Data analysis and description: This category emerged from the remarks of five of the interviewees, mainly assessors working in the public health sector and actively involved in the training of candidates. Three subcategories were identified, namely, The level of performance, Personal drive and Work ethics.

Discussion: Candidates need to perform at an acceptable level throughout the training period, which involves their exposure to all imaging modalities during normal working hours, as well as after hours. This is, inevitably, sometimes challenging because of the workload generally experienced by all health facilities. One of the interviewees was of the opinion that, *"there's no struggle without casualties"* [AU2]. The candidate's attitude is obviously influenced by the level of knowledge that has been gathered during the training period, keeping in mind that one should always try to improve regardless of challenges that may arise along the way. The consultant remains crucial for noting the candidate's attitude and aptitude at the end of every rotation block, thereby foreseeing and preventing future crises or unexpected failures by initiating immediate remedial intervention, if needed.

4.3.1.4 Theme 4: Roles to fulfil

The next theme that arose, namely, **Roles to fulfil**, involved a collection of several responses from interviewees, who identified some of the roles that a candidate needs to fulfil to be deemed ready for the summative assessment. Two roles were identified from the interviewees' responses, and categorised as **Communicator** and **Collaborator** (cf. Table 4.2).

Communicator

Data analysis and description: This category emerged due to the extensive opinions of 10 of the 11 interviewees on this topic. Fulfilling the role of communicator is one of the cornerstones of becoming a qualified radiologist. Seven categories were identified, namely, Communication with clinicians, Communication via different modalities, Inductive communication, Deductive communication, Factors influencing communication, Quality control of communication and The timing of communication.

Discussion: Communication skills are important for effective interaction with patients, staff, colleagues and clinicians. A candidate should be able to discuss a patient with a clinical colleague to gather more clinical information when needed, to advise clinicians in an informative and relevant manner by answering the clinical question, and to make a contribution to the correct, timely management of the patient. *"Answer the clinical question first and foremost"* [AUR3]. Such communication should also entail properly guided suggestions on further, relevant imaging modalities, when needed, as well as guidance regarding better imaging options if inappropriate requests have been made. Relevant

clinical information may be needed for the planning and execution of certain imaging procedures and/or interventions, to assess for possible risks, complications, morbidities and mortality that may arise.

Telephone communication skills are even more important, because of a higher risk of miscommunication and misinterpretation during the reporting of imaging findings. The candidate should know when to communicate emergency findings that require urgent intervention. In-person consultations should always be nurtured and encouraged but may sometimes be challenging due to time constraints.

Personalities differ (introvert versus extrovert) and all parties should be given the opportunity to voice their thoughts and opinions on findings and further patient management. Furthermore, language barriers (if present), are likely to contribute to miscommunication. Miscommunication may lead to confrontation and could result in inappropriate patient management. *"You need to be able to communicate, written, verbal and on an interpersonal level with your teachers and your patient"* [MR1]. Good verbal skills are therefore needed to present cases at interdepartmental meetings in an informative manner and with an educational perspective, so that everyone involved can learn from interesting cases or previous mistakes. A good communicator will be able to communicate successfully with both senior and junior colleagues in an effective and constructive manner.

Communication with the clinician entails, in the majority of cases, only a written report with no verbal communication. Therefore, it is very important that the report should be compiled according to radiological nomenclature, so that findings of the diagnostic imaging, together with the relevant diagnoses and suggestions for further appropriate radiological management of the patient, when indicated, are transferred clearly and correctly. *"Meetings with clinicians are extremely helpful to learn on both sides"* [AR2]. Mastering proper communication skills is valuable for the summative assessment, especially in radiology practice.

Collaborator

Data analysis and description: This category was identified by eight of the interviewees as one of the qualities needed for successful preparation for the summative assessment. Three subcategories were identified, namely, The importance of teamwork, Contributing to the correct diagnosis and patient management and The assessment of collaborator skills.

Discussion: Within the modern radiology community, *"we do not function in silos"*[AUR2], and therefore a practitioner will not survive as a professional if s/he is unable to work as part of a team. Gone are the days where a radiologist sat in a dim back room reporting on general radiographic images, relatively inaccessible to patients and clinicians. Radiology is a referral centre and therefore cannot function in isolation. Teamwork is important and being a team player is a quality that should be sought in every candidate that is admitted to the radiology training programme. The radiologist is an integral member of the clinical team and contributes to the correct diagnosis and management of the patient.

An open line of communication should exist between support staff and the head of the radiology department to identify poor collaboration of a candidate within the radiology team. Any reports about the candidate, whether positive or negative (to report misconduct), should be in writing. One of the responsibilities of a candidate as a team player is to work as part of a unit regardless of agreement or disagreement with decisions that have been implemented, thereby optimising the functioning of the team. Collaborator skills can be assessed during interdepartmental meetings as well as by making use of *"Multi-source feedback"* (cf. Point 2.5.3.1). *"In radiology, you got to work as a team"* [AR2].

4.3.1.5 Theme 5: Formative assessment

The next theme that flowed from the above-mentioned discussion, namely, **Formative assessment**, identified the relevance of continued assessment during the training period. Although formative assessment in radiology is not the focus of this study, and although it has already been researched by Janse van Rensburg (2015:1), the researcher decided to report on the theme to present a more comprehensive understanding of the question relating to readiness of a candidate for summative assessment in radiology. Furthermore, the theme surfaced repeatedly during the interviews, which convinced the researcher to present the data to prevent bias and to contribute to the credibility and dependability of the study.

The categories that emerged as part of Formative Assessment were **Written papers, Long cases, rapid reporting and orals, Practical evaluations, Logbook, Annual progress report, Consultant general impression** and **Opinion of the HOD** (cf. Table 4.2).

Written papers

Data analysis and description: This category was mentioned by six assessors and one moderator. Written questions usually form part of a general formative assessment that happens episodically and includes other instruments. It is discussed separately to differentiate this instrument from short and long cases. The written questions simulate the written part of the exit examination, which require the candidate to answer specific questions from a question paper in writing. Five subcategories were identified, namely, The relevance of written papers, Ensuring objectivity, Reliability as an assessment instrument, Assessment intervals and Giving feedback.

Discussion: Written assessments may be conducted quarterly after every rotation block or after completion of specific academic modules within the curriculum. Every academic radiology department currently has its own way of conducting the written assessments – it is done either formally or informally, at different time intervals, and the number of assessments throughout the training period varies. The written assessments may be correlated with the Consultant General Impression and, retrospectively, has been proven to be very accurate in predicting the outcome of a candidate's success in the summative assessment.

Written assessments may furthermore function as an objective instrument to prove unsatisfactory performance when a candidate has a different opinion regarding his/her readiness for the summative assessment; the written assessment can be used to exclude consultant bias. It would be senseless to conduct written assessments if no feedback is given to the candidates about gaps in their knowledge with the ultimate aim of initiating remedial intervention, if needed. The purpose of written assessments is not necessarily to look at the outcome of one specific assessment, but rather to evaluate the progress of a candidate during the training period up to being fully prepared for the national exit examination.

Long cases, rapid reporting and orals

Data analysis and description: Long cases, rapid reporting and orals were mentioned by only four interviewees but are nonetheless important. Although it was not specifically mentioned by the other seven interviewees, after considering all the data, the researcher deduced that it should be incorporated into other types of TLAs of radiology departments.

Three subcategories were identified, namely, The relevance of the assessment, Conducting a mock assessment and The purpose of the assessment.

Discussion: This category has emerged as another important type of formative assessment. In some academic departments this assessment forms part of a formal "mock" assessment that functions as a final denominator to determine the candidate's readiness to attempt the final assessment. In other radiology departments the outcome of the last of a series of exposures to long cases and rapid reporting (short cases) throughout the training period carries a lot of weight when it comes to deciding on the final opinion of the head of the department. This form of formative assessment assesses and, furthermore, functions as a training opportunity in examination technique, stress management, interpersonal skills and communication skills. For this assessment instrument to be successful, the consultants should have experience as assessors of the summative assessment. This fact will be discussed further under upcoming categories that were identified during the empirical phase of this study.

Practical evaluations

Data analysis and description: This category was identified from opinions of five assessors working in the public and private health sectors. No remarks were noted by the moderators, probably because they are not that actively involved in practical training. Three subcategories were identified, namely, Continuous evaluation by a consultant, Modality-based assessment and Time allocation for practical assessments.

Discussion: A modality-specific block rotation system is a requirement for training and strengthening practical skills. Practical assessments should ideally be conducted while the candidate is rotating at a specific imaging modality. Most academic departments conduct practical assessments at the end of the rotation block, because of limited resources and to give the candidate an opportunity to prepare for the assessment. This may lead to the question, "What happens if a candidate has not achieved the desired outcomes at the end of the rotation block?" Isolated assessments may feel artificial and could lead to unrealistic responses by candidates, support staff and patients. For this reason it is preferable if consultants conduct regular observation together with intermittent assessments. *"It is on-site continuous assessment and supervision that will tell you when this candidate has the necessary practical skills"* [AU1]. The assessments will ultimately create more learning opportunities and contribute to quality control. This opinion is summarised by one of the

private health sector assessors: *"It should be an ongoing assessment during their training"* [AR2].

Logbook

Data analysis and description: This category emerged from strong and definite opinions by all the interviewees in this group. Some of the interviewees voiced several thoughts on the relevance and validity of logbooks. A logbook is a list of patient names and imaging studies that were executed and reported by the candidate throughout the training period. It is a prerequisite that needs to be submitted before the candidate is allowed to attempt the summative assessment. Seven categories were identified, namely, The relevance of a logbook, The logbook's value as a quantitative instrument, Learning from repetition, Standardisation needed to ensure reliability, Not assessing quality, Time consuming and Quality control intervals.

Discussion: Logbooks present a quantitative measure of the number of patients that was reported during the training period. The limitation of this formative assessment instrument is that it does not provide any insight in the quality of work that was performed. One can argue that the more you do the better you become, but this is probably more relevant for learning practical skills. One of the interviewees mentioned Gary Player's claim, *"The more I practise the luckier I get"* [AU1]. It may still be relevant for acquiring structured reasoning skills, radiological imaging approaches and correct patient management, provided that the candidate is working under adequate supervision and the guidance of a qualified teacher.

Keeping in mind that it is time consuming to prepare and sign a logbook, most of the interviewees were of the opinion that logbooks should be checked regularly (at least biannually) and not only prior to the summative assessment. The reason for this requirement identified the second reason for having a logbook. If checking is done summatively, it will be too late to correct limitations in the candidate's exposure to certain imaging modalities. Therefore, logbooks function as a formative instrument, constantly guiding and motivating the candidate during the training period to get enough exposure to all modalities. A step in the right direction would be to standardise a minimum requirement for all imaging modalities. The question that arises from this argument is, "How much exposure is enough?" One of the participating moderators addressed this thought by stating that, *"The logbook is no replacement for good training"* [MR1].

Finally, although a logbook presents proof of the candidate's exposure to certain modalities, the accuracy of reporting for certain modalities (such as general radiographs) may be questionable, because of the possibility that cases are signed off as being reported, while there are no quality control measures to confirm proper reporting. Regardless of some negative sentiment towards logbooks, not one of the interviewees suggested that logbooks should be removed as an assessment instrument.

Annual progress report

Data analysis and description: Six interviewees suggested the incorporation of an annual progress report and therefore this is the next category under the theme of formative assessment. One participant thought it may be challenging to implement in a big educational system with many registrars and a limited number of consultants. Four subcategories were identified, namely, The relevance of an annual progress report, Assessing progress, Assessing continued performance and Giving bidirectional feedback.

Discussion: As part of assessing the candidate's readiness for the summative assessment consultants should be able to recognise visible improvement, achievement of consistency in making correct diagnoses, and continuous progressive performance throughout the training period. This, together with the results of the formative assessments, should be formally noted in an annual report and should be discussed individually with every candidate. The meeting should not only address the progress of the candidate, but should include all matters that may be relevant to the candidate's training and behaviour. *"I think an annual progress report would be very good"* [AU1].

Consultant general impression

Data analysis and description: The sixth category that emerged under the theme of formative assessment was voiced by seven of the nine assessors and no moderator, probably because of the assessors' closer interaction with the candidates. Seven subcategories were identified, namely, The time frame for developing an impression, The purpose of an impression, The collection of evidence, The forum for discussion, Criteria to be assessed, Challenges of giving an impression and Giving feedback.

Discussion: It should be noted right from the start that the weakness of presenting a consultant impression lies in the risk of bias towards the candidate. One would hope that

consultant experience would counteract this human tendency. Furthermore, quantitative assessment instruments, as discussed previously, would contribute to a fair assessment of the candidate's readiness for the summative assessment. To enable the consultant to give a valid, reliable and trustworthy impression of the candidate's true abilities, continued direct observation and supervision is needed. For this reason the opinions of different consultants may vary due to different levels and duration of exposure to the candidate, and this should be acknowledged.

Regardless of the drawbacks of expecting consultants to give a general impressions of candidates, as discussed above, it may still be a valuable assessment tool (if bias can be limited) to assess the level of theoretical knowledge, other roles of the CanMEDS Framework (cf. Figure 2.3), weaknesses within the candidates' performance, observational skills, quality of reporting, practical skills, dependability, interpersonal skills, work ethics and the candidate's safety towards patients, staff and self. All of these outcomes can only be achieved through interaction with the candidate during quality control sessions, handover rounds, checking reports and tutorial sessions.

To prevent bias, all individual cases should be discussed at a joint formal forum with the other consultants who are directly involved with the candidate. This should lead to formal and constructive feedback to the candidate. Again, it may be difficult to give individual feedback in a big circuit, but this would be deemed essential if this tool is to function as a final assessment prior to attempting the summative assessment. If feedback could take place more regularly, e.g. monthly or biannually, less formal feedback would suffice.

Opinion of the head of department

Data analysis and description: The next category that emerged as a separate entity of the previous category was the opinion of the HOD. This was voiced by five of the nine assessors and both moderators who were included in the group. Four subcategories were identified, namely, The relevance of the HOD's opinion, The reliability of the HOD's opinion, Reasons for becoming unreliable and The ideal scenario to ensure a reliable opinion.

Discussion: In the end it is the HOD who needs to make the decision and sign the candidate off as ready to be presented for the summative assessment. It is also his/her responsibility to advise the candidate if readiness has not been proven. This decision is obviously based on the quantitative and qualitative instruments that have already been

discussed. Interestingly, interviewees report that HODs have not been wrong over the last five years regarding advice to candidates about readiness for assessment. *"The HOD's advice hasn't been wrong for the last five years"* [AUR2].

From the examination body's perspective it is clear that a candidate should not be presented if s/he is not deemed fit for the summative assessment. In reality, though, HODs are faced with the imperfect situation of having little choice but to present candidates who are not ready to be assessed. Some candidates decide to attempt the assessment to gain "experience" regardless of the HOD's advice, and ultimately fail. If the candidate's situation is favourable and s/he passes the assessment regardless of some deficiencies, the HOD may still advise the candidate to remain in the department for a certain time until s/he is deemed fully competent.

In the ideal setting a candidate should spend adequate quality time in the department. This time should encompass three facets of experience, namely, practical service delivery training while rotating through different imaging modality blocks (case-based learning, cf. Point 2.8.1.12), theoretical knowledge academic training and, finally, research training.

The challenge with service delivery lies in the heavy workloads experienced nationally due to limited resources. The Department of Health pays the candidate's salary and is therefore entitled to expect the candidate to use his/her time to render a service. For this reason very little time can be allocated for academic training. When it comes to research time allocation the scenario is even worse. Research training should be assessed through the presentation of a supervised dissertation or a peer-reviewed publication. Completion of a research project is a requirement of the training university and the examination body for the summative assessment, but at the majority of radiology departments the candidate is allocated very limited time, if any, to work on the research project.

For the above-mentioned reasons HODs are forced to present candidates to the examination body even though the candidates are not necessarily ready to sit for the summative assessment.

4.3.1.6 Theme 6: Systematic approach

The following theme, namely, **Systematic approach**, which emerged from the semi-structured interviews with assessors and moderators, identified the relevance of the

candidate's thinking processes and approach to a radiological case for identifying readiness for the summative assessment. One category, namely, the candidate's **Way of reasoning** (cf. Table 4.2), emerged from the interviews.

Way of reasoning

Data analysis and description: Four subcategories, namely Demonstration of logical thinking, Demonstration of a systematic and structured approach, Demonstration of integration, interpretation and insight and The collection of reasoning evidence, emerged from the opinions of nine of the interviewees who referred to the candidate's way of reasoning.

Discussion: A candidate should demonstrate common sense and logical thinking, and a clear, structured approach to radiological pathology. *"They have to be demonstrating some common sense"* [AU1]. To do this the candidate should apply all his/her theoretical knowledge and apply it to the relevant clinical context. This can only be achieved through recognition of a series of different imaging patterns. These findings should finally be conveyed to the assessor and clinician in a structured manner to prove insight in the clinical scenario. *"The kinds of words they use show insight"* [AU1]. This structural approach is ideally assessed during individual interaction with the consultant during the rotation block, tutorials and interdepartmental meetings.

4.3.1.7 Theme 7: Diagnostic assessment

The last theme that emerged from the question about the candidate's readiness for the summative assessment, namely, **Diagnostic assessment**, refers to the assessment of the candidate prior to admission to the training programme. Although this is not part of summative assessment, it is argued (cf. Point 2.5.1.1) that proof of previous performance is a good predictor of future success in the summative assessment. One category, namely, **Admission criteria for the training programme** (cf. Table 4.2), emerged from the interviews.

Admission criteria for the training programme

Data analysis and description: The category that emerged under this theme identified a number of criteria that should be considered during diagnostic assessment, as expressed

by two interviewees in this group. Three subcategories were identified, namely, The identification of clear criteria, Proof of continued performance and The quality and quantity of previous experience.

Discussion: The qualities that are sought in the successful candidate should be identified and stipulated clearly prior to selection of a registrar who is interested in specialising in radiology. One of these qualities needs to be proof of continuous previous performance. The quality of previous performance is more important than the measure of experience. It has been experienced that general practitioners who have not been involved with a medical academic institution for more than five years tend to not do well in radiology.

A summative perspective on the first question: The first question of the semi-structured interviews provided the researcher with a better understanding of candidates' readiness to sit for the summative assessment in radiology. Identifying a successful candidate starts during diagnostic assessment for acceptance into the training programme and continues with formative assessment throughout the programme up to the summative assessment. The candidate should spend adequate quality time in the department to gain basic general knowledge of radiology and to merge good observation skills with critical thinking. The candidate should intertwine good clinical skills, interpersonal skills, problem-solving qualities, practical skills and communication skills to work as a member of the team. The candidate should provide evidence of a structured approach to radiological pathology and should be evaluated continuously to be deemed ready to sit for the summative assessment by the consultant body and the HOD.

4.3.2 Identifying readiness of a candidate for independent radiology practice

The second question in the interview guide that the researcher asked all the interviewees was: "When is a candidate ready for radiology practice?"

The responses of all the interviewees were analysed and arranged into themes, categories and subcategories. The themes that were identified were as follows:

- Theme 1: Competence;
- Theme 2: Safety; and
- Theme 3: The roles of a radiologist.

The themes, with the coupled categories and subcategories, are presented in Table 4.3 and will be discussed separately. To simplify the reporting each subcategory is followed by the coding of the respondent. Some of the responses are presented as direct quotes, to enhance the credibility, dependability and confirmability of the study.

TABLE 4.3: IDENTIFYING READINESS OF A CANDIDATE FOR RADIOLOGY PRACTICE
[Table continues on next pages]

THEMES	CATEGORIES
1. Competence	Foundational competence <u>The relevance of radiology knowledge</u> • "book knowledge important" [AUR1] • Should be comfortable in basic general radiology theoretical knowledge. [AUR2] • "Basic knowledge." [AU1] • Should be knowledgeable. [AU4] • The summative assessment is structured to assess theoretical knowledge at the level of a general radiologist. [AR2] • Have a lot of theoretical knowledge once qualified. [AR2] <u>The relevance of spending enough time in a safe environment</u> • "I think time is a very important dimension, it is a very important factor." [MU1] • Should have completed enough time in an academic department because of the exponential increase in radiology knowledge due to technological advances. [AR1] • "Certain countries, certain departments consider it to be five years." [MU1] • "I'm a strong candidate of a five year training period in which to function in a very safe environment." [AUR3] • "Our training time is five years." [AU3] • "Probably about five years, after (which) he gives his exam, because the exam basically examines knowledge." [MR1] • Should complete five years registrar training because of the increase in new knowledge, and sit the assessment in the final year. [AR2] Practical competence <u>Giving a short differential diagnosis list</u> • No need for a long list of differential diagnoses. [AUR1] • "Long list of differential diagnoses only proves a good memory." [AUR2] • "Come to a reasonable short differential diagnosis, relevant to the clinician." [AU1] <u>Choosing an appropriate imaging modality</u> • Know what the most appropriate investigation to use is. [AR2] <u>Being practically skilled</u> • A candidate needs more than just theoretical knowledge to be competent; s/he needs practical skills as well. [AR2] • "To become overall competent in radiology, you've got to be able to do certain things with your hands." [AR2] Reflexive competence/working independently <u>The time frame for developing reflexive competence</u> • Takes time to develop in practice. [AUR1] • "Sometimes it happens that candidates aren't there yet, although they have completed their five years." [AUR1] • "You're still learning, even beyond qualification." [AU1] • Candidates should spend some time in the academic department after they qualify. [AR2] • "That year after the examination was the steepest learning curve." [AR1]

	• Best competence is achieved within a one-year period post summative assessment. [AR1] <u>Demonstrating independence</u> • Really start learning radiology once you need to make independent decisions. [AR2] • Should become independent. [AUR3] • "They don't actually have to refer to you, as the consultant, or rely on you so much, they are independent thinkers." [AU1] • <i>"Not somebody else anymore."</i> [AUR1] • "Buck stops with you." [AUR2] • "The buck stops with you." [AR1] <u>Demonstrating confidence and leadership</u> • Should be confident. [AUR3] • Should be able to give an opinion confidently. [MU1] • "They have to demonstrate confidence to a certain extent." [AU1] • Should show leadership. [AUR2] • <i>"He understands what he wants and can transfer it to somebody else."</i> [AU3] <u>Making correct decisions</u> • Be able to make correct decisions. [AUR2] • Is able to make correct decisions on what imaging is indicated and what not. [AU3] • As a consultant you need to make the final decision without having the safety net of being a registrar. [AR1] • "Dependability and reliability." [AU4] • "How safe is the person to work alone in any environment." [AU4] Clinically relevant reasoning skills • Critical thinking. [AUR1] • Clinical insight is the difference between somebody who passed the examination and somebody with experience. [MU1] • Logical reasoning is important to be a competent radiologist. [AU2] • Should liaise with the clinician for more information when relevant. [AR2]
2. Safety	Patient safety <u>Patient safety is the paramount denominator</u> • Most important quality. [AUR1] • Patient safety is the main thing. [AU1] <u>Being critically self aware and acknowledging own limitations</u> • "Should know their limitations." [AU2] • "Maturity, being able to know your limitations." [MU1] • Need to be mature enough to acknowledge limitations and the inability to come up with an answer. [AU3] • Safety comes with knowledge, knowing your limits, being mature in your self assessment and not making up radiological findings. [AR1] • Should be self-aware to know your strengths and weaknesses. [MU1] • A good radiologist has to look critically at himself. [MR1] <u>Being cautious of arrogance or overconfidence</u> • "Be confident but don't be arrogant." [AU2] • "Overconfidence is very dangerous." [AR1] • It is very difficult to fail somebody who is overconfident because the examination assesses knowledge. [MR1] • "We haven't passed those people; we are scared of it, overconfidence." [AU1] • Overconfidence is a problem, is difficult to handle, should be discussed to realise mistakes and be able to take advice from other people. [AR2] • Overconfident people tend to be aggressive and make cardinal mistakes; people tend to avoid them but it should be addressed. [AR2] <u>Considering other diagnoses or management</u> • Should know when to search. [AUR1]

	• Shouldn't be dogmatic not to consider other possibilities. [MU1] <u>Preventing unnecessary radiological imaging or interventions</u> • Not unnecessarily expose patients to radiation. [AU2] • Prevent unnecessary radiation exposure. [AR2] • Should not expose the patient to unnecessary interventions. [AU3] <u>Other relevant remarks</u> • Safety encompasses more than just knowledge and diagnosis; includes correct responses to findings, patient management, communication, interpersonal skills. [AU2] • Should not have significant misses. [AUR3]
3. The roles of a radiologist	Demonstrating professionalism • Realises responsibilities. [AUR1] • Be able to perform under pressure. [AUR1] • Professionalism is very important, to be able to interact with all stakeholders and members of the team. [MU1] • Should represent the radiology community at large. [AU2] • "You got to be approachable." [AR2] • Should be a team player in the management of the patient. [AR2] Becoming a lifelong scholar <u>Realising a gap in knowledge</u> • Should know when to ask for help. [AU1] • Should know when to consult. [MU1] • A good radiologist is one who knows his/her limits and will ask for advice or will look it up. [MR1] • Be humble, review the case and get other opinions. [AU2] • Need to read if nobody to consult. [AUR1] <u>Being motivated to learn</u> • Must be willing to learn. [AU2] • If one does not know the answer, go search for it. [AUR2] <u>When to learn</u> • "One's degree is your licence to learn radiology." [AUR2] • Summative assessment is not the end point of learning; it is the starting point of knowing radiology. [AU2] • "One should never stop learning." [AUR2] • Constantly need to upgrade your skills and keep learning. [AU2] • Constantly need to learn, e.g. by attending conferences. [AU3] • Because radiology and medicine are constantly changing, one should learn something new every day, the boundaries remain infinite. [AR1] <u>Where to gather knowledge</u> • Should know where to search. [AUR1] • "If you do not know the answer, you consult your colleagues." [AU4] • "<i>A lot of literature.</i>" [AUR1] • Consult the literature or somebody else if one has not seen the pathology before. [AUR3] • Search the internet for the answer. [AU3] Demonstrating managerial skills • Business, managerial and basic accounting skills of value. [AUR2] • Leadership skills are important to choose the correct team. [AUR2] • Proper time management of lists at different modalities. [AU1] • Need to properly manage resources, especially in a resource-limited system. [AR2] • Monitor radiation exposure, especially in children. [AR2] Becoming an expert <u>It takes time to develop</u> • Takes time to develop. [AUR1] <u>Expert opinion is trusted</u> • Opinion should be trusted by others. [AUR2] • "People actually are listening to what you say." [AUR3]

	• Clinicians want a high level of expertise. [AUR3] <u>Expert contributes to patient care</u> • Should contribute to the patient management. [AUR3] • "Assist the clinician to a certain stage and communicate with him." [AU1] • Communicating to the clinician clinically relevant findings and differentiate between what is urgent and what not. [AR1] • Need to guide the clinician as a member of the team, planning patient care. [AR1]

4.3.2.1 Theme 1: Competence

The first theme, namely, **Competence**, which emerged following the question about a competent radiologist, lead to the identification of four categories: **Foundational competence, Practical competence, Reflexive competence/working independently** and **Clinically relevant reasoning skills** (cf. Table 4.3). Competence and competency have a similar meaning but in different contexts. "Competence" refers to the abilities that a person possesses to perform a certain task, while "competency" refers to the actual performance of such abilities (McConnell 2001:14).

Foundational competence

Data analysis and description: The first category of this theme became obvious while the researcher listened to the opinions of the interviewees. Two subcategories were identified, namely, The relevance of radiology knowledge and The relevance of spending enough time in a safe environment.

Discussion: Foundational competence is defined by SAQA (2001:11) as, "[t]he demonstrated understanding of what we are doing and why we are doing it." In the radiology context, foundational competence refers to the basic knowledge that the radiologist has to possess to be able to execute radiological investigations and procedures.

From the responses it became clear that a competent radiologist should have a grasp of basic theoretical radiology knowledge. Time was identified as a very important determinant for gathering this knowledge and a period of five years was suggested as the preferred time before candidates present for the summative assessment, which is ultimately structured to assess mainly knowledge at the level of a general radiologist. *"I think time is a very important dimension, it is a very important factor"* [MU1]. *"I'm a strong proponent of a five-year training period in which to function in a very safe environment"* [AUR3]. Radiology knowledge increases exponentially due to technological advances and therefore it is

advisable to practice in a safe environment for a certain period of time after passing the summative assessment, prior to going into independent practice. Foundational competency by itself does not mean a radiologist is ready for independent practice.

Practical competence

Data analysis and description: The next category that emerged from the discussion on qualities of a competent radiologist and readiness for practice was voiced by four of the assessors and none of the moderators. Three subcategories were identified, namely, Giving a short differential diagnosis list, Choosing an appropriate imaging modality and Being practically skilled.

Discussion: Practical competence is defined by SAQA (2001:11) as, "[t]he demonstrated ability to perform a set of tasks and actions in authentic contexts (situations)." In the radiology context this involves the application of knowledge to perform radiological diagnostic imaging and to create a list of relevant differential diagnoses, furthermore, it also includes the ability to perform relevant practical procedures and interventions.

The radiologist does not help the clinician if s/he presents a long list of differential diagnoses, unless the diagnoses are clinically relevant, and unless the proposed diagnoses are ordered in such a manner as to rank the diagnoses from most likely correct to least likely. *"Come to a reasonable, short differential diagnosis, relevant to the clinician"* [AU1]. An unnecessarily long list only gives evidence of a good memory, and may lead to unnecessary and expensive further investigations that may expose the patient to unnecessary risks and delay proper treatment. Practical skills are also a prerequisite for being a competent radiologist, due to the need of certain interventional procedures that are done by radiologists in daily practice. *"To become overall competent in radiology, you've got to be able to do certain things with your hands"* [AR2].

Reflexive competence/working independently

Data analysis and description: The third category that emerged from this theme was considered important by nine of the 11 interviewees in this group. Four subcategories emerged, namely, The time frame for developing reflexive competence, Demonstrating independence, Demonstrating confidence and leadership and Making correct decisions.

Discussion: Reflexive competence is defined by SAQA (2001:11) as, "[t]he demonstrated ability to integrate our performances with our understanding so that we are able to adapt to changed circumstances and explain the reason behind these adaptations." In the context of radiology this is a very important quality that needs to be acquired by every radiologist because of the nature of radiology practice. A radiologist is confronted with something unexpected every day. Even so, when a radiologist is faced with a rare clinical syndrome, an unfamiliar clinical scenario, unexpected radiological findings or even awkward managerial challenges, s/he is expected to be able to manage the patient or situation in a safe and proper manner that should be justified, if required. *"Sometimes it happens that candidates aren't there yet, although they have completed their five years"* [AUR1].

These abilities take time to develop in practice, even though a candidate may have passed the summative assessment. A private health sector assessor commented as follows: *"That year after the examination was the steepest learning curve"* [AR1]. Proof of reflexive competence includes qualities such as showing leadership, giving a confident opinion, and working independently without the supervision of a more senior person, understanding what s/he wants from a specific imaging modality and possessing the ability to transfer that information to somebody else.

The person should be safe in any environment, be able to make the correct diagnosis repeatedly and should realise the weight of the responsibilities that goes with being a radiologist. *"The buck stops with you"* was voiced by a number of interviewees.

Clinically relevant reasoning skills

Data analysis and description: This category emerged from the comments of four interviewees.

Discussion: A competent radiologist should apply critical thinking constantly for the sake of protecting his/her patients. The radiologist is not a technician that is expected to follow orders without considering the correctness, indication and validity of such orders. Again, it is apparent that clinical insight is necessary to differentiate between somebody who has acquired a certain level of knowledge and somebody who has gained enough experience to realise when a request for a radiological investigation, procedure or intervention should be queried. Signified queries should be managed by liaising with the referring clinician to

gather more information about the patient and the clinical scenario. This can only be achieved if the radiologist can think critically in addition to being able to reason logically.

4.3.2.2 Theme 2: Safety

This theme, namely, **Safety**, focuses primarily on **Patient safety** (cf. Table 4.3), which was the only category to emerge from the question aimed at identifying readiness for radiology practice.

Patient safety

Data analysis and description: This category was expressed by seven of the assessors and both moderators participating in this interview. Six subcategories were identified, namely, Patient safety is the paramount denominator and it is achieved by Being critically self-aware and acknowledging own limitations, Being cautious of arrogance or overconfidence, Considering other diagnoses or management, and Preventing unnecessary radiological imaging or interventions, and Other relevant remarks that did not fall under a specific subcategory.

Discussion: Patient safety was considered to be the most important quality of a competent radiologist. First and foremost, the radiologist should not miss significant findings and should not expose the patient to unnecessary radiation or interventions. Although it is important to be confident and to function independently, as discussed previously, every radiologist should look critically at him/herself and should be able to identify any weaknesses and limitations that s/he may have. There is a fine line between being confident and becoming arrogant. *"Be confident but don't be arrogant"* [AU2]. A radiologist needs to reach a certain level of maturity and self awareness to realise his/her limitations, beyond which the radiologist will not be safe.

A person should not be so fixed in his/her manner of reasoning or his/her ways of practicing radiology that s/he does not consider other possibilities. An important question that should always be asked, even if confronted with the obvious is, "what else can this be?" One of the limitations of summative assessment, as voiced by a moderator, is that a candidate cannot be failed for being overconfident, because the assessment assesses mainly the level of knowledge. For this reason a candidate may become a knowledgeable radiologist but is not necessarily safe to practice yet.

Safety encompasses more than merely knowledge and making a diagnosis. It includes the correct responses to clinical and imaging findings, patient management, communication and interpersonal skills. Overconfident individuals are difficult to manage because they tend to be aggressive and less approachable. *"Overconfidence is very dangerous"* [AR1]. Overconfidence can lead to cardinal mistakes which, in turn, may lead to undesirable consequences. For this reason overconfidence should be addressed by, first, acknowledging that mistakes have been made, and then listening to advice from colleagues.

4.3.2.3 Theme 3: The roles of a radiologist

The third theme is **The roles of a radiologist**. Although some of these roles have been discussed under the previous question on readiness for the summative assessment, other roles that were identified signifies more specifically the readiness for radiology practice. Four categories were identified under this theme, namely, **Demonstrating professionalism, Becoming a lifelong scholar, Demonstrating managerial skills** and **Becoming an expert** (cf. Table 4.3).

Demonstrating professionalism

Data analysis and description: Four interviewees made remarks that refer to a radiologist as being a professional.

Discussion: It became clear from the interviews that a radiologist should realise his/her responsibilities and therefore should not withhold imaging, treatment or intervention that could lead to the neglect of his/her patients. Ethical conduct is needed, even when the radiologist is working under pressure; ethics should never be abandoned during interaction with other members of the team. Another facet of being a professional is to represent the radiology community at large by implementing, applying and constantly reviewing the principles and protocols that are made available regularly by the regulatory bodies of radiology and radiography, in this country as well as internationally. A radiologist should always be approachable by behaving ethically towards patients, but also by applying work ethics towards colleagues. *"You got to be approachable"* [AR2].

Becoming a lifelong scholar

Data analysis and description: The next category was identified from the responses of 10 interviewees. Four subcategories were identified, namely, Realising a gap in knowledge, Being motivated to learn, When to learn and Where to gather knowledge.

Discussion: Once a candidate has qualified it is only the beginning of a journey of lifelong learning. *"One's degree is your licence to learn radiology"* [AUR2]. Part of this journey would include attending conferences to interact with peers and to gather frontline knowledge. Whenever a radiologist does not know the answer to a specific clinical question or is unsure about the interpretation of specific imaging findings, s/he should know where to search for the correct answer. This may include a review of the literature, whether cited in a book, journal, internet search or online databases. The amount of knowledge that is currently available is vast. If this search is inconclusive, not practical or inaccessible, a colleague at the same level of competency should be consulted or, if available, a colleague at a higher level of specialisation. *"If you do not know the answer, you consult your colleagues"* [AU4]. Interdisciplinary or interdepartmental consultations may further help to get to the correct answer.

Once a radiologist has realised that s/he has reached his/her limits of his/her knowledge, it is the time for humility and for asking advice. A competent radiologist should constantly work towards an infinite boundary of gaining more knowledge, skills and experience. It was ascertained that medical practitioners should remain lifelong learners, due to rapid and constant advances in medical fields, including the field of radiology.

Demonstrating managerial skills

Data analysis and description: The next category was identified from the responses of only three interviewees in this group, but it is no less important.

Discussion: In the radiological context a competent radiologist, as the manager of the radiology team, should be able to present leadership skills. In the private health sector a radiology practice usually appoints a practice manager to address business issues and accounting and managerial duties related to staff management. Information technology (IT) issues related to the PACS and RIS are managed by a PACS administrator who is usually qualified in information technology.

In the public health sector all these facets may be managed by different departments or private companies that are contracted to provide technical support. Regardless of the support systems in place, a radiologist needs to have a general knowledge and understanding of all the relevant systems, to be able to manage and take informed decisions about any challenges that may arise regarding any one of the facets.

The radiologist should, furthermore, be able to manage his/her list effectively to ensure optimal imaging, interventions and throughput of patients while providing a timely report that is easily accessible to referring clinicians. As part of this management the radiologist needs to ensure the archiving of such information for future reference when needed. Within these contexts the radiologist should always manage available resources optimally, especially in a resource-limited setting. Finally, radiation exposure should be monitored via the different support systems and structures currently available, with a focus on limiting radiation exposure to children.

Becoming an expert

Data analysis and description: The last category under this theme emerged from the responses of five interviewees in this group. Three subcategories were identified, namely, It takes time to develop, an Expert opinion is trusted and an Expert contributes to patient care.

Discussion: An expert should be able to differentiate between what is urgent and what is not. It takes time to become an expert whose opinion is trusted by other people and *"people actually are listening to what you say"* [AUR3]. In the current radiology context it has become even more challenging because clinicians require a higher level of expertise to be able to contribute effectively to patient management. In many scenarios this requires super-specialisation to answer the call by clinicians in certain public institutions in South Africa, and more probably the private health sector.

To contribute to CME in radiology in South Africa, the RSSA, together with other partners, have established a CME programme to complement the training of registrars in general but also aimed at super-specialities, which are presented by internationally renowned radiologists (Janse van Rensburg 2010:50). By presenting these conferences the RSSA is contributing to the expertise of both academic and private consultants and uplifting the level of radiological expertise in general in South Africa.

A summative perspective on the second question: The second question addressed the readiness of a candidate for radiology practice. A competent general radiologist should show foundational competence by having a grasp of basic theoretical radiology knowledge, present practical competence by being able to apply his/her knowledge to perform relevant practical procedures and interventions, and present reflexive competence to always manage any patient or situation in a safe and proper manner. S/he should show leadership, be safe, constantly apply critical thinking, show clinical insight through logical reasoning, not miss significant findings and look critically at him/herself to identify any weaknesses and limitations. The radiologist should behave in an ethical fashion and represent the radiology community at large, as a lifelong learner and manager of the radiological team, while optimally managing available resources, monitoring radiation exposure and differentiating between what is urgent and what is not.

4.3.3 Identifying the roles and qualities of an assessor in the radiology summative assessment

The third question in the interview guide that the researcher asked the interviewees was: "What are the roles and qualities of an assessor in the radiology summative assessment?"

The responses of all the interviewees were analysed and arranged into themes, categories and subcategories. The themes that were identified were as follows:

- Theme 1: Health advocate;
- Theme 2: Referee;
- Theme 3: Expert;
- Theme 4: Feedback;
- Theme 5: Structuring of the assessment; and
- Theme 6: Team player.

The themes, with the coupled categories and subcategories, are presented in Table 4.4 and will be discussed separately. To simplify the reporting each subcategory is followed by the coding of the respondent. Some of the responses are presented as direct quotes to enhance the credibility, dependability and confirmability of the study.

TABLE 4.4: IDENTIFYING THE ROLES AND QUALITIES OF AN ASSESSOR IN THE RADIOLOGY SUMMATIVE ASSESSMENT [Table continues on next pages]

THEMES	CATEGORIES
1. Health advocate	Patient safety <u>Identifying a safe radiologist</u> • "Protect the public." [AUR1] • "Your primary objective is to ensure that the public are safe." [AR1] • Must certify a safe radiologist. [AUR2] • Examiners are there to ensure that the candidates are safe. [AUR3] • "Is the person mature, is he safe." [AU1] • Critical to assess if someone is safe. [MU1] • Make judgment whether the candidate is safe or not. [MU1] • Need to decide if the candidate will be safe towards the community. [AU2] • Need to decide whether the candidate is safe. [AU3] • "A candidate mustn't be a danger to society." [AR2] • "Weigh up the candidate's well-being against the patient's well-being." [AR1] <u>Identifying impulse decisions</u> • Be on the lookout for impulsive decisions. [AUR1]
2. Referee	Ascertain the level of competency <u>Conducting a structured assessment</u> • "He has to listen and say; what do I want from that answer." [MR1] • Should be decisive and firm. [AUR2] <u>Identifying basic knowledge</u> • Should assess at the level of a general radiologist. [AUR3] • Ask questions that are fundamental to identifying a safe radiologist. [AUR3] • "Does he have basic knowledge?" [AU1] • Should have basic important knowledge of general radiology, especially emergency-care-type cases. [AR2] <u>Identifying skills</u> • Identify observation and interpretation skills. [AUR1] • Only allow good radiologists into practice, that are able to do the work. [AU3] Ensuring a valid and reliable assessment <u>Ensuring a fair assessment</u> • Assessment must be fair. [AUR1] • "Are the questions fair and meet the required standard?" [AU2] • Must be fair. [AUR2] • Should be fair without fear or favour. [MU1] • Assess the candidate fairly without being emotional. [AU4] • "Try and be objective, fair and sensitive." [AR1] • Fairness improved by anonymity of candidates during the assessment. [AU3] • Provide valid examination material. [MU1] • Prevent assessor fatigue by becoming bored, remain interested. [AU1] <u>Being wary of bias</u> • Not try to be a perfectionist. [AUR2] • "Examiners are not looking to fail people." [AUR3] • Be wary of bias towards different verbal skills, accents and personalities. [AU1] • Do not confuse nervousness, slow speech and poor communication for lack of knowledge. [AU1] • Should not confuse poor communication with lack of knowledge. [MU1] • Put emotion aside, listen to the candidate and do not be biased. [AU2] <u>Providing a non-threatening environment</u> • Be calm and help the candidate to relax. [AU1] • Need to put the candidate at ease. [AR2] • "Listen to the candidate." [AU1]

3. Expert	• "Understand that it is an artificial environment." [AR1] The level of academic experience <u>Being knowledgeable about the curriculum and learning outcomes</u> • Should be well prepared. [AUR1] • "You got to know what the curriculum is." [AUR3] • "The assessor needs to know the curriculum." [AU1] • <i>"What is required of a general radiologist?"</i> [AUR1] <u>Being involved with an academic department</u> • Need to be involved in the teaching process to be able to make judgment on the level of required knowledge. [MU1] • Must be involved with an academic radiology department. [AUR1] • It helps to be affiliated to an academic department, but it is not a necessity. [AR1] <u>Being knowledgeable about general radiology</u> • "You have to have general radiology knowledge." [AU1] • Assessor should be an expert in general radiology. [AUR2] • "He should be an expert on what he is assessing." [AU1] • S/he should be knowledgeable in what s/he is assessing. [MU1] <u>Being aware of new developments</u> • Should be up to date with new developments. [AUR1] • Should be up to date with the latest developments, do not assess outdated knowledge. [AU2] • Should be at a higher level of knowledge. [AU2] • Must understand the requirements of the public national healthcare system. [AUR2] <u>Assessing at the level of a general radiologist</u> • Should only assess at the level of a general radiologist. [AU3] • Keep perspective on a general radiologist. [AUR1] • "Need generalists as examiners." [AUR3] • Subspecialists should not assess in their area of interest or expertise. [AR1] • Even a super-specialist should only show common, relevant cases seen in daily practice. [AR2] • Super-specialists have to be very cognisant of what they ask. [AUR3] • "Should be knowledgeable without your own super-speciality dictating you." [AU4] <u>Being experienced</u> • Must be experienced. [AUR1] • Assessor must be at a higher level. [AUR1] • Should have enough experience in general radiology. [AR1] • Should have at least five years experience as a consultant before becoming an assessor. [AR2] • Proper level of experience should be a prerequisite. [AUR2] • "The assessor has to be experienced; an official minimal requirement should exist." [AU1] • "If the assessor is not experienced, the assessor has to be guided by an experienced co-assessor." [AU1] • Need to be experienced to quickly judge between anxiety and lack of knowledge. [AU3] • Need to be experienced in the field of radiology. [MU1] <u>Providing proof of experience</u> • Need to provide some form of academic portfolio. [AUR2] • Proof level of experience, CV and assessment training. [AU1] <u>Including private radiologists</u> • Public and private health sector radiologists show similar radiology approach. [AUR1] • Include private radiologists who have an interest in education. [AUR3] • Private radiologists should be included in the summative assessment. [AR2]

	• "Private examiners have a lot to bring to the exam but they would have to be familiar with the radiology syllabus." [AU1] • "It is a good thing to have a good private assessor." [MR1] • Private assessors should be involved in the academic department. [MU1] • Private assessors should be aware of and involved in the academic programme. [AU2] • Private radiologists who do sessions at the academic departments can be used for the summative assessment. [AU3] • Important that private assessors are involved in the academic programme. [AU3] • Private radiologists can contribute to the academic departments. [AUR2] Legal preparedness <u>Conducting a structured assessment and moderation</u> • "Organisation, standardisation, structured assessment, time, instrumentation." [AU1] • Ensure that all questions and cases are moderated or peer reviewed. [AUR2] <u>Noting assessor comments</u> • Make notes if legally needed for future reference. [AUR1] • It is advisable to write down comments for future reference but currently no record is kept of such comments. [AR1] <u>Keeping record of assessment tools</u> • Memorandum, marking sheet or rubric with short comments to explain why candidate fails. [AU2] • Memorandums and rubrics will help in resolving differences. [AU3] • Memorandum will have to guide because the assessor will not recall his/her line of reasoning at a later time. [AU4] • Do the job to the best of your ability and be honest; the memorandum should prove one's fairness. [AR2] <u>Preventing bias</u> • Anonymity during the assessment may help in legal issues. [AU3] • Bias is prevented by using different instruments and multiple assessors. [AU3] <u>The disincentive effect of legal concerns</u> • If there is a legal concern: "I do not want to be an examiner". [AU4]
4. Feedback	Feedback from and to the examination body <u>The rationale for giving feedback</u> • Identify gaps in training. [AUR1] • Feedback improves assessment. [AUR1] • Remove unfair questions. [AUR1] • "We can only improve if we know where the flaws are in our candidates and rectify either our teaching or how we prepare them." [AU1] • "Without feedback nothing is going to change." [AU1] • An institution will never know what is wrong with its candidates if no feedback is given. [AU2] • Feedback will help to improve the quality of assessments. [AU4] <u>Feedback from the assessors to the examination body</u> • Assessors should give feedback regarding the assessment to moderators. [AUR1] • Assessors should ideally be able to attend some board meetings. [AUR3] • Feedback should be voluntarily and directed towards the examination body in writing. [AUR3] • Feedback must be conscientious and thorough. [AUR1] • Immediate feedback would be ideal directly after the post-examination meeting. [MU1] • Feedback should be structured and as soon as possible after the assessment, maybe in the form of an email. [AU1]

	• Feedback to the examination body can be done after two weeks by completing a voluntary structured questionnaire via email. [AR2] <u>Feedback from the candidates to the examination body</u> • A candidate should respond in writing if s/he felt that some part of the assessment was unfair. [AU4] • Ideal to give feedback to the assessment body on the assessment within a safe environment. [AR1] <u>Feedback from the examination body to the assessors</u> • More guidance needed from the examination body on when a candidate should be deemed competent. [AR2] <u>Feedback from the examination body to the academic departments</u> • Feedback should be forwarded to the academic departments regarding standards and moderation. [AU1] • Feedback should be given on why the candidate failed, to a representative of the academic department, immediately after the examination meeting. [AU2] • Feedback is very important because candidates may fail due to a systemic problem in an academic department. [MU1] <u>Feedback from the examination body to the HODs</u> • Feedback should be forwarded to the head of department. [AU2] Feedback to the candidates <u>The rationale for giving feedback</u> • Identify gaps in knowledge. [AUR1] • "If you failed, your knowledge is deficient." [MR1] • Important to give constructive feedback to candidates to identify weaknesses and initiate an improvement plan. [AU2] • "Otherwise we don't know why candidates are failing and they don't know why they are failing." [AUR3] • "It is a learning process, it is a reflective process." [AU1] • "We shouldn't make this exam an enigma, we should be transparent." [AU1] • Candidates should be able to judge for themselves. [MR1] • Feedback is important to build confidence and provide support. [AR1] <u>Feedback via the HOD to candidates who failed</u> • Feedback is very important and should be done either directly or indirectly. [MU1] • Ideally to every individual candidate. [AUR3] • Feedback to individual candidates should be given by the head of the relevant academic department. [AUR2] • Individual feedback should be given by the HOD to a candidate who failed. [AU3] • Feedback by the relevant HOD to the failing candidate is important to identify mistakes and weaknesses. [AR2] • After the examiners' meeting discussed the failed candidates, the HOD should give individual feedback at a later date. [AR1] • Feedback is currently done by the head of the department. [AUR3] • Orals can be videotaped if needed for future discussion. [AR1] <u>Feedback to candidates who passed</u> • Feedback after the summative assessment is still essential but to a lesser extent because it does not have such a great impact. [AR1] • Feedback to candidates who passed is not a priority and is less practical due to time constraints. [AR1] • Summarised report of results from examination body is acceptable. [AUR2] • It is the responsibility of the candidate to ask for feedback. [MR1] <u>Feedback to candidates who are still preparing</u> • "Feedback is most vital to candidates who are in the training circuit." [AR1] • Can be done at a joint meeting with the registrars to give feedback on general aspects of the assessment. [AU3]

	• Feedback can be given by a departmental representative or a candidate who passed. [AU3] • "We have a pre-examination course." [MR1] Feedback to oneself (auto internal moderation) • Self re-marking if the memorandum changes or interpretation of the question by the candidates is the same. [AUR1] • Re-marks all papers if the memorandum is expanded. [AU3] • If the memorandum is adapted, one should re-mark all the papers. [AR1] • A memorandum is not cast in stone and therefore one should re-mark if new facts are included in the memorandum. [AR2]
5. Structuring of the assessment	General considerations in structuring the assessment <u>Conducting pre-assessment moderation</u> • Assessment must be structured. [AUR1] • <i>"How one assesses the candidate."</i> [AUR1] • The number of required facts per mark should be clearly indicated on the question paper. [AU2] • Not be confusing. [AUR1] • Assessors should be involved in pre-assessment moderation. [AUR1] • Impractical to have assessors present at the pre-examination meeting. [AU3] <u>Preventing bias</u> • Candidates should be completely anonymous to the assessors. [AUR3] <u>Making use of different assessment instruments and tools</u> • Should make use of different assessment instruments. [AR2] • Use several instruments. [AUR2] • Essential to have a memorandum. [AUR3] • Should present the "model answer" (memorandum). [AUR1] <u>Covering the curriculum</u> • Should be a good generalisation of curriculum. [AUR1] • The assessment should cover the majority of the curriculum. [AU3] • Every assessor should cover a domain to ensure that the curriculum is covered. [AU3] • Cover all the subspecialties on the level of a general radiologist. [AUR3] <u>Covering the cognitive domain</u> • Cover the whole cognitive domain (test blueprint). [AUR1] • "Look at the candidate at different levels and at the end of that, have a fair assessment." [AU1] • Collaboration between assessors in providing easy and difficult cases to set a balanced assessment. [AU4] Technical quality of papers and images • Convenor's responsibility. [AUR1] • Papers should be language edited. [AUR1] • Not repetition of previously asked questions. [AUR1] • All images should be digital. [AUR2] • Every candidate must get the same quality. [AUR1] • Electronic images should be of very good quality and completely anonymised. [AUR3] • Should be enough variation of cases. [AUR1]
6. Team player	Interpersonal skills <u>The relevance of interpersonal skills</u> • Interpersonal skills necessary to be able to communicate with and learn from colleagues. [AU2] • An assessor should have good interpersonal skills. [AR2] <u>Being professional and friendly</u> • Professional level of engagement. [AUR2] • Assessor should be calm, professional, friendly and easily accessible. [AU2] • Should be friendly, approachable and amenable. [MU1] • Should not intimidate candidates; make them feel comfortable. [AU2]

	• "You need to be a personable person, it's a personality trait." [AU1] <u>Being respectful</u> • "Have respect for your colleagues, respect for their opinions, and respect for the cases." [AU1] • Should be able to listen. [MU1] • Inexperienced assessors can be moulded and developed. [AU1] <u>Being a team player</u> • Is needed to be able to work in a team. [AUR2] • The assessor forms part of a team that need to meet with other assessors and make joint decisions. [AU3] • "Examinations are not decided by one person." [AR1] <u>Being responsible</u> • Assessor should be a responsible person. [AUR1] • Unfair, aggressive, inappropriate assessors, not accepting criticism and not a team player, shouldn't be re-invited. [AU1] <u>Remarks that contradict the general opinion</u> • Not important. [AUR1] Critical thinking • Good if different opinions. [AUR1] • "Critique without fear or favour." [AUR2] • Should be able to give reasons for decisions on pass or fail. [MU1] • The assessor should not be offended by critique from peers. [AU4] • "Sometimes you're wrong and you got to accept that you're wrong." [AR1]

4.3.3.1 Theme 1: Health advocate

The first theme that emerged was that of being a **Health advocate**. In the context of being a radiology assessor it is clear that an assessor should ultimately decide whether a candidate is safe to be allowed to practice radiology independently. Only one category emerged from this theme, namely, **Patient safety** (cf. Table 4.4).

Patient safety

Data analysis and description: The only category that emerged from this theme was alluded to by nine of the 11 interviewees. Two subcategories were identified, namely, Identifying a safe radiologist and Identifying impulse decisions.

Discussion: The core role of an assessor is to *"protect the public"* [AUR1]. *"Your primary objective is to ensure that the public are safe."* [AR1]. This is done by assessing whether the candidate has achieved a certain level of maturity regarding the amount of knowledge needed to practice radiology safely, the ability to apply his/her gathered knowledge by approaching clinical and radiological cases in a logical, structured manner, and guiding the clinician by generating a concise, structured, relevant and clear report that will contribute to the proper management of the patient in a milieu of working together as a team. To fulfil this role of being a health advocate, the assessor constantly needs to *"weigh up the*

candidate's well-being against the patient's well-being" [AR1] to prevent the candidate becoming a danger to society.

4.3.3.2 Theme 2: Referee

The second theme to emerge from the interviews on the roles and qualities of an assessor is the role of **Referee**. For the assessor to judge the candidate, two categories were identified. The assessor needs to **Ascertain the level of competency** while **Ensuring a valid and reliable assessment**.

Ascertain the level of competency

Data analysis and description: The category that emerged was touched on by six assessors and one moderator. Three subcategories were identified, namely, Conducting a structured assessment, Identifying basic knowledge and Identifying skills.

Discussion: The assessor needs to identify and assess the candidate's observation and interpretation skills by being decisive and firm. It is important that the assessor only assesses at the level of a general radiologist and not at the level of his/her special interest or at the level of a super-specialist. For this reason the questions that are asked should be fundamental for identifying a safe general radiologist. The assessor should ask him/herself: *"What do I want from that answer"* [MR1]. As a referee, the assessor should only allow candidates into independent practice who would be able to do the work expected of a radiologist. Such a radiologist should be able to identify, diagnose and manage all possible emergencies that may arise in radiology.

Ensuring a valid and reliable assessment

Data analysis and description: Presenting a valid and reliable assessment is obviously an integral role of being an assessor and was mentioned by 10 of the interviewees. Three subcategories were identified, namely, Ensuring a fair assessment, Being wary of bias and Providing a non-threatening environment.

Discussion: While the assessor does not need to be a perfectionist, it is his/her role to be fair. Assessors do not start off with a view to failing candidates and should constantly ask themselves: *"Are the questions fair and meet the required standard?"* [AU2]. The assessor

should provide valid examination material, and assessment instruments that measure what they are supposed to measure. An assessor should remain calm throughout the assessment and should avoid influencing the candidate in a way that would be disadvantageous to him/her. It is advisable to help the candidate to relax and to put him/her at ease by offering a friendly gesture as simple as greeting the candidate with a smile. The assessor should be supportive but should not guide the candidate too much towards the correct answer. *"Understand that it is an artificial environment"* [AR1].

The assessor should put emotion aside and be wary of bias, which can easily arise due to factors such as poor verbal skills, different accents and differences in personality traits between the assessor and the candidate. The assessor should not confuse nervousness, slow speech and poor communication with a lack of knowledge. It is important to really listen to what the candidate is saying and to understand what is being said. For this reason the assessor should avoid assessor fatigue, which may set in as the assessment progresses, and should avoid becoming bored from listening to the same responses being repeated. Fairness of the assessment is improved by anonymising the candidates and by not allowing assessors to assess candidates who are familiar to them because they are from the same institution or they had previously been assessed by the same assessor.

4.3.3.3 Theme 3: Expert

The next theme that emerged is that of being an **Expert**. It is taken for granted that an assessor should be an expert within the field that s/he is assessing in, but more clarity was presented in the two categories arising from this theme, namely, **The level of academic experience** and **Legal preparedness** (cf. Table 4.4).

The level of academic experience

Data analysis and description: All interviewees expressed opinions that made it clear that an assessor should know the curriculum and the learning outcomes in order to conduct the summative assessment. Eight subcategories were identified, namely, Being knowledgeable about the curriculum and learning outcomes, Being involved with an academic department, Being knowledgeable about general radiology, Being aware of new developments, Assessing at the level of a general radiologist, Being experienced, Providing proof of experience and Including private radiologists.

Discussion: An assessor should know what is required of a general radiologist. The assessor should be well prepared for the assessment and should be up to date with recent developments regarding assessing candidates and the field of radiology in general. *"You got to know what the curriculum is"* [AUR3]. Therefore, the assessor needs to be involved in the teaching process affiliated to an academic radiology department to be able to make a judgement on the required level of knowledge. The assessor should not assess outdated knowledge. The assessor should realise during the assessment when s/he is going outside the realm of general radiology. For this reason the assessor should have enough experience and be actively involved in practicing general radiology.

The assessor needs at least five years experience as a radiologist prior to becoming an assessor of summative assessment in radiology. Some of the interviewees were of the opinion that this should be an official minimum requirement and that some form of academic portfolio should be presented to the examination body prior to being accepted as an assessor. Such a portfolio could include the level of experience and proof of assessment training. Junior assessors should be guided by more experienced senior assessors during the assessment. It has been noted that there is no difference between assessors working in the public and private health sectors with regard to the approach to radiological cases. *"Private examiners have a lot to bring to the exam but they would have to be familiar with the radiology syllabus"* [AU1]. It is important that the individual should have an interest in education and assessment. An assessor should also have an understanding of the requirements of the public national healthcare system.

Legal preparedness

Data analysis and description: The examination body should always consider the possibility of legal action by a disgruntled candidate – even though it rarely happens. Therefore assessors should consider how to be prepared if faced with such a scenario. Seven interviewees gave their opinions on this issue as part of being an expert in assessment. Five subcategories were identified regarding being legally prepared, namely, Conducting structured assessment and moderation, Noting assessor comments, Keeping record of assessment tools, Preventing bias and being aware of The disincentive effect of legal concerns.

Discussion: It was suggested that an assessor should make notes on the answer sheet to explain any issues for future reference, as it is likely that the people involved will have

forgotten the reasoning behind specific decisions on a specific answer after a few months. All answer sheets with notes should be archived for a certain period of time. Part of being prepared is keeping proof of the moderation of all questions, memorandums, mark sheets, rubrics and cases. To prove fairness in the assessment, the examination body needs to show that all the assessments were conducted appropriately. One assessor summarised proof of consistency as, *"Organisation, standardisation, structured assessment, time, instrumentation"*[AU1]. Anonymising candidates may also be of value to prove that there was no bias towards individuals.

It is very important to have proper memorandums, mark sheets or some form of documentation to standardise the correct expected responses. Having several experienced assessors with geographic variation also contributes to ensuring a fair assessment that is unlikely to be queried. Legal risks should be addressed by the examination body and should not be the sole responsibility of the assessor; if it is, it will deter people from becoming involved with the assessment process. This will be detrimental to assessment, especially in the current setting where we are faced with a shortage of experienced assessors. *"If there is a legal concern, I do not want to be an examiner"*[AU4].

4.3.3.4 Theme 4: Feedback

Giving **Feedback** emerged as another important role of assessors. Three categories (cf. Table 4.4) were identified, namely, **Feedback from and to the examination body**, **Feedback to the candidates** and **Feedback to oneself (auto internal moderation)** - the latter also known as double internal marking (cf. Point 2.6).

Feedback from and to the examination body

Data analysis and description: This category emerged from the opinions of nine interviewees of this group. Six subcategories emerged, namely, The rationale for giving feedback, Feedback from the assessors to the examination body, Feedback from the candidates to the examination body, Feedback from the examination body to the assessors, Feedback from the examination body to the academic departments and Feedback from the examination body to the HODs.

Discussion: Feedback from the assessors to the examination body is important for identifying gaps in the academic training. Some of the interviewees suggested that joint

pre-examination and post-examination meetings may be beneficial. *"We can only improve if we know where the flaws are in our candidates and rectify either our teaching or how we prepare them"* [AU1]. Feedback can be given to representatives of specific departments immediately at the post-examination meeting. Such feedback should be forwarded by the examination body to the heads of the academic departments, to address standards and quality of teaching. *"Without feedback nothing is going to change"* [AU1]. It may be that candidates from a particular department are failing due to a systemic problem within the parent department. Therefore, feedback should be done in a conscientious and thorough manner.

Furthermore, feedback to the assessment body will also improve future assessments. It is valuable for identifying and removing unfair questions. This will only be successful if assessors can provide feedback to the moderators. Feedback on the assessment can also be done voluntarily after the assessment, in writing, due to time constraints at the post-examination meeting, but should be structured and directed to the examination body. This should ideally be done within two weeks. Feedback should also be given to the examination body, on the value and significance of assessment training for assessors and moderators as well as training for assessors on when a candidate should be deemed competent.

One of the assessors mentioned that a candidate should be able to give feedback to the examination body. This should be done in writing if the candidate is of the opinion that some part of the assessment was unfair. Another interviewee mentioned that feedback to the examination body should ideally be given in a safe environment.

Feedback to the candidates

Data analysis and description: While exploring the theme of feedback in greater depth the category of feedback to candidates emerged from the thoughts of eight of the assessors and both moderators. Four subcategories were identified, namely, The rationale for giving feedback, Feedback via the HOD to candidates who failed, Feedback to candidates who passed and Feedback to candidates who are still preparing.

Discussion: One of the main reasons for giving feedback to a candidate is to notify him/her about gaps in his/her knowledge. *"We shouldn't make this exam an enigma, we should be transparent"* [AU1]. Another reason for giving feedback is to give the candidate insight in the examination processes to help him/her to prepare optimally and to decrease

anxiety prior to and during the assessment. Feedback to candidates who failed should be given individually by the head of the training department. A summarised report of the candidate's results is acceptable but inadequate if the aim is to improve future performance. *"Otherwise we don't know why candidates are failing and they don't know why they are failing"* [AUR3].

It is obvious that if a candidate fails, his/her knowledge is not at the level required to be a competent radiologist. *"If you failed, your knowledge is deficient"* [MR1]. Although some assessors may argue that it is the candidate's responsibility to request feedback, we should ask ourselves if this is the optimal way of educating future members of the radiology workforce. As mentioned the above, bear in mind that the independent assessment body, which is currently tasked with conducting the summative assessment, is responsible solely for the assessment. Why is it their responsibility to give feedback, if the responsibility for training lies with the academic departments, or is it the responsibility of the academic departments to enquire why their candidates failed, so that they can give feedback to their candidates and to furthermore review their training programmes?

If the academic department accepts responsibility for giving individual feedback to the candidates, it should be done in a constructive manner in order to identify weaknesses, to build confidence, to provide support and to initiate an improvement plan. Feedback can also be given at a joint meeting with registrars, but should then be aimed at general aspects of the assessment and not at any individual weaknesses. Such feedback can be given by a departmental representative who attended the assessment or by a candidate who passed the assessment. *"Feedback is most vital to candidates who are in the training circuit"* [AR1]. Feedback to candidates who passed is less of a priority and less practical in the face of time constraints, but should still be given if requested. It may be advisable to make video recordings of the orals for future reference and for the purpose of feedback. Such recordings may also be valuable if legal queries should arise.

Feedback to oneself (auto internal moderation)

Data analysis and description: Another role of the assessor is to review his/her own judgement. The category emerged from the opinions of four assessors.

Discussion: Auto (referring to oneself) internal moderation involves the assessor re-marking answer sheets after a certain period of time to assess for consistency in marking.

It often happens that the assessor queries some facts that are presented by the candidate. After reviewing the literature the assessor sometimes finds that the candidate is correct and that the fact should be added to the memorandum. This necessitates that all the scripts that were marked up to the point of adjusting the memorandum, should be re-marked to account for the change that was adopted in the memorandum. From this we can deduce that the memorandum is not set in stone and that the assessor should be flexible enough to accept new facts that are relevant and correct in the context that it was asked and presented.

4.3.3.5 Theme 5: Structuring the assessment

The fifth theme that emerged from the semi-structured interviews pertains to the assessor's role in **Structuring the assessment**. The theme contains two categories, addressing **General considerations in the structuring of the assessment** and the **Technical quality of papers and images** (cf. Table 4.4). Some of these aspects show similarities to other categories, though in different contexts. Methods, instruments and tools will be addressed in a separate question (cf. Point 4.3.6).

General considerations of structuring the assessment

Data analysis and description: Various comments were made about the theme of structuring the assessment. These considerations were gathered from eight of the assessors. Five subcategories were identified, namely, Conducting pre-assessment moderation, Preventing bias, Making use of different assessment instruments and tools, Covering the curriculum and Covering the cognitive domain.

Discussion: The structuring of the assessment determines how the candidates will be assessed. Without proper planning and structuring it will be very difficult to evaluate the validity and reliability of the assessment. The number of facts required per mark should be clearly visible on the question paper. It is essential to have a memorandum that presents the model answer and which is not confusing to anyone. The assessment should cover the whole of the cognitive domain and assess the candidate at different levels by making use of several assessment instruments. *"Look at the candidate at different levels and at the end of that, have a fair assessment"* [AU1]. Furthermore, the assessment should cover the curriculum by covering all subspecialties at the level of a general radiologist. It may be useful to request every assessor to attend to a particular domain of the assessment to

ensure that the curriculum is covered. Assessors should collaborate to present a spectrum of cases ranging from simple to challenging. To prevent bias the candidates should be completely anonymous to the assessors. It may be advantageous to have a joint pre-examination meeting between assessors and moderators, though it may be challenging to arrange this due to time constraints.

Technical quality of papers and images

Data analysis and description: The second category that emerged under this theme summarises the remarks of four assessors about the quality of the papers and images that are presented to the candidates.

Discussion: The written papers should be language edited and contain no repetition of previously asked questions. All images should be digital and completely anonymised and every candidate must be presented with the same quality imaging. The assessment should contain enough variation of cases from simple to challenging and should cover all subspecialties. The selection of the cases is currently the responsibility of the convenor.

4.3.3.6 Theme 6: Team player

The next theme, namely, **Team player**, as one of the roles and qualities of an assessor refers to his/her role of being a member of a team of assessors and moderators. This includes two categories, which address **Interpersonal skills** and **Critical thinking** (cf. Table 4.4).

Interpersonal skills

Data analysis and description: The first category that emerged addresses the interpersonal skills that an assessor should possess, and was voiced by eight of the interviewees. Six subcategories were identified, namely, The relevance of interpersonal skills, Being professional and friendly, Being respectful, Being a team player, Being responsible and Remarks that contradict the general opinion.

Discussion: Only one assessor was of the opinion that interpersonal skills are not important as one of the qualities of an assessor of the summative assessment. Interpersonal skills are needed to work effectively in a team, especially to engage at a professional level and to make joint decisions. *"Have respect for your colleagues, respect*

for their opinions, and respect for the cases" [AU1]. Inexperienced assessors need to be moulded and developed. To achieve this goal, *"you need to be a personable person, it's a personality trait"* [AU1]. Unfair, aggressive and inappropriate assessors who do not accept criticism and who are not team players should not be re-invited. An assessor should always be friendly, approachable, amenable and calm. S/he should not intimidate candidates and should make them feel comfortable. The assessor should be able to communicate with and learn from his/her colleagues. *"Examinations are not decided by one person"* [AR1].

Critical thinking

Data analysis and description: Five interviewees voiced their opinions about the relevance of critical thinking as part of the assessor's role as a team player.

Discussion: It is good to have different opinions in a team. All opinions should be respected and assessors should be allowed to *"critique without fear or favour"* [AUR2]. Furthermore, every assessor should be expected to give reasons for failing a candidate. An assessor should not be offended by criticism by his/her peers but should focus on the common goal of conducting the best assessment possible. *"Sometimes you're wrong and you got to accept that you're wrong"* [AR1].

A summative perspective on the third question: The third question identified the roles and qualities of an assessor of the radiology summative assessment. An assessor should ensure that the public is safe by weighing up the needs of the candidate's well-being against the patient's well-being. An assessor needs to identify and assess the candidate's observation and interpretation skills at the level of a general radiologist. The assessor should be fair, provide valid examination material and assessment instruments, ensure quality written papers and digital images, avoid assessing outdated knowledge, remain calm, be wary of bias and be wary of assessor fatigue. S/he should be well prepared for the assessment and cover the curriculum. S/he should have proper memorandums, give feedback to the assessment body and give feedback to candidates. The assessor should be affiliated to an academic radiology department, and possess at least five years experience as a radiologist. S/he should understand the public national healthcare system. S/he should collaborate with other assessors, have interpersonal skills and give reasons for failing a candidate.

4.3.4 Identifying the roles and qualities of a moderator of the radiology summative assessment

The fourth question in the interview guide that the researcher asked all the interviewees was: "What are the roles and qualities of a moderator in the radiology summative assessment?"

The responses of all the interviewees were analysed and arranged into themes, categories and subcategories. The themes that were identified were as follows:

- Theme 1: Leader;
- Theme 2: Ensure a fair assessment;
- Theme 3: Expert; and
- Theme 4: Quality assurance.

The themes, with the coupled categories and subcategories, are presented in Table 4.5 and will be discussed separately. To simplify the reporting each subcategory is followed by the coding of the respondent. Some of the responses may be direct quotes, to enhance the credibility, dependability and confirmability of the study.

The question was addressed to both the assessors in the context of "users" and to the moderators in the context of "suppliers", keeping the theoretical perspectives identified in Chapter 2 in mind to enhance the trustworthiness of the study by means of triangulation.

TABLE 4.5: IDENTIFYING THE ROLES AND QUALITIES OF A MODERATOR IN THE RADIOLOGY SUMMATIVE ASSESSMENT [Table continues on next pages]

THEMES	CATEGORIES
1. Leader	The selection of assessors <u>Selection by the moderators</u> • Moderator should be responsible for selecting assessors. [AUR1] <u>Selection by the HODs</u> • Convenor decides on the assessors put forward by the academic departments, not the responsibility of the moderator. [AU3] • Assessors are currently selected by the HODs. [MR1] • Moderators should not be responsible for the selection of the assessors, should be left to the HODs. [AU2] • The HODs should put assessors forward but the moderators need to decide if the assessors are up to standard. [AR1] • Assessors should be selected and presented by the academic department, moderators only need to approve. [AU1]

	<u>Ensuring the quality of the assessors</u> • <i>"Ensuring that the examiners who are invited have the necessary experience."</i> [AU3] • Should oversee the selection of the examiners to ensure that they are suitably qualified people. [MU1] • <i>"The moderator should be in his job for a long enough period of time, to make sure that some kind of continuity flows through the examiners as well."</i> [MR1] <u>Ensuring enough assessors</u> • <i>"Ensuring that there are enough examiners."</i> [AU3] <u>Ensuring geographic representation</u> • The assessor body should geographically be well represented to pick up any departmental weaknesses. [AU2] • All academic departments should be represented. [AUR2] • Academic departments should be represented geographically. [AU3] • <i>"Ensuring that there is a good distribution throughout all the academic institutions."</i> [AU3] The guidance of assessors <u>Guidance of junior assessors</u> • Many junior assessors in the current system. [AUR1] • Guide training of new assessors. [AUR1] • <i>"You trust their judgment."</i> [AU1] • The moderators need to guide the assessors on how to assess different levels of knowledge. [AR2] <u>Moderator qualities needed to guide assessors</u> • <i>"A wise person."</i> [AU1] • Skills of moderator are different to skills of an assessor. [AU3] • <i>"That person is a leader, who is able to communicate with colleagues."</i> [AU1] • Should have good interpersonal skills. [AU2] • Should have a very strong sense of fairness. [MU1] • Should be objective. [AUR2] • Should be trustworthy. [AUR2] • Should be able to handle confidential information. [AU2] • Should be firm and able to tell someone if s/he is wrong or going off the mark. [AR1] • Must have a very strong personality to believe in what they do. [MU1] • Should be independent without bias or being swayed easily from one end to the other, sticking to the rules, framework and guidelines of the examination body. [MU1] • To be trusted, unemotional, not easily swayed by general opinion, an independent thinker. [AU3] • Should be possible to be swayed by reasonable argument from the assessor body. [AU3] • Should be able to be an amenable member of the team and to listen to other views. [MU1] • Should not be influenced by personal bias. [AU3] • Should be able to create a strong working environment. [AU1] <u>Admonitions on giving guidance</u> • <i>"Be careful not to become the examiner."</i> [MU1] • <i>"Be very careful what you say and how you say it."</i> [MR1] • Be very careful on influencing the way that other people think. [MR1] <u>Giving feedback to assessors</u> • <i>"The moderator's job is also to evaluate how good the examiners are."</i> [MR1] • <i>"The idea is to give the examiner feedback."</i> [MR1] • Moderators should give feedback to assessors. [AUR1] • The moderators should give feedback to the assessors. [AR1] • Individual feedback to discuss structuring of the long cases. [AUR3]

	<u>Timing of feedback</u> • Feedback should be given well before the examination. [AUR3] • Ideal to get guidance on the long cases at a joint pre-examination meeting. [AR1] • The pre-examination meeting is only for moderators and convenors. [MR1] • Feedback is given at the examiners' meeting after the assessment. [MR1] <u>When to give guidance</u> • If an assessor is too lenient or difficult, s/he should be guided. [AU4] • Should be able to guide assessors, especially if they have different opinions. [AU3] • Unwind the situation. [AU4]
2. Ensure a fair assessment	Evaluating the fairness, validity and reliability of the assessment <u>Fairness</u> • A moderator must be fair. [AR1] • Ensuring a fair assessment. [AUR2] • Ensure a fair assessment at the level of a general radiologist. [AU2] • "Make sure that the assessments are fair." [MU1] • "To ensure fairness and standardisation of the examination." [AU1] • No intimidation of candidates. [AUR1] • Evaluating fairness of the assessment is not an individual decision. [AU3] <u>Validity and reliability</u> • Every candidate must get the same level of questions. [AUR1] • Ensure a reliable assessment. [AU3] • Need to oversee the process from the beginning to the end. [MU1] • Should oversee the assessment and make a final call when necessary. [AU3] • There should be a moderator at every component of the assessment. [AU1] • "I don't think that is necessary, I evaluate the examiner." [MR1] • Try and standardise the examiners in some way. [MR1]. • Read the emotions of the candidate and the assessor to assess the assessment. [AU4] • Does not need to moderate everything, only need to sample. [MU1] • Meet with moderators from other colleges of medicine to improve validity and reliability. [AU3]
3. Expert	The level of experience and knowledge needed <u>Higher level of experience in assessments</u> • Should be experienced. [AUR1] • "The moderator needs to be experienced." [AU1] • A moderator needs much more experience than an assessor in terms of assessments and radiology. [AR1] • Should have the most experience. [AU3] • <i>"Has to be somebody who has been an examiner for many years."</i> [AU3] • Should have enough experience in summative assessment. [AU2] • A moderator should have completed several assessments. [AU4] • Somebody who has observed the whole process. [AU3] • "He has observed." [AU2] <u>Higher level of experience in radiology</u> • Should be an experienced radiologist. [MU1] <u>Higher level of professionalism</u> • Should be at a higher level of professionalism. [AUR2] • "A moderator is a step up from the assessor." [AR1] • Should have all the qualities of an assessor. [AUR2] • "Everything that a good assessor should be is essential in a moderator." [AR1] • Professional respect due to level of experience is very important. [AUR2] • "Has to have the respect of people who are quite experienced themselves." [AU1]

	<u>Knowledgeable about the curriculum and the learning outcomes</u> • Should know the outcomes and what kind of radiologist should be produced at the end of this assessment, realising that we are testing general radiologists. [MU1] • Need to know what is required. [AU2] • Should definitely know the curriculum and outcomes. [AU3] • The moderator should know the curriculum. [AR1] • Curriculum must be covered. [AUR1] • Knowing the curriculum <i>"goes without saying."</i> [AU3] • Ensure that equal shares of all the different subspecialties are covered. [AU3] <u>Involved with an academic department</u> • A moderator should know the curriculum and be involved with an academic department. [AR2] • Should be academically inclined and involved with academic radiology. [MU1] • Should know what the training of registrars entails. [MU1] <u>Knowledgeable about the rules and regulations of the examination body</u> • Should be familiar with what is required by the examination body in terms of training and assessment. [MU1] • Should be au fait with the rules of the examination body. [MU1]
4. Quality assurance	Review written questions <u>The process of reviewing written questions</u> • Moderator should review the questions. [AR1] • All cases, questions and answers are presented via internet to the convenor who chooses (covering all modalities and organ systems) and then submits to the moderator. Everything is moderated and is discussed at the pre-examination meeting. [MR1]. <u>Reviewing the fairness and level of difficulty</u> • Ensure fair questions, fair marking, evaluate the level of difficulty and ensure reliability by standardising the assessments. [MR1] • Ensure that they are fair, valid and at a suitable standard. [MU1] • The moderator needs to review that the questions are fair and at the level of a general radiologist. [AUR3] • <i>"Check level of question."</i> [AUR1] • Should be at the level of a general radiologist. [AUR2] • Ensure that the questions are relevant and at the current standard. [AU2] <u>Reviewing the structuring of the written questions</u> • Ensure a balanced paper. [MR1]. • Ensure appropriate time and mark allocation. [MU1] • Questions should be clearly phrased, understandable and not ambiguous. [MU1] Review answer sheets • The moderator should review some of the answer sheets, especially if all the candidates fail a particular question. [AR2] Review memorandums <u>The relevance of reviewing the memorandums</u> • Moderator should review the memorandums. [AR1] • The moderators should look at the memorandums. [AR2] • All questions should be accompanied by a memorandum. [AU3] • Memorandums should be submitted with the questions. [AUR3] <u>Reviewing mark allocation, level of knowledge and time allocation</u> • Should clearly show facts and mark allocation. [AU3] • Evaluate the level of knowledge and the time needed to answer the question to be fair. [AUR3] Review cases <u>Reviewing the quality of the cases</u> • Cases should be standardised at the same level of difficulty. [AU2]

	• Need to assess the quality of the cases. [AU4] <u>Reviewing the long cases</u> • Long cases need more moderation regarding quality and the level of knowledge to be assessed. [AUR3] • Evaluate the level of difficulty on long cases by using norm-referenced assessment. [MR1] <u>Reviewing the short cases</u> • Short cases also moderated. [AUR3] <u>Reviewing the oral cases</u> • Cases for the oral part of the assessment should also be moderated or peer reviewed prior to the assessment. [AUR2] • Oral cases should ideally be moderated beforehand. [MU1] • "We try to see what cases are going to be shown beforehand." [MR1] • Should be involved with all the cases and the orals. [MU1] Review rubrics • "We have to be aware of the rubrics." [MR1]

4.3.4.1 *Theme 1: Leader*

The first theme that emerged from this question was the role of the moderator as a **Leader**. Two categories were identified, namely, **The selection of assessors** and **The guidance of assessors** (cf. Table 4.5). Some of the responses were supportive and some were negative.

The selection of assessors

Data analysis and description: Assessors are currently selected by the convenor who, in most cases, is the HOD tasked by the assessment body with the responsibility of conducting the assessment. The convenor is usually supported by a co-convenor (cf. Point 6.2.1). This category emerged from the opinions of six assessors and both moderators. Five subcategories were identified, namely, Selection by the moderators, Selection by the HODs, Ensuring the quality of the assessors, Ensuring enough assessors and Ensuring geographic representation.

Discussion: Two assessors, both working in the public health sector, had conflicting opinions about who should select the assessors. One of the assessors was of the opinion that the moderators should select the assessors, while the other one believed that selection should be left to the HODs. The rest of the group was of the opinion that assessors should be presented by the individual HODs of the relevant departments and that these candidate assessors should be approved by the moderators based on the qualities, qualifications and experience needed to become an assessor of the summative assessment. The role of the moderator would be to ensure continuity throughout the assessment process to improve

the reliability of the assessment. For this reason a moderator should be appointed for a long enough period to be effective in his/her role. Furthermore, the moderator's role is to ensure that the assessment body is well represented geographically, to compensate for any departmental weaknesses that need to be addressed, *"ensuring that the examiners who are invited have the necessary experience, ensuring that there is a good distribution throughout all the academic institutions, ensuring that there are enough examiners"*[AU3].

The guidance of assessors

Data analysis and description: This category emerged from the opinions of all 11 interviewees in this interview group. All interviewees pointed out that guidance for the assessors is necessary, but the manner and magnitude of such guidance needed more investigation. Six subcategories were identified, namely, Guidance of junior assessors, Moderator qualities needed to guide assessors, Admonitions on giving guidance, Giving feedback to assessors, Timing of feedback and When to give guidance.

Discussion: Currently a large number of junior, inexperienced assessors are active in the assessment body. The negative impact of this situation is the fact that more guidance and support are needed by more experienced assessors and moderators. The positive impact is that new blood brings new energy that may result in review of the assessment process and movement away from traditional methods and ways of reasoning. This may become very relevant when we have to suggest alternative solutions for modern-day challenges. The role of the moderator in this respect would be to guide the training of new assessors, and to provide guidance on ways to assess different levels of knowledge. The assessor should be neither too lenient nor too harsh. *"The moderator's job is also to evaluate how good the examiners are"*[MR1].

To accomplish proper moderation of the assessors, the moderator should be able to give feedback to the assessors. This can be done individually, for example, by discussing the structuring of the long cases. Feedback should be given before, during and after the assessment. Again, it was suggested that a joint pre-examination meeting may be of value (or even earlier, prior to the assessment), as is done at the post-examination meeting. The moderator should also be able to defuse the situation if such a meeting becomes volatile. Currently the pre-examination meeting is only for the convenors and moderators.

The moderator also needs to show some other qualities necessary for providing guidance to assessors. The moderator should be trustworthy and be able to handle confidential information. S/he must have a strong personality and must believe in what they do but should still be amenable to listen to other views as a member of the team. The moderator should be able to create a strong working environment. *"Be very careful what you say and how you say it"* [MR1]. The moderator should be careful to prevent influencing the way other people think. *"Be careful not to become the examiner"* [MU1]. Therefore, the moderator should always be objective and unemotional, an independent thinker who is not easily swayed by general opinion, except by reasonable argument from the assessor body. The moderator should have good interpersonal skills without any personal bias and must be able to tell someone if s/he is wrong or going off track. The moderator should ultimately stick to the rules, framework and guidelines of the examination body.

4.3.4.2 Theme 2: Ensure fair assessment

The second theme that emerged, namely, **Ensure a fair assessment**, identified the role of the moderator in **Evaluating the fairness, validity and reliability of the assessment** (cf. Table 4.5).

Evaluating the fairness, validity and reliability of the assessment

Data analysis and description: The only category to emerge under this theme was voiced by seven of the assessors and both moderators in this group. Two subcategories were identified, namely, Fairness and Validity and reliability.

Discussion: A moderator should have a very strong sense of fairness to be able to ensure a fair and reliable assessment at the level of a general radiologist. S/he should be able to read the emotions of both the candidate and the assessor during the assessment. The moderator must ensure that no candidate is intimidated and that every candidate is asked the same level of questions. The moderator needs to oversee the assessment process from the beginning to the end, to make a final call on the fairness of the assessment. Ideally, there should be a moderator present at every component of the assessment, although this may not be practically possible. *"I don't think that is necessary, I evaluate the examiner"* [MR1]. The second moderator in the interview group shared the view that the moderator does not need to moderate everything and that moderation through sampling is sufficient.

The final decision on the moderation is not to be taken individually and should be discussed with the other moderators who are involved with the assessment.

The moderator should, furthermore, meet with moderators of other colleges to gather their thoughts and opinions on the level of competency required in current radiology practice, with the ultimate aim of improving the validity and reliability of the radiology summative assessment.

4.3.4.3 Theme 3: Expert

The moderator should be an **Expert** in assessment. The third theme that emerged was identifying **The level of experience and knowledge needed** to be a moderator.

The level of experience and knowledge needed

Data analysis and description: The researcher created this category as a result of comments by nine of the interviewees whose opinions promoted a better understanding of the required scope of experience and knowledge of a moderator. Six subcategories were identified, namely, that a moderator should be at a Higher level of experience in assessments, Higher level of experience in radiology, Higher level of professionalism, be Knowledgeable about the curriculum and the learning outcomes, be Involved with an academic department and be Knowledgeable about the rules and regulations of the examination body.

Discussion: The moderator needs to be more experienced than the assessor in terms of summative assessment as well as radiology. *"Everything that a good assessor should be is essential in a moderator"* [AR1]. S/he should, furthermore, be at a higher level of professionalism if s/he is to garner the respect of assessors who are quite experienced themselves. The moderator *"has to be somebody that's been an examiner for many years"* [AU3]. The moderator should know the curriculum and the learning outcomes to ensure that equal shares of all the different subspecialties are covered in the assessment at the level of a general radiologist. The individual should be academically inclined and involved with academic radiology to realise what the training of registrars in radiology entails. S/he should be aware of the rules of the examination body and what is required by the examination body with regard to training and assessment.

4.3.4.4 *Theme 4: Quality assurance*

Quality assurance, as another role of the moderator, emerged as the fourth theme. Although certain categories were covered to a lesser extent by the remarks of the interviewees, the theme was differentiated into five categories, namely, **Review written questions**, **Review answer sheets**, **Review memorandums**, **Review cases** and **Review rubrics** (cf. Table 4.5).

Review written questions

Data analysis and description: This category was elaborated on more than the other categories in this theme. Five assessors and both moderators voiced their opinions. Three subcategories were identified, namely, The process of reviewing written questions, Reviewing the fairness and level of difficulty and Reviewing the structuring of the written questions.

Discussion: As discussed previously, the moderator has to ensure a fair assessment. S/he has to ensure fair questions and fair marking, evaluate the level of difficulty and ensure reliability by standardising the structure of the assessments to make it replicable at the same level of difficulty. The written paper needs to be balanced with regard to easy and difficult questions, and also needs to cover all subspecialties in the curriculum at the level of a general radiologist. Currently all questions are submitted by the assessors to the convenor, who selects the questions and forwards it to the moderators for moderation. The moderator needs to evaluate that the mark allocation as well as the time allocated per question is appropriate. All questions should be clearly phrased, understandable and not ambiguous.

Review answer sheets

Data analysis and description: Only one assessor mentioned the role of the moderator in evaluating the answer sheets.

Discussion: The moderator should review some of the answer sheets, especially if all the candidates fail a particular question [AR2]. This was confirmed from the theoretical perspectives that were gathered for this study, namely, that the moderator should check the evidence of the candidates to ensure consistency of the assessment (cf. Point 2.6).

Review memorandums

Data analysis and description: Four assessors suggested that the moderator should review the memorandums. The memorandum as a tool will be discussed further under the question pertaining to the tools used in the assessment. Two subcategories were identified, namely, The relevance of reviewing the memorandums and Reviewing mark allocation, level of knowledge and time allocation.

Discussion: Memorandums should be submitted, together with all the questions, to assess the validity, the cognitive level, the mark allocation and the time allocation for the specific question.

Review cases

Data analysis and description: Six interviewees suggested that the moderator should review the cases. Four subcategories were identified, namely, Reviewing the quality of the cases, Reviewing the long cases, Reviewing the short cases and Reviewing the oral cases.

Discussion: All cases to be presented at the orals, rapid reporting and long cases should be reviewed by the moderators prior to the assessment. *"We try to see what cases are going to be shown beforehand"* [MR1]. The long cases need more moderation, to assess the quality of the images and the level of knowledge to be assessed. It is important to standardise the cases at the same level of difficulty, especially those cases that are presented in the orals.

Review rubrics

Data analysis and description: Although the rubrics will be discussed under the question pertaining to the tools used in the assessment, this category pertains to the role of the moderator in moderating rubrics. Only one moderator and no assessors referred to moderation of the rubrics.

Discussion: *"We have to be aware of the rubrics"* [MR1]. The researcher has still not confirmed whether the rubrics are currently moderated at all. The possible limited moderation of rubrics may be due to the recent introduction of rubrics as an assessment tool in the radiology summative assessment.

A summative perspective on the fourth question: The fourth question investigated the roles and qualities of a moderator in the radiology summative assessment. A moderator should give input for approval of assessors, ensure continuity throughout the assessment, ensure that the assessment body is geographically well represented, guide the training of new assessors, evaluate the assessors during the assessment, give feedback to the assessors, be trustworthy, have a strong personality and create a working environment. The moderator should have good interpersonal skills without any personal bias, should adhere to the rules and guidelines of the examination body, have a very strong sense of fairness, oversee the assessment process, meet with other moderators, know the curriculum and the learning outcomes and should be involved with academic radiology. S/he should review a number of the answer sheets, memorandums, cases and rubrics.

4.3.5 Identifying factors that play a role in radiology summative assessment

The fifth question in the interview guide that the researcher asked all the interviewees was: "What are the factors playing a role in the radiology summative assessment?" The responses of all the interviewees were analysed and arranged into themes, categories and subcategories. The themes that were identified were as follows:

- Theme 1: Organisation;
- Theme 2: Motivation;
- Theme 3: Planning ahead; and
- Theme 4: Bias.

The themes, with the coupled categories and subcategories, are presented in Table 4.6 and will be discussed separately. To simplify the reporting each subcategory is followed by the coding of the respondent. Some of the responses may be direct quotes, to enhance the credibility, dependability and confirmability of the study.

TABLE 4.6: IDENTIFYING THE FACTORS PLAYING A ROLE IN THE RADIOLOGY SUMMATIVE ASSESSMENT [Table continues on next pages]

THEMES	CATEGORIES
1. Organisation	Time management <u>Time management during the preparation phase</u> • Responsibility of convenor, not the assessor. [AUR1] • "A lot of planning." [AUR1] • A lot of work goes into planning and organising an assessment. [AR2] • Questions and cases should be submitted timeously to the convenor and the moderators. [AU2] • Time of day not that important. [AUR1]

	• Need to allocate enough time to every component. [MU1] • Currently enough time allocated for all components of the assessment. [AU4] <u>Adhering to the time schedule</u> • Time schedule should run smoothly. [AU3] • Strictly adhere to the time schedule. [AUR2] • Avoid any waiting periods. [AU3] <u>Time allocation for the long cases</u> • Important to allocate enough time to the long cases. [MU1] • Should be enough time allocated to the long cases and not too many images, especially if candidates need to write reports. [AU2] • Time allocation is vital to assess the candidate's ability to manage time, comparable to the real world scenario. [AR1] <u>Time management during the orals</u> • Time management in the orals is challenging if one needs to probe further to assess deeper knowledge. [MU1] • Should be enough time to assess and discuss the candidate. [AU1] • "They are given enough time to discuss." [MR1] • Cannot allocate more time to the orals, to be practical, but would like to spend time with the candidate to discuss the long cases. [AR1] • Other countries may be moving away from the orals to MCQs due to the large number of candidates and not having enough time to conduct the orals. [AU4] The limited number of assessors <u>The public health sector</u> • Limited consultant/registrar ratio may lead to problems. [AUR1] • Limited number of available assessors and moderators. [AUR1] • Currently no backup system for assessors and moderators. [AUR1] • The public health sector is unable to retain experienced consultants, leading to younger assessors in the assessments. [AR1] • Currently many junior assessors. [AUR1] <u>The private health sector</u> • Involve private radiologists. [AUR2] • Incorporate private practitioners into the process. [AUR3] • A larger number of experienced radiologists are working in the private health sector. [AR1] The role of support staff <u>Maintaining service delivery</u> • Need to have enough consultants to be able to host the assessment because service delivery has to continue. [AU4] • A department cannot host an examination without having enough support staff and consultants to continue service delivery. [AR1] • "So we have a lack of staff, I think every department in the country takes a knock during exam time." [AU1] • Service delivery goes down significantly during examination time throughout all academic departments. [MR1] • Book fewer patients for the imaging modalities. [AU2] • Notify all relevant stakeholders about the assessment. [AU2] <u>Transportation of assessors and moderators</u> • Staffing for transport of assessors. [AUR2] • "Shouldn't get delayed by local factors such as transportation, and confusion, going to the wrong centre." [AU1] <u>The role of a floor manager</u> • Floor manager for the clerical work. [AUR2] • "Support staff, making sure that people get whatever they need at the time that they need it." [MU1] • Ensure reliable lines of communication between all relevant parties. [AU2] • Confusion creates anxiety. [AU1]

	<u>The role of IT support</u> • Proper IT support. [AUR2] • Good IT support is very important. [AR2] • Dedicated IT specialist. [AUR3] • Must have enough staff including competent IT support. [AU2] • The summative assessment cannot be conducted without good IT support. [AR1] <u>Ensuring the security of assessment documentation</u> • Make backup copies of written answer sheets and ensure a reliable, secure courier service. [AU2] Ensuring confidentiality • Assessors should submit several questions and should not know which questions are chosen for the assessment. [AU2] • Ensure confidentiality through different levels of access to information. [AU2] • Test IT systems only with mock cases. [AU2] Infrastructural factors <u>The responsibilities of the convenor</u> • Convenor's responsibility. [AUR1] • Convenor is the HOD of the assessment venue as assigned by the examination body. [AUR2] • Need to have sufficient staff, computer facilities and money. [MR1] • Everything needs to run like clockwork or you will be in deep trouble with the candidate body. [MR1] • Entertainment for waiting candidates and assessors. [AUR2] <u>Decentralising the written assessment</u> • Written part should be in the different academic departments. [AUR3] <u>The examination venue setting</u> • Proper directions to examination venues. [AUR2] • Relaxing, non-threatening environment. [AUR2] • Should be as stress free as possible. [AUR3] • The candidates should feel at home. [AU2] • "The noise levels have to be minimal." [AU1] • Should be in a quiet setting. [AR2] • Quiet area, no interruptions. [AUR1] • "No interruptions, the ambient temperature of the room should be good." [AU1] • Infrastructure important, temperature not too hot. [AR1] • Assessment outside of service delivery area. [AUR1] • Outside of service delivery area. [AU2] • Outside of service delivery area. [AU3] • Not in a service delivery area. [AR1] • Fully equipped examination venue. [AU4] • Should have adequate rooms for the orals that are "radiology friendly", ideally with reporting stations. [AU2] • Seating and lighting setup done professionally. [AUR3] • "The lighting has to be good; the chairs have to be comfortable." [AU1] • Comfortable chairs and desks. [AR1] • Clean fresh water, changed every day. [AU1] <u>Computer facilities required</u> • Need a venue with enough computers. [AR1] • Computer laboratory is essential. [AUR1] • Within a computer laboratory. [AUR3] • Smoothly running computer laboratory with good IT support. [AU3] • Must have a properly serviced computer laboratory. [AU2] • The equipment needs to work. [AU1] • Backup computers. [AUR2]

	<u>Digital material required</u> • Digital examination materials as a prerequisite. [AUR2] • Digital images. [AU3] • Simultaneous projection of cases needed. [AUR3] <u>Backup electricity required</u> • Backup electrical power. [AUR2] • Backup electricity supply. [AU3] • Backup generator for electricity. [AU1] • Backup electricity because the assessment is computer driven. [AR1] • Backup electricity easier in one dedicated centre. [AUR3] Financial expenses <u>Financing the expenses of the assessors and moderators</u> • Examination body should cover all expenses. [AU3] • Assessors' expenses should be covered. [AR1] • If the examination body covers the accommodation and travel expenses it is fine. [AR2] • The examination body should cover all accommodation and travel expenses of the assessors. [AU4] • Transport, accommodation, food. [AUR1] • Assessors and candidates provided with basic refreshment needs. [AUR2] <u>Financing of the stationery</u> • Answer sheets and books provided by examination body. [AUR1] <u>The funding of expenses</u> • "It costs. It is not a cheap thing to do." [MR1] • It is difficult to find funding for organising the assessment. [AU2] • Funds are raised from candidates sitting the assessment, which makes a single venue unlikely due to limited funding. [AU4] • Donations should come from private radiology practices to contribute to assessments. [AUR2]
2. Motivation	Assessors and moderators <u>Personal incentives</u> • <i>"labour of love"</i> [AUR1] • <i>"We do it for radiology."</i> [AUR1] • "To make a contribution to a future radiologist." [AUR2] • Some would like to make a positive contribution to radiology training. [AR1] • "I needed to see what the examiners were thinking and how they would be conducting such things." [AR2] • <i>"It is stimulating and part of my work."</i> [AU3] • Assessing is part of my job. [AUR3] <u>Money not an incentive</u> • No financial incentive. [AUR1] • Motivation should never be monetary. [AR1] <u>Prestige as an incentive</u> • Acknowledgement by the examination body. [AUR2] • Involvement in the assessment should enhance reputation, credibility and prestige of the assessor. [MU1] • Some would just want to put it on their CV. [AR1] <u>CPD [continued professional development] points as an incentive</u> • CPD points may contribute to motivating assessors. [AU2] • CPD points, especially ethics points, would motivate assessors. [AR1] • "If I get CPD points it is fine." [AR2] • "We are getting CPD points." [AUR2] <u>Support during the preparation for assessments</u> • Assessment is not a simple process. [AUR1] • "Do all those things while you are running." [AUR2] • Preparation done mostly after hours. [AUR2] • Provide time to assessors for preparation if feasible. [AUR2]

	<u>Collaboration among assessors</u> • Collaboration between assessors may be of value. [AUR2] • Collaboration should be at grass-roots level. [AUR2] • There should be a pool of assessors who assess according to a specific cycle. [AR2]
3. Planning ahead	Identifying future needs <u>Identifying a business plan</u> • Summative assessment, once set up properly, should be a self-sustaining business. [AUR3] • "Requires a huge amount of organisation." [AUR3] • "What equipment we're going to need." [AUR3] • "How it's going to affect the expenses and the service delivery eventually." [AUR3] • "We need to know where we're going to be in 10 years time." [AUR3] • "Predicting what's going to happen, how many more candidates we require to pass." [AUR3] • "How many radiologists do we need in South Africa?" [AUR3] <u>Interacting with the Department of Health to appoint more consultants</u> • Interaction between the Department of Health and universities for future needs is vital. [AUR3] • "I do have faith that the Department of Health has a plan, I think there are good people." [AUR3] • "At the moment we are OK, we manage, but if we need to double the number of radiologists, everything has to shift." [AUR3] • "Universities have to have more consultants in order to train more registrars." [AUR3] • We need more specialists but there are not enough training posts. [AR2] <u>Discussing the relevance of a dedicated examination venue</u> • Not every academic department is able to host the national assessment; a single venue is more likely to run efficiently with fewer apprehensive candidates. [AU3] • May be better to have a properly equipped centre where the assessment can be conducted. [MU1] • "We're thinking of trying to put it into a single venue." [MR1] • One examination venue would be ideal in radiology. [AR2] • Ideal to have an independent, dedicated examination site for the oral part of the examination. [AUR3] • A single examination venue would be the best but it would cost a fortune. [AR1] • "If one is going to have a centre, it has to be planned." [AUR3] <u>Identifying the benefits of a dedicated examination venue</u> • A dedicated, customised, neutral examination venue would be ideal to prevent geographical bias concerns. [AU2] • If only one site, less risk of leaking examination material, better security. [AUR3] • Centralising to one venue removes stress, better IT support, better standardisation, better human resources and better organisation. [MU1] • A single examination venue will contribute to standardisation of the assessment. [AU4] <u>Restructuring the assessment</u> • Written papers and rapid reporting are currently decentralised; consider including the long cases as well. [MR1] • Candidates only then need to travel for the orals or include the long cases with the orals. [MR1] • Candidates should be given access beforehand to the examination software with mock long cases and rapid reporting to familiarise themselves. [AU2]

	<u>Considering a supervision period for junior consultants</u> • Consider advising that if a candidate passed at a certain level, s/he may register, but below that level, must work under supervision for a certain period before registering for independent practice, like internship. [AU2] <u>Ensuring staffing support</u> • Staffing support will likely be needed in future, likely coming from private health sector or other centres. [AR1] <u>Considering more super-specialisation in radiology</u> • We need more opportunities to subspecialise in South Africa but the service delivery component is too big with not enough staffing and equipment resources. [AR1] • Worldwide there is a trend towards becoming more super-specialised and that is what is needed in this country. [AR2] • One will become more competent if one spends more time in a particular field of interest. [AR2] • In the old days a general radiologist would have sufficed, but now, one needs to super-specialise to be able to give a sensible report. [AR2] • The focus is constantly changing, both in the public and private health sectors, because of the vast amount of available knowledge. [AR2] • Super-specialisation should come after qualifying as a general radiologist. [AR2]
4. Bias	The possibility of geographic bias • No bias in terms of geographic centres. [AR1] • Have heard comments that to pass in a specific geographic location is "well done", but there is no truth in that. [AU4] • Theoretically there should be no difference because it is the same set of assessors that would assess at different geographic locations. [AR1] The possibility of assessor and moderator bias • The summative assessment is fair and objective. [AR1] • The faculty is representative of all academic departments and sectors. [AU4] • Nobody wants to fail a candidate, there is no bias; they want to pass a safe candidate. [AR2] • "I didn't experience prejudice among examiners." [AR2] • "By and large I thought that people were fair in the exam, the way they conducted it." [AR2]

4.3.5.1 Theme 1: Organisation

The first theme, namely **Organisation**, identified factors that play a role in the organisation of a radiology summative assessment. Six categories emerged for organisation factors, namely, **Time management**, **The limited number of assessors**, **The role of support staff**, **Ensuring confidentiality**, **Infrastructural factors** and **Financial expenses** (cf. Table 4.6).

Time management

Data analysis and description: Ten interviewees mentioned factors related to time management of the assessment. Four subcategories were identified, namely, Time

management during the preparation phase, Adhering to the time schedule, Time allocation to the long cases and Time management during the orals.

Discussion: A lot of work goes into planning and organising the summative assessment. Questions and cases should be submitted timeously to the convenor and the moderators to ensure moderation well in advance of the assessment. Time management during the assessment is the responsibility of the convenor and not the assessors or the moderators. Waiting periods should be avoided as far as possible. During the assessment it is very important to adhere strictly to the time schedule to ensure reliability of the assessment and fairness towards the candidates. Therefore, it is important that adequate time should be allocated to every component of the assessment, especially the long cases.

Images in the long cases should be limited to provide enough time for the candidates to write proper reports, keeping in mind that, in the real-world scenario, most candidates report via digital recordings or voice recognition. The correct time allocation is vital to assess the candidate's ability to manage time properly in relation to the real-world scenario.

Time management may be challenging if the assessors need to probe further during the orals to assess deeper knowledge. After completing an oral session there should be enough time for the assessors to discuss the candidate. Currently it would not be practical to allocate more time per oral session. *"They are given enough time to discuss"* [MR1]. A possible solution may be to have a discussion with the candidate around one or more of the long cases. Other countries may be moving away from the orals to multiple choice questions due to the large number of candidates that they need to assess and lack of time and resources to conduct the orals. Enough time should also be set aside at the post-examination meeting to discuss candidates, especially those who failed.

The limited number of assessors

Data analysis and description: Four assessors mentioned the limited number of assessors as a factor that plays a negative role in the summative assessment. Three of the assessors work in the public health sector and have limited private practice experience, and the fourth is in full-time private practice. Two subcategories were identified, namely, The public health sector and The private health sector.

Discussion: The limited consultant/registrar ratio in many academic departments may lead to challenges in the future training of registrars. This unfavourable ratio is not limited only to radiology. The public health sector is unable to retain experienced consultants, leading to younger assessors involved in the assessments. This creates a domino effect, with a smaller number of available, experienced assessors and moderators in the summative assessment. Currently no backup system exists if an assessor or moderator has to withdraw from an assessment at short notice. The greatest number of radiologists is working in the private health sector. For this reason it has become important to involve privately practicing radiologists in the radiology summative assessment.

The role of support staff

Data analysis and description: Nine of the interviewees made remarks on the relevance of support staff in conducting the summative assessment – seven were assessors and two moderators. Five subcategories were identified, namely, Maintaining service delivery, Transportation of assessors and moderators, The role of a floor manager, The role of IT support and Ensuring the security of assessment documentation.

Discussion: *"So we have a lack of staff, I think every department in the country takes a knock during exam time"* [AU1]. Providing sufficient qualified staff for the summative assessment is another challenge that is faced by several of the academic departments responsible for hosting the summative assessment. Providing sufficient support is critical for the successful hosting of the assessment. Confusion should be prevented at all times as this creates anxiety for candidates, assessors and moderators. Therefore it is of great importance to ensure that all the processes in the summative assessment run smoothly. Support staff is needed to guarantee the timely and correct transportation of the assessors and moderators so that they don't report to the wrong destination.

Furthermore, supporting staff members are responsible for providing any other resources that may be required by the assessors and moderators. *"Support staff, making sure that people get whatever they need at the time that they need it"* [MU1]. Reliable lines of communication should be maintained constantly between all relevant parties. A floor manager should be appointed to supervise all relevant clerical work. Backup copies need to be made of all the answer sheets that form part of the written part of the assessment prior to the answer sheets being couriered, via a reliable courier service, to the assessment

body. This is relevant because the written part of the assessment is conducted within the constituent academic departments.

The hosting department should have sufficient consultants to continue with service delivery even while conducting the summative assessment. It has been noted that service delivery tends to reduce during the assessment period, probably because fewer patients are booked for radiological investigations. The reason for this may be that the clinical disciplines are running their assessments concomitantly with the radiology summative assessment. Regardless, it is important to notify the management of the institution where the assessment will be conducted, as well as all other relevant stakeholders, of the upcoming assessment.

Proper IT support is of the essence and should be assigned to a well qualified IT specialist who is capable of functioning independently. In the current scenario the summative assessment will not be able to continue if the IT support should fail at any time before or during the assessment.

Ensuring confidentiality

Data analysis and description: The issue of confidentiality was mentioned by only one assessor. Perhaps this matter drew very little attention because it is taken for granted.

Discussion: Confidentiality can be ensured by arranging different levels of access to information. IT systems should only be tested with mock examination cases. All the assessors should submit several questions and should not be aware which questions are chosen by the convenor and the moderators for the assessment. Obviously, if the confidentiality of the assessment material should be breached at any point in time, it is likely to have major legal repercussions.

Infrastructural factors

Data analysis and description: This category emerged from the opinions of nine of the interviewees. Six subcategories were identified, namely, The responsibilities of the convenor, Decentralising the written assessment, The examination venue setting, Computer facilities required, Digital material required and Backup electricity required.

Discussion: Providing the infrastructure is the sole responsibility of the convenor, who is currently the HOD of the academic department that is assigned by the assessment body to host the assessment. It has already been mentioned that the hosting department needs to provide sufficient staff, computer facilities and also financial support to host the assessment. The latter will be discussed in one of the following categories.

A properly serviced computer laboratory with enough computers is essential for the practical part of the assessment that currently involves the simultaneous presentation of multiple images to the candidates. For this reason it is essential that all images should be in a digital format. This session involves the long cases and the rapid reporting (short cases). The rapid reporting cases may also form part of the written part of the assessment, which is conducted in the constituent academic departments. There should be sufficient backup computers that are immediately functional if any computer should fail during the assessment. The venue should have a backup electricity supply in the case of a power failure, with an uninterruptible power supply (UPS) linked to every computer station, so that the transfer to and from the backup electricity supply can go unnoticed. It was mentioned by one of the interviewees that it would be easier to provide backup electricity if the assessment body had a dedicated examination venue to conduct the summative assessment. This will be discussed in one of the follow-up categories.

The examination venue should have an adequate number of rooms for the orals. These rooms should be radiology friendly, ideally with reporting stations to simulate the real-world scenario. The candidates should feel at home. The environment should be as stress free as possible. The seating, desks and lightning of the examination room should be done professionally so that it is adequate and comfortable. *"The lighting has to be good; the chair has to be comfortable"* [AU1]. The environment should be relaxing and non-threatening, with a comfortable ambient temperature. The assessment should be conducted outside of a service delivery area, with no background noise. The noise levels within the examination rooms before and during the assessment should also be kept to the minimum. No interruptions should be allowed during the assessment. Clean, fresh water should be available at all times and should be changed daily. Some form of relaxing entertainment may be valuable for waiting candidates, assessors and moderators.

Online maps should be available with clear, understandable directions to the examination venue. By making use of online mapping software (e.g. Google Maps) and global positioning system (GPS) coordinates, it should not be a challenge to provide the exact

location to the candidates. Proper directions should be visible at the examination venue to guide candidates, assessors and moderators from the entrance of the venue towards the assessment rooms.

Financial expenses

Data analysis and description: This category emerged from the opinions of eight interviewees (seven assessors and one moderator). Three subcategories were identified, namely, Financing the expenses of the assessors and moderators, Financing of the stationery and The funding of expenses.

Discussion: The assessment body should cover the accommodation, transport and food expenses of the assessors and moderators, as well as any basic refreshment needs that may arise. All answer sheets, books and relevant stationery should be provided by the examination body. *"It costs. It is not a cheap thing to do"* [MR1]. It is difficult to find funding for conducting the summative assessment. Funding mainly comes from the examination fees that are paid by the candidates who are attempting the assessment. Consequently it is unlikely that a single examination venue will be available in the current setting. (This matter will be discussed in more depth in one of the following categories.) One assessor suggested that donations may be asked from private radiology practices, because most of the successful candidates end up in the private health sector, making private practices the biggest end user of the summative assessment.

4.3.5.2 Theme 2: Motivation

The second theme, namely **Motivation**, emerged from comments about the only category in this theme, namely, the current motivation of **Assessors and moderators** (cf. Table 4.6) who take part in the summative assessment and motivate other radiologists to become involved in the assessment.

Assessors and moderators

Data analysis and description: Eight of the interviewees made comments related to the motivation of assessors and moderators. Six subcategories were identified, namely, Personal incentives, Money not an incentive, Prestige as an incentive, CPD points as an

incentive, Support during the preparation for assessments and Collaboration among assessors.

Discussion: Every assessor and moderator has different incentives for becoming involved with the summative assessment. Incentives include an interest in understanding the assessment process, contributing to the field of radiology, finding it intellectually stimulating, considering it a "*labour of love*" [AUR1] or just because it is part of a consultant's responsibilities. A number of individuals do it for the prestige of being an assessor or moderator of the summative assessment, and for the acknowledgement given by the examination body. It may enhance one's reputation and credibility and can be reported on a curriculum vitae (CV). Furthermore, an assessor and moderator may earn CPD points, of which highly valued ethical points appeal to a number of individuals.

Assessment is not a simple process. Preparations for the assessments are mostly done after hours. "*Do all those things while you are running*" [AUR2]. For this reason it would be ideal if time could be allocated to assessors during normal working hours to fulfil their responsibilities and prepare for the assessment. Collaboration between assessors at grass-roots level may also be of value in guiding junior assessors and to rotate assessors according to a specific cycle. There is no financial incentive for assessors and moderators, nor should there be any monetary motivation, as this may attract the wrong individuals for the wrong reasons to the assessments.

4.3.5.3 Theme 3: Planning ahead

The third theme, namely, **Planning ahead**, that emerged from asking the question about factors playing a role in the summative assessment, lead to one category, namely, **Identifying future needs** (cf. Table 4.6) for the summative assessment.

Identifying future needs

Data analysis and description: This category emerged from the opinions of eight of the interviewees. Eight subcategories were identified, namely, Identifying a business plan, Interacting with the Department of Health to appoint more consultants, Discussing the relevance of a dedicated examination venue, Identifying the benefits of a dedicated examination venue, Restructuring the assessment, Considering a supervision period for

junior consultants, Ensuring staffing support and Considering more super-specialisation in radiology.

Discussion: The summative assessment, once set up properly, should be a self-sustaining business. This *"requires a huge amount of organisation"* [AUR3]. For this to happen, the examination body will first have to predict how many candidates will be required to pass in the future. Furthermore, we will have to predict what equipment we will need to assess the candidates and how this will affect the expenses of the assessment as well as service delivery while conducting the assessment. *"We need to know where we're going to be in 10 years time"* [AUR3]. Another question that needs to be addressed is: *"How many radiologists do we need in South Africa?"* [AUR3].

Therefore, interaction between the Department of Health and the universities is vital. *"I do have faith that the Department of Health has a plan, I think there are good people"* [AUR3]. At the moment the examination body is able to cope with the current demand for assessment of candidates, but if the demand for more qualified radiologists should increase, the current system will have to be reviewed and improved. This necessitates an increase in the number of radiology consultants in academic departments as well as an increase in the number of registrars.

One of the considerations would be to have an independent examination site for the long cases and oral part of the radiology assessment. *"We're thinking of trying to put it into a single venue"* [MR1]. Not every academic department is able to host the national assessment; a single venue is more likely to run efficiently with fewer apprehensive candidates. *"If one is going to have a centre, it has to be planned"* [AUR3]. A dedicated, customised, neutral examination venue would be ideal to prevent geographic bias concerns. With one site there will be less risk of examination material leaking, and security will be better.

Centralising to one venue will remove some of the stress, provide better IT support, enable better utilisation of human resources and contribute to better standardisation with better organisation of the assessment in general. The challenge of a centralised examination venue lies in the fact that it will probably be very expensive to set up and to maintain.

The written papers and rapid reporting are currently decentralised and the examination body is considering doing the same for the long cases. Candidates would, in future, only

need to travel for the orals. An alternative would be to include the long cases with the orals, but the practicality of this would be questionable because the time needed for the orals would increase exponentially. Candidates should be given access to the examination software prior to the assessment with mock long cases and rapid reporting, to familiarise themselves with the software and examination technique. This will decrease the level of anxiety experienced during the assessment and improve the standardisation of the assessment. Staffing needs for conducting the summative assessment are likely to increase in future.

Another consideration for the future is the possibility that, if a candidate passes the assessment at a certain level, s/he may be allowed to register immediately for independent practice, but if s/he passes below the determined level, s/he should work under supervision for a certain period of time, similar to internship.

The focus on the level of radiology training is constantly changing, in both the public and private health sectors, because of the vast amount of knowledge available. We need more specialists but there are not enough training posts. A radiologist will only become more competent if s/he spends more time in a particular field of interest. In the past a general radiologist would have sufficed in the bigger centres but in recent times a radiologist needs to super-specialise if s/he is to be able to give a sensible report.

Super-specialisation has become a worldwide trend. Therefore, more opportunities are needed for subspecialisation in South Africa, however, the service delivery demand is huge while there are not enough staffing and equipment resources. Super-specialisation should only be considered after qualification as a general radiologist.

4.3.5.4 Theme 4: Bias

The fourth theme to emerge, namely **Bias**, is quite a sensitive one, but very important. The discussion on bias developed from the opinions of a number of interviewees, including assessors and candidates (who participated in the interviews, as reported on in Chapter 5). Two categories emerged, namely, **The possibility of geographic bias** and **The possibility of assessor and moderator bias** (cf. Table 4.6).

The possibility of geographic bias

Data analysis and description: Two assessors mentioned geographic bias during the interviews. One works in the public health sector and one in the private health sector.

Discussion: The assessors refuted the possibility of geographic bias. Theoretically there should be no difference between assessors coming from different geographical sites, because the same set of assessors assess at different geographic locations over a certain period of time. Furthermore, the assessment is structured in such a manner that the candidates are anonymous to the assessors when they are marking the scripts for the written questions, as well as for the long cases and rapid reporting. The candidates are also anonymous when they are presented for the orals, except when they are identified according to their examination number during the orals for the purpose of allocating the marks. Finally, no candidate is assessed by an assessor representing his/her own institution during the oral part of the assessment. Even during the post-examination meeting, candidates' marks are reviewed anonymously. It is only during an in-depth discussion of failing candidates that a candidate may be identified at the post-examination meeting by the representative of the parent department.

The possibility of assessor and moderator bias

Data analysis and description: This category flowed from the above-mentioned discussion, but as a separate category. Only three assessors made remarks relevant to this category.

Discussion: The faculty represents all academic departments and sectors to ensure that the summative assessment is fair and objective. No assessor wants to fail a candidate unless s/he is unsafe. *"I didn't experience prejudice among examiners"* [AR2].

A summative perspective on the fifth question: The fifth question was asked in order to identify the factors that are particularly relevant to the summative assessment. Factors that were identified included timeous submission of the questions and cases to the convenor and the moderators for moderation, and time management by the convenor according to a strict schedule, with enough time allocated to the post-examination meeting to discuss candidates, especially those who failed. Other factors included the inability of the public

health sector to retain experienced consultants, which means that more junior assessors are involved in the assessments. No backup system exists if an assessor or moderator has to withdraw from an assessment at short notice. The need to involve private radiologists in the radiology summative assessment was addressed.

Matters raised included the roles of sufficient support staff during the assessment, reliable lines of communication, the role of a floor manager, making backup copies of answer sheets, having sufficient consultants to continue service delivery, notifying all stakeholders about the assessment, proper IT support, ensuring confidentiality, providing sufficient infrastructure and a stress-free, comfortable, quiet environment, proper directions to the venue, defraying financial expenses, supporting the assessors and planning for future needs with suggestions to address future challenges. Finally, it was confirmed from the findings that there is no geographic or assessor bias in the assessment process.

4.3.6 Identifying assessment methods, instruments and tools to be used in the radiology summative assessment

The sixth question in the interview guide that the researcher asked to all the interviewees was: "What assessment methods, instruments and tools do you think should be used in the radiology summative assessment?"

The responses of all the interviewees were analysed and arranged into themes, categories and subcategories. The themes that were identified were as follows:

- Theme 1: Evaluation of an end product;
- Theme 2: Questioning; and
- Theme 3: Tools.

The themes with the coupled categories and subcategories are presented in Table 4.7 and will be discussed separately. To simplify the reporting each subcategory is followed by the coding of the respondent. Some of the responses may be direct quotes to enhance the credibility, dependability and confirmability of the study.

TABLE 4.7: IDENTIFYING ASSESSMENT METHODS, INSTRUMENTS AND TOOLS TO BE USED IN THE RADIOLOGY SUMMATIVE ASSESSMENT [Table continues on next pages]

THEMES	CATEGORIES
1. Evaluation of an end product	The portfolio <u>The purpose of a portfolio</u> • Aim would be to inculcate a certain trend in our registrars. [AU1] • Portfolio is useful to show proof of continued performance. [AU4] <u>Standardisation of the portfolio according to a pro forma</u> • Should set a minimum standard. [AUR1] • Should be standardised. [MU1] • Should set a specific standard nationally. [AUR1] • "There should be a pro forma made available at the very beginning of the training process." [AUR3] • Should include different categories. [AUR3] • Every consultant should mentor a number of registrars to endorse certain qualities in the portfolio. [AU1] <u>The portfolio serves as an adjunct to a CV</u> • May contribute as an "extended curriculum vitae". [AUR2] • To present everything that one did to add to one's CV. [AUR3] • Portfolio may be a good adjunct. [AU3] • Good to have for a CV but not important for the summative assessment. [AR1] The research project <u>The purpose of a research project</u> • "Academia goes with research." [AU2] • "In principle it's an excellent exercise." [AUR3] • Main aim is to teach candidates how to do research. [AUR2] • The aim is to learn how to do research and to critically appraise published research, the process of conducting the research project is more important than the end result. [AR1] • Research is important to learn critical thinking. [AR2] <u>Encouraging collaboration between academic departments</u> • Encourage collaboration between national academic departments. [AUR2] • Encourage collaboration between international academic departments. [AUR2] <u>Standardisation of the research project</u> • "There is no standard." [MR1] • Identify similar outcomes. [AUR1] • Should be standardised and progress monitored. [AU4] • Should be standardised, what is expected, how it should be evaluated. [MU1] • "HODs need to sit down and work out standardisation for the M.Meds." [MR1] • Organise a workshop on standardising the research project, aimed at radiology. [AU2] <u>The managerial body of the research project</u> • "Would be the responsibility of the university." [AU1] • "The research project is a function for the university to control." [MR1] • Different universities may not agree. [MU1] • Cannot prescribe to universities. [AUR1] • "Has to be taken to the deans of the faculties and that needs to be put through the universities' research departments." [MR1] <u>Challenges in setting a standard</u> • Some supervisors have themselves not done a lot of research. [AUR3] • Currently not enough supervisors in the public health sector to accommodate too high a standard for the research project. [AR1]

	• Challenging because of limited staffing, lack of experience in research and the demands of service delivery. [AU2] • "You need to be well staffed." [AU1] • Adds a tremendous workload to the system. [AUR3] • Challenging to identify research topics in radiology. [AU3] <u>Considerations in doing the research project</u> • Do something that is manageable. [AUR3] • Research project should be done early in the training period. [AU3] • Research should be publishable or no point in doing it. [AUR3] <u>The relevance of a departmental research committee</u> • Research topics should be discussed at a departmental research meeting for approval and planning. [AU3] • "Set up a dedicated research committee not involved in clinical service delivery, not involved in teaching, only to develop research projects." [AU1] • Identify panel-accepted topics beforehand, allocate according to interest, prioritise early in training period and try to build on previous research. [AU4]
2. Questioning	Essay-type questions <u>The purpose of essay-type questions</u> • Main aim to evaluate higher levels of cognitive thinking. [AUR1] <u>Drawbacks of essay-type questions</u> • Marking is more challenging. [AUR1] • Essay-type questions should not be used because it is difficult to mark and to defend. [AU4] • More difficult to defend. [AUR1] • Are cumbersome for the candidate, extremely difficult to mark and usually unstructured. [MR1] • Does not cover the curriculum. [AUR2] <u>The relevance of essay-type questions in the current setting</u> • Do away with long essays. [AU1] • Make use of multiple instruments. [AU1] • Essay questions do not work; too risky. [AU3] • Essay-type questions are not fair. [AR2] Short questions <u>The relevance of short questions in the current setting</u> • Currently too much "list and tabulate" questions. [AUR1] • "We should have fairly short questions." [AUR3] • Change to multiple shorter questions, making up 25 marks. [AU1] • Short-type questions are preferred. [AU4] • Short questions are fine. [AR1] <u>The benefits of short questions</u> • Easier to defend. [AUR1] • "Easy for the assessor to mark." [AU1] <u>Short questions assessing a wide spectrum of knowledge</u> • Short questions give scope for knowledge testing. [MR1] • Written papers should test wide knowledge. [MU1] • Short questions enable the assessors to assess a wider spectrum of knowledge. [AU2] • Shorter questions are better to get an impression of the candidate's overall knowledge. [AR2] <u>Short questions assessing insight</u> • Simple questions can be asked to assess insight in practical hands-on skills, imaging protocols and methodologies. [AU2] • Better to integrate in the questions, clinical scenarios that are encountered in daily practice, to assess clinical insight and the higher levels of the cognitive domain. [AR2]

Multiple choice questionsThe benefits of MCQs

- Marks easily. [AUR1]
- Easier to defend. [AUR1]

Assessing a wide spectrum of knowledge

- Wide coverage of curriculum. [AUR1]
- Can assess a wide range of knowledge. [MR1]
- MCQs help to assess wide knowledge. [AU2]
- Can assess many different topics with MCQs, a wider spectrum of knowledge. [AR1]
- MCQs should be utilised more often to assess a wide range of knowledge. [AU4]
- "MCQs are very difficult because you need a vast amount of knowledge to answer and to compile." [AR2]

Drawbacks of MCQs

- MCQs are difficult to compile. [AU3]
- MCQs are terribly time consuming and laborious. [AUR3]
- With MCQs it may be difficult to assess insight. [AU1]
- Cannot assess insight. [MR1]

The structuring of MCQs

- Should be compiled correctly. [AUR1]
- Should be properly structured. [AU2]
- Should be correctly structured. [AU3]
- Must be able to test higher levels of cognitive domain. [AUR1]
- Should assess deeper theoretical knowledge. [AUR2]

The preferred type of MCQ

- The single-best-answer type of MCQs is the preferred one. [MR1]
- Single-best-answer MCQs are easy to mark but most difficult to set. [MR1]

Other considerations in setting MCQs

- "The bank of questions has to be maintained." [AUR3]
- MCQs influence how candidates study for the examination. [AUR3]
- May include images with MCQs. [AU1]

OralsThe relevance of the orals

- Should keep the orals. [AR1]
- Almost never a huge discrepancy between the orals and the other instruments. [AUR3]

The purpose of the orals

- Important to observe the candidate. [AUR1]
- Evaluate performance under pressure. [AUR1]
- Aim is to see how someone thinks on their feet (reflexive competence). [MU1]
- Aim is not to only assess observation skills but to see if s/he can think out of the box. [AR2]
- Aim is to assess structured reasoning skills. [AUR2]
- Useful to assess communication and structured reasoning. [AUR3]
- Our assessment is multi-tiered to identify structured reasoning skills. [AU1]
- Aims to assess a structured, logical approach. [MU1]
- Aim is to assess deeper knowledge and not to present "Aunt Minnies". [AUR2]
- Oral should be aimed at assessing deeper levels of knowledge, including the further management of the patient. [AR2]
- To assess clinical insight and verbal communication. [MU1]

The structuring of the orals

- "Maybe an oral isn't always very well structured, maybe not always well standardised, but it is very important." [AU1]
- Cases should be relevant to general available technology and infrastructure. [AUR1]

	• Oral should cover a wide range of domains to assess good general knowledge of radiology. [AU3] • Should be cases to extract more insight from the candidate. [MR1] • The aim is not to push the candidate through as many cases as possible. [AR1] • Should not be a repetition of the rapid reporting. [MR1] • Shouldn't be just "up and down" of cases. [MU1] • More time is needed in the oral to assess in-depth knowledge. [MR1] • Start with basic common cases and gradually build to more challenging cases. [AU2] <u>Drawbacks of orals</u> • May be very stressful for the candidate. [AUR3] • Orals are very stressful but remain an important instrument as long as we can manage the numbers of candidates to be assessed. [AU4] • Running out of time, the assessors may be unsure whether to pass or fail the candidate due to incomplete oral assessment or discussion. [MU1] • Be wary of potential bias. [AUR3] <u>Other considerations regarding the orals</u> • Should not misinterpret lack of confidence for lack of knowledge. [AU2] • A mock examination may help to reduce anxiety associated with the oral. [AU2] The long cases <u>The purpose of the long cases</u> • "gives the greatest insight" [MR1] • Function as a form of simulation. [AUR1] • Also observation (skills) needed. [AUR1] • Observation and communication. [AU1] • Assesses observation of findings, synthesis of knowledge and integration with clinical scenario, including written communication skills. [MU1] • Long cases assess observational skills, structured approach and speedy, concise report writing. [AU3] • "It tests whether the candidate can pick up certain signs and generate a structured report." [AU1] • Important for assessing the writing and structuring of reports. [AUR2] • Assesses how the candidate communicates with the clinician. [MR1] • Will help to assess the communicator role and interpersonal skills. [AUR1] • Evaluate competency (knowledge, skill and aptitude). [AUR1] <u>Challenges in presenting the long cases</u> • Challenging to put together. [AUR3] • Challenging for assessor to prepare. [AUR1] • More moderation required regarding quality and level of long cases in the assessment. [AUR3] • Should be timeously submitted electronically for proper moderation. [AUR3] <u>Presenting the long cases to the assessors</u> • Preferably write written reports and then come and present the long cases to the assessors in a structured format. [AU2] • Should present to a panel of assessors. [AUR1] • Can also be presented verbally to answer the clinical question. [MU1] • Would like to discuss one long case in depth with the candidate to be able to assess reasoning skills, logical thinking and clinical insight. [AR1] • It would be a good idea if the long cases can become part of the orals. [AU4] • Can be incorporated into the oral to defend his/her report with the aim of assessing further insight. [MR1] <u>Other considerations regarding the long cases</u> • Try to minimise the number of images. [MR1] • Use cases that they will be coming across on a day-to-day basis. [MR1]

	The rapid reporting <u>The purpose of rapid reporting</u> • Aim is to assess basic observational skills to identify a baseline safe radiologist. [AUR2] • Good to assess observation skills. [AR1] • Assesses observation skills on daily common cases. [AU3] • Rapid reporting should assess the observation skills, based on day-to-day emergency cases. [MU1] • To assess the classical appearances of pathologies. [AR2] • Rapid reporting is good to assess making instant diagnoses. [AU4] <u>The benefits of rapid reporting</u> • Easier to select short cases and mark. [AUR1] <u>Ensuring the validity and reliability of rapid reporting</u> • Cases should be up to date (time context). [AUR1] • "Ensure that it is valid and reliable." [AU1] <u>Ensuring fairness</u> • "Rapid reporting shouldn't be a trap door." [AU1] • "It should be fair, it should be clear, it should be one diagnosis and it should be an emergency." [AU1] <u>The cognitive level of rapid reporting</u> • The assessors should agree on the level of difficulty of the cases and all cases should be a specific diagnosis. [AR1]
3. Tools	Rubrics <u>The relevance of rubrics</u> • One should adhere to it. [AU1] <u>The legal benefits of rubrics</u> • Easier to defend. [AUR1] • May act as a legal document for the orals. [AUR3] <u>The structuring of rubrics</u> • Very useful if properly designed, from an educational perspective. [MU1] • The structuring of the rubric is very important. [MR1] • Should be simple and not oversophisticated. [AUR3] • Holistic rubrics work very well. [MR1] • Rubrics are too stringent if it is analytical; better to have a holistic rubric in radiology assessment. [AU3] • Analytic rubric only useful if assessing a list of positive findings, but the holistic rubric is more useful to assess findings and insight. [AU3] <u>Rubrics contribute to making a decision</u> • "They offer guidelines to people who are not robots." [MR1] • Rubrics may help to guide the assessor in making a definite decision and identify guessing by the candidate. [AU2] • Forces assessor to make a final, definite decision. [AUR1] • Rubrics do help to come to a definite decision. [AU4] • Rubrics are useful to guide the assessor to come to a definite decision and to standardise the assessment. [AU3] <u>Rubrics improve the standardisation and reliability of the assessment</u> • A rubric is a very good guide to standardise the assessment. [AR1] • Helps to standardise the assessment. [MR1] • Improves reliability of assessment. [AUR1] <u>Rubrics identify detail and gaps in knowledge, but remain time consuming</u> • Rubrics are helpful to identify gaps in knowledge on specific imaging modalities but take time to complete. [AR2] • Is important to assess the details of an oral assessment. [MR1] Memorandums <u>The relevance of memorandums</u> • Should be defensible. [AUR1] • Without a memorandum it becomes a non-quantitative assessment. [AUR3]

	• The memorandum presents the information that would be expected in a text book. [AR2] <u>The benefits of memorandums</u> • Prevents bias. [AUR3] • Ensures proper time management per question. [AUR3] • Improves reliability by assessing the correct level of knowledge. [AUR3] <u>Auto internal moderation</u> • Auto internal moderation (self re-marking) necessary. [AUR1] • Adapt memorandum when necessary. [AUR1] • Memorandum cannot be rigid at postgraduate level and should be seen as a guideline. [MU1] • The memorandum can be expanded if a candidate responds with a valid, proven fact. [AU3] • The memorandum should be adapted if a fact is verified and the assessor learns from the candidate. [AR1] • Model answer is a goal, not reality. [AUR1] <u>The structuring of memorandums</u> • Should be structured and clearly show specific allocation of marks. [AU4]

4.3.6.1 Theme 1: Evaluation of an end product

The first theme to emerge from the question fell in the domain of the **Evaluation of an end product**. Two categories relevant to the current radiology context emerged, namely, the evaluation of **The portfolio** and **The research project** (cf. Table 4.7). The examination body currently requires the submission of a portfolio prior to admission to the summative assessment. Furthermore, the presentation of a dissertation or publication, as proof of a research project, is required to register as a radiologist in independent practice.

The portfolio

Data analysis and description: Seven assessors and one moderator voiced opinions on the portfolio as an assessment instrument. Three subcategories were identified, namely, The purpose of a portfolio, Standardisation of the portfolio according to a pro forma and The portfolio serves as an adjunct to a CV.

Discussion: The purpose of the portfolio is to present everything (academic presentations, posters, attendance of conferences etc.) that the candidate has attended or presented, and to demonstrate how the candidate has progressed during the training period. The portfolio should be presented according to a specified, prescribed format, *"a pro forma made available at the very beginning of the training process"* [AUR3], to standardise the portfolio nationally. A minimum standard should be set to include different categories with the aim of inculcating a certain trend among the registrars. Every consultant should mentor a number of registrars to endorse certain qualities in the portfolio. The portfolio will then

function as a conclusive document that shows proof of continued performance and it will finally be a good adjunct to the candidate's CV.

The research project

Data analysis and description: All the interviewees in this group expressed opinions stating that the research project was a prerequisite for registration as a radiologist. Seven subcategories were identified, namely, The purpose of a research project, Encouraging collaboration between academic departments, Standardisation of the research project, The managerial body of the research project, Challenges in setting a standard, Considerations in doing the research project and The relevance of a departmental research committee.

Discussion: At first, it was noted that a national standard is required to evaluate the level of the research project, because *"there is no standard"* [MR1]. It was advised that the HODs should compile a standardised document to determine the requirements for an acceptable research project. This can be achieved by organising a workshop on standardising the research project aimed specifically at radiology. Such a document should include guidelines on what is expected from the research project as well as the assessment of the research presented. Although nobody should prescribe to universities, it may be relevant to take such a unified document to the deans of the faculties so that it can be reviewed by the relevant research departments. It is possible that universities may disagree, but the aim would be to identify similar outcomes. In the researcher's opinion it may not be necessary to present such a standardised document to the universities or deans of the faculties, because all research projects have to be approved by the relevant ethics committees – this approval will function as a quality control mechanism.

The research project should be done early in the training programme. Ideally, the research project should be publishable, but the focus should remain on the main reason for conducting the research. One of the interviewees was of the opinion that the main aim of the research project as part of the radiology training programme is to teach registrars how to conduct research and to appraise published research critically. The interviewee stressed that the process of conducting the research project is more important than the end result [AR1]. *"In principle it's an excellent exercise"* [AUR3].

One of the challenges of doing research in a radiology department is the fact that it adds a tremendous workload to the system. Other challenges include limited staffing, lack of

experience in research and the demands of service delivery. *"You need to be well staffed"* [AU1]. Some supervisors themselves do not have a lot of experience in conducting research. Currently, there are not enough supervisors in the public health sector to accommodate too high a standard for the research project; therefore, the candidate should attempt a project that is manageable.

Furthermore, it is challenging to identify research topics in radiology. This can be resolved, as suggested by one of the assessors: *"Set up a dedicated (in-house) research committee not involved in clinical service delivery, not involved in teaching, only to develop research projects."* [AU1]. This would probably be the responsibility of the universities and not of the Department of Health, although it should be aligned with the research guidelines and priorities of the Department of Health. *"The research project is a function for the university to control"* [MR1]. One of the purposes of such a committee would be to discuss research topics at a joint departmental meeting for approval and planning. The committee should monitor the progress of the different research projects and identify topics that may be able to build on previous research.

"Academia goes with research" [AU2]. It is therefore relevant that radiology departments should encourage collaboration between national academic departments and international academic departments.

4.3.6.2 Theme 2: Questioning

The second theme, **Questioning**, relates more directly to the type of instruments used during the written and practical parts of the summative assessment. Six categories emerged, namely, **Essay-type questions**, **Short questions**, **Multiple choice questions**, **The orals**, **The long cases** and **The rapid reporting** (cf. Table 4.7).

Essay-type questions

Data analysis and description: The first category refers to the relevance of essays as an assessment instrument and was mentioned by seven of the interviewees. Three subcategories were identified, namely, The purpose of essay-type questions, Drawbacks of essay-type questions and The relevance of essay-type questions in the current setting.

Discussion: The main aim of essay-type questions is to assess the higher levels of the cognitive domain. Essay-type questions are cumbersome for the candidates to answer and usually lead to an unstructured response. The general sentiment was that essay-type questions are unfair. The problems that arise with this type of questioning are that the marking is much more challenging and it is much more difficult to defend the model answer. Furthermore, by asking only essay-type questions it becomes highly unlikely that the assessor will be able to cover the curriculum. For these reasons essay-type questions have been abandoned by the examination body and the decision was taken to make use of multiple assessment instruments instead.

Short questions

Data analysis and description: The next category to emerge was short-type questions as assessment instrument. This was raised by seven assessors and both moderators who were part of this interview group. Four subcategories were identified, namely, The relevance of short questions in the current setting, The benefits of short questions, Short questions assessing a wide spectrum of knowledge and Short questions assessing insight.

Discussion: *"We should have fairly short questions"* [AUR3]. Short questions are easier to defend and are easier to mark. Short questions provide scope for assessing a wider range of knowledge by covering a wider spectrum of the curriculum and by assessing different levels of the cognitive domain. Short questions, in the hands of a competent assessor, can be used to assess insight in different skills, imaging protocols and methodologies. This can be achieved by integrating clinical scenarios in the questions that are encountered in daily practice to assess clinical insight and the higher levels of the cognitive domain. The different categories of shorter-type questions should cover the different subspecialties in radiology and should not comprise of more than 25 marks per category.

Multiple choice questions

Data analysis and description: The category on MCQs emerged from the opinions of 11 of the interviewees. Six subcategories were identified, namely, The benefits of MCQs, Assessing a wide spectrum of knowledge, Drawbacks of MCQs, The structuring of MCQs, The preferred type of MCQ and Other considerations in setting MCQs.

Discussion: The stronghold of MCQs is that it covers many different topics encompassing the curriculum and can assess a wide range of knowledge, which may all serve as incentives to utilise MCQs more often. Other benefits of MCQs are that it is easy to mark and easier to defend. Furthermore, in the radiology context, images can also be incorporated in the questions. *"MCQs are very difficult because you need a vast amount of knowledge to answer and to compile"* [AR2]. On the other hand, it is very time consuming and laborious to prepare and *"the bank of questions has to be maintained"* [AUR3]. The challenge that arises from asking MCQs lies in the fact that the assessor should not only assess superficial theoretical knowledge, but should try to assess deeper knowledge and the higher levels of the cognitive domain. With MCQs it may be difficult to assess insight, therefore, it is vital that MCQs should be structured correctly and compiled according to the prescribed guidelines for setting MCQs. MCQs also influence how candidates prepare for the assessment – they could respond by studying lists of facts instead of studying approaches to dealing with clinical challenges. The single-best-answer type of MCQ is the preferred type, but it is the most difficult to prepare.

Orals

Data analysis and description: The next category that emerged was motivated by the thoughts of all the interviewees in the interview group. Five subcategories were identified, namely, The relevance of the orals, The purpose of the orals, The structuring of the orals, Drawbacks of orals and Other considerations regarding the orals.

Discussion: Several reasons exist for conducting orals in the radiology summative assessment. It almost never happens that there is a huge discrepancy between the orals and the other assessment instruments. It is valuable for the assessor to observe the candidate, to see how s/he performs under pressure. Because the oral may be very stressful for the candidate, the assessor should start with basic, common cases, and then gradually build up to more challenging ones while constantly being aware of potential bias. The assessor should not misinterpret lack of confidence for lack of knowledge. A mock examination during the candidate's preparation for the summative assessment may help to reduce oral-related anxiety.

All the cases presented at the orals should be relevant in terms of the generally and nationally available technology and infrastructure. The assessor should not present rare cases with a specific radiological sign that point to only one diagnosis (*"Aunt Minnies"*). A

wide range of subspecialties should be covered to assess a good general knowledge of radiology and to improve the reliability of the assessment. The main aim of the orals is not to push the candidate through as many cases as possible, thereby creating an *"up and down"*[MR1] scenario, but to rather assess deeper knowledge and to extract clinical insight from the candidate about the further management of the patient. The oral therefore remains a fundamental instrument for assessing reflective competence, which is possible if the assessor guards against presenting a repetition of the rapid reporting.

During the oral the assessor not only assesses observation skills, but evaluates the candidate's ability to think out of the box. The assessor continues to evaluate the candidate's verbal communication skills, reasoning skills and his/her structured approach to radiological pathology. *"Maybe an oral isn't always very well structured, maybe not always well standardised, but it is very important."*[AU1]. The orals will remain a good assessment instrument as long as the examination body is able to continue managing the number of candidates that needs to be assessed. If time management becomes a greater challenge it may happen that, when assessors run out of time, they are uncertain whether to pass or fail the candidate due to an incomplete oral assessment or discussion.

The long cases

Data analysis and description: This category emerged from the opinions of 10 of the interviewees. Four subcategories were identified, namely, The purpose of the long cases, Challenges in presenting the long cases, Presenting the long cases to the assessors and Other considerations regarding the long cases.

Discussion: The purpose of the long cases is to function as a form of simulation. Currently the long cases are not directly observed, but it was suggested by several assessors that this should be revised. Suggestions included the incorporation of the long cases into the orals, giving the candidate the opportunity to verbally present the long cases to a panel of assessors. This would create an opportunity to discuss a long case in depth, to enable better assessment of reasoning skills, logical thinking and clinical insight. Furthermore, the assessors would be able to assess communication skills as well as interpersonal skills. The practicality of both suggestions remains questionable due to the limitations posed by time constraints and the number of candidates that needs to be assessed. Regardless of the above-mentioned suggestions to improve this segment of the assessment, the long cases

still remain valuable in the current setting because *"it tests whether the candidate can pick up certain signs and generate a structured report"* [AU1].

Cases to be presented should include typical cases that occur in the day-to-day-functioning of a general radiologist, for the sake of assessing the candidate's observation of findings, synthesis of knowledge and integration with the clinical scenario, including written communication skills. All of the components mentioned should be incorporated in a specific time limit to generate a structured report that is assessed as proof of competency (knowledge, skill and aptitude).

Long cases are challenging to prepare and put together. Therefore, it should be submitted to the convenor and moderators in good time, in a digital format, for moderation. Moderation is important for assessing the quality of the images and the level of difficulty. Part of the moderation should include tailoring the number of images according to the prescribed guidelines of the examination body.

The rapid reporting

Data analysis and description: The sixth category to emerge under the theme of assessment instruments was voiced by eight of the interviewees. Five subcategories were identified, namely, The purpose of the rapid reporting, The benefits of the rapid reporting, Ensuring the validity and reliability of the rapid reporting, Ensuring fairness and The cognitive level of the rapid reporting.

Discussion: Rapid reporting (short cases) are easier to select and mark than the long cases. It is important that the cases should be up to date (recent) and in context with the curriculum and the general availability of technological resources. The aim is to assess basic observational skills and the candidate's ability to make instant diagnoses on day-to-day cases that include a number of *"emergency"* [MU1] type cases as a baseline for identifying a safe radiologist. *"Rapid reporting shouldn't be a trap door"* [AU1] and the cases should be fair and clear, presenting the classical appearances of pathologies with only one possible diagnosis as the correct answer. The cases that are presented should be moderated to assess the level of difficulty and to ensure that it is valid and reliable as an assessment instrument.

4.3.6.3 Theme 3: Tools

The last theme to emerge from this question, namely, **Tools**, relates to the assessment tools that are relevant to the radiology summative assessment. Two categories emerged, namely, **Rubrics** and **Memorandums** (cf. Table 4.7).

Rubrics

Data analysis and description: Eight of the assessors and both moderators voiced their opinions about utilising rubrics as a tool in the radiology summative assessment. Six subcategories were identified, namely, The relevance of rubrics, The legal benefits of rubrics, The structuring of rubrics, Rubrics contribute in making a decision, Rubrics improve the standardisation and reliability of the assessment, and Rubrics identify detail and gaps in knowledge, but remain time consuming.

Discussion: Rubrics make it easier to defend the long cases and may act as a legal document for the orals. It furthermore enables the assessor to reach a definite decision, especially in borderline candidates, to identify any guessing by a candidate and to *"offer guidelines to people, who are not robots"* [MR1]. The assessor should adhere to the rubric to improve the reliability and standardisation of the assessment. The rubric is valuable for assessing the finer details of the oral. Rubrics may be helpful to identify gaps in the candidate's knowledge but take time to complete if it is incorrectly structured. Therefore, the rubric should be designed properly, as simple as possible and not oversophisticated. Some of the assessors were of the opinion that analytical rubrics are too stringent and that holistic rubrics is preferable. It was suggested that analytical rubrics are useful for assessing a list of positive findings, but that a holistic rubric is more useful for assessing insight.

Memorandums

Data analysis and description: The last category to emerge from this question was identified from the opinions of seven of the interviewees in this interview group. Four subcategories were identified, namely, The relevance of memorandums, The benefits of memorandums, Auto internal moderation and The structuring of memorandums.

Discussion: To make the memorandum defensible, it should present the information that would be expected in a text book, however, at postgraduate level it cannot be rigid and

should be seen as a guideline. It should be structured and should clearly show the specific allocation of the number of facts per mark. Auto internal moderation, where the assessor re-marks all the scripts, is necessitated when the memorandum was adopted to include facts that were not originally included in the memorandum but were correctly mentioned by the candidate. From the above mentioned it becomes clear that the memorandum can be adapted during the marking of the scripts. The reason for this is that the field of radiology is vast, with new knowledge constantly emerging. The model answer is a goal and not a reality. A memorandum prevents bias and in the absence of a memorandum the assessment becomes a non-quantitative assessment. Another benefit of a memorandum is ensuring proper time management for each question. It furthermore helps to improve the reliability of the assessment by assessing the correct level of knowledge in every candidate when the assessors are marking multiple scripts.

A summative perspective on the sixth question: The sixth question identified the methods, instruments and tools to be used in the summative radiology assessment. This included evaluation of an end product, questioning and quality of observation of the candidate during the orals. Instruments identified included the portfolio, to assess continued performance, and a dissertation or publication to assess research training. Essay questions have been abandoned for the reasons discussed. Short questions, MCQs, long cases, rapid reporting (short cases) and orals are used as questioning instruments. Memorandums have been used as a tool together with rubrics, which were introduced relatively recently to grade the candidates. The benefits and challenges of each instrument and tool were discussed to give the researcher a better understanding of the relevance of each within the context of the radiology summative assessment.

4.3.7 Identifying factors related to assessment training of assessors and moderators

The seventh question in the interview guide that the researcher asked all the interviewees was: "What is your opinion on assessment training for assessors and moderators?"

The responses of all the interviewees were analysed and arranged into themes, categories and subcategories. The themes that were identified were as follows:

- Theme 1: Training opportunities; and
- Theme 2: Motivation.

The themes with the coupled categories and subcategories are presented in Table 4.8 and will be discussed separately. To simplify the reporting each subcategory is followed by the coding of the respondent. Some of the responses may be direct quotes to enhance the credibility, dependability and confirmability of the study.

TABLE 4.8: IDENTIFYING FACTORS RELATED TO ASSESSMENT TRAINING OF ASSESSORS AND MODERATORS [Table continues on next pages]

THEMES	CATEGORIES
1. Training opportunities	Practical observation <u>The relevance of practical observations</u> • We learn through observation. [AUR2] • In radiology we basically learn through observation. [MR1] • "You learn a lot by observing and watching the process." [AUR3] • Practical observation is relevant to learn the manner of questioning and how marks are awarded. [AU2] • Observation is most important to hear the discussions. [AR1] <u>The required number of observations</u> • Certain number of observations for assessor. [AUR1] • Certain number of prior assessments for moderator. [AUR1] • "Need to do whole year's observation." (two assessments) [AUR3] • Observed twice. [AU1] • Should observe at least two or three assessments. [AR2] <u>Practical observation at a joint assessor-moderator meeting</u> • Peer reviewed pre- and post-exam joint meeting between assessors and moderators. [AUR1] • A pre-exam joint meeting between moderators and assessors to discuss long cases may contribute to assessment training. [AR1] <u>The value of junior-senior assessor or junior-moderator combinations</u> • It is good that local junior consultants are more often getting the opportunity to observe the assessment. [AUR3] • Every assessment should include junior observing assessors. [AR2] • "It is good to have someone more seasoned with you." [AU1] • "It is good to benchmark yourself." [AR1] • "There are two moderators and a trainee or observant moderator." [MR1]. Assessment and/or moderation course <u>The relevance of a training course</u> • "Theoretical course is needed." [AUR1] • Theoretical training is a good idea. [AR1] • "I do think it's important." [AUR3] • We need to understand some of the principles of assessment. [AUR3] • "Preparation courses definitely helps." [AU1] • "I think it would be very good." [MR1] • "Examiners do need to be taught." [MR1] • May contribute to setting better quality MCQs. [AU2] • Theoretical training is less important because observation is enough. [AU4] • Experience may not be enough, theoretical guidance on setting assessments may be necessary. [MU1] <u>Training improves standardisation and reliability of the assessment</u> • Training will help to standardise the assessment. [AR2] • Theoretical training will be useful to ensure a reliable, standardised assessment. [AU3] • Training of assessors will contribute to standardisation and therefore reliability of the assessment. [AU2] • Examination body remains responsible for determining the quality of the assessor. [MU1]

	<u>Conducting workshops</u> • "Run workshops." [AUR2] • Dedicated, focused workshop is a good start. [MU1] • A theoretical workshop would be ideal to be on the same page. [AR1] • A workshop on a weekend would help. [AR2] • Ideally a weekend course. [AUR3] • Focus on academic departments. [AUR2] • Part of in-service training programme. [AUR1] • Multilevel pre-exam courses within the department. [AU1] • "Moderators need probably more direct mentorship." [AUR3] <u>Training should be comprehensible and relevant</u> • Universities' education departments are underutilised. [MR1] • "We need educators to come and talk to us as GPs, not as educators. I don't know whether there are any available to do that." [MR1] • "(They) speak a language which is incomprehensible." [MR1] • Very important that it should be relevant, energetic, comprehensible and aimed at the radiologist. [MR1] <u>Training should be aimed at the radiology assessment</u> • Assessment training should be focused for radiology assessors. [MU1] • Radiology assessment training should be specific for radiology and should be conducted by a radiologist or an educationist who comprehends the radiology environment. [AU4] • Should be aimed at and tailor-made for the academically active radiology fraternity and should include private assessors. [AU3] <u>Private radiologists should be included</u> • Private radiologists also have to be trained as assessors. [AU1] • Private assessors also have to know the assessment guidelines. [MR1] Online training • Can do an online course. [AUR1] • Very impersonal, unlikely to work. [MU1] • Can be done online but then need to show proof of completing the course. [AU3] Webinars • Financially cheaper. [AUR1] • Not for moderators. [AUR1] • Webinars as an adjunct. [AUR2] • Webinars not necessarily good attendance or attention. [AUR3] • May contribute if organised nationally. [AU1] • Webinars are good but still impersonal. [MU1] • Webinars are limited with limited interaction. [AU3] • Webinars are most practical for assessors in private practice who cannot attend workshops. [AR1] Formative assessments • Also serves as training opportunities for assessors. [AU1] • Formative assessment of registrars also contributes to assessment training of assessors doing summative assessment. [AU4] • Continued guidance and training by the academic department. [AUR2] • Training should be a continuous process through different interfaces. [AU2] • "You need to be a teacher in an academic environment; an exam, it's merely an extension of what you have been doing." [MR1] The training body • Certified training body. [AUR1] • Training should be done at institutional level. [AUR2] • Ideally it has to be educators associated with the university's health sciences education. [AUR3] • Should be conducted by the universities as well as the examination body. [AU2]

	• Workshops should be presented by the examination body. [AU3] • The examination body should be responsible for planning a workshop on assessment. [AR2]
2. Motivation	Continued professional development points • Offer CPD points. [AUR1] • "CPD points will do." [AUR2] • CPD points should be given. [MU1] • "I cannot think of anything other than CPD." [AR1] • CPD points should definitely be given; ethics points are highly motivational. [AU3] • Ethics points would be ideal. [AUR3] Certification <u>The relevance of certification</u> • Training should be recognised. [AU2] • A certificate may help but will not make a big difference because of the limited assessor pool. [AR1] • May lead to a core group of professional assessors and demotivate new assessors to join. [AR2] <u>Certification as a prerequisite for an assessor</u> • Prerequisite for public and private health sector assessors. [AUR1] • May be a prerequisite from the examination body to show proof of attending an assessor training course. [AR2] • Certification may be a prerequisite from the examination body. [AUR3] • May need to provide proof of assessment training to qualify as an assessor for the summative assessment. [MU1] • Certification should be given to prove completion of the assessment training course. [AU3] • Proof of completion. [AUR1] <u>The benefits of certification</u> • Can be seen as part of career enhancement. [MU1] <u>Requirements for certification</u> • Should not write any examinations. [AUR1] Continued awareness by the consultant body • Every academic consultant should be given an opportunity to assess. [AUR2] • Any consultant in the public service should be able to examine. [AU4] • New junior assessors are constantly needed to be able to adapt to the changing needs of the assessment. [AR2] Personal drive • "Responsibility." [AU1] • "You have to step up and do it." [AU1] • "It is good for your CV." [AU1] • "You need to embrace it and become an academic radiologist." [AU1] • "For career progression, if you enjoy it." [AU1] • "Academics have never been about monetary value, it has always been about more." [AU1] • "I feel that I have to give back to radiology." [AR2] • "Identify who wants to be examiners." [AR2] • Consultants should be motivated to teach radiology. [AR2]

4.3.7.1 Theme 1: Training opportunities

The first theme, namely, **Training opportunities**, emerged from the question about factors related to the training of assessors and moderators. Six categories, including five possible types of training opportunities, were identified, namely **Practical observation**,

an **Assessment and/or moderation course**, **Online training**, **Webinars** and **Formative assessments**, as well as **The training body** responsible for taking leadership in assessment and moderation training (cf. Table 4.8).

Practical observation

Data analysis and description: This category emerged as the most relevant training opportunity; it was shared by nine interviewees in this interview group. Four subcategories were identified, namely, The relevance of practical observations, The required number of observations, Practical observation at a joint assessor-moderator meeting and The value of junior-senior assessor or junior-moderator combinations.

Discussion: The benefits of practical observation in radiology assessment are learning the methods of questioning, hearing the discussions and lines of reasoning during the meetings, watching the assessment process and observing how marks are allocated. A certain number of observations (at least two complete assessments) are required per consultant prior to acceptance as an assessor of the summative assessment. The same principle should apply to moderators, where a certain number of assessments and observations are a prerequisite for becoming a moderator of the radiology summative assessment.

Currently the summative assessment is conducted with two moderators and one trainee moderator. Pre-examination and post-examination meetings between assessors and moderators offer valuable opportunities for practical observation and may contribute to assessment training, because *"you learn a lot by observing and watching the process"* [AUR3]. Every assessment should therefore include junior observing assessors, thereby creating practical observation opportunities. It is furthermore important that a junior assessor is guided by a senior, more experienced assessor, because *"it is good to have someone more seasoned, with you"* [AU1] to *"benchmark yourself"* [AR1].

Assessment and/or moderation course

Data analysis and description: The second category to emerge as a relevant training opportunity was voiced by all the interviewees in this group of interviewees. Six subcategories were identified, namely, The relevance of a training course, Training improves standardisation and reliability of the assessment, Conducting workshops, Training

should be comprehensible and relevant, Training should be aimed at the radiology assessment and Private radiologists should be included.

Discussion: The examination body remains responsible for determining the quality of the assessor. It became clear from the interviews that *"a theoretical course is needed"* [AUR1] and that it could contribute to the quality of the questions that are set. It appears that personal experience of summative assessment may not be enough to teach junior assessors assessment skills, although one interviewee was of the opinion that observation outweighs theoretical training. The aim of an assessment and moderation course would be to teach assessors and moderators the principles of assessment, thereby contributing to a reliable, standardised assessment.

Universities' education departments are underutilised and an assessment/moderation course can form part of an in-service training programme that focuses on academic radiology assessors and moderators. Such a training programme may need to be a multilevel pre-examination course that is conducted within the department.

Private radiologists will also have to be trained as assessors because they should be familiarised with assessment guidelines. For this reason another option is presenting a workshop on a weekend to make it more accessible to both public and private health sector radiologists. It is very important that educationalists who present at such a workshop present the information in a fashion that makes it easy to grasp by all the attendees. One of the interviewees was of the opinion that *"we need educators to come and talk to us as GPs, not as educators"* [MR1].

Therefore, the presentations should be relevant to the field of radiology, presented in an energetic manner, be comprehensible and aimed at the radiologist. Radiology assessment training should be ideally be conducted by a radiologist or an educationist who comprehends the radiology environment. *"Moderators need probably more direct mentorship"* [AUR3] than a general workshop, due to the nature of their roles and the fact that moderators are probably fewer in number.

Online training

Data analysis and description: Only three interviewees made comments that led to the emergence of this category. None of the comments were very persuasive.

Discussion: Assessment training can be done online, but this presentation mode is very impersonal and unlikely to work. Reasons for the scepticism about the likelihood of success of this training method include the daily workload that radiologists in general have to carry effectively, and a lack of motivation to spend more hours in front of a computer after spending most of the day working on some kind of computer or technological equipment. If an online course is completed the assessor needs to show proof of completing such a course. Regardless, an online course may still be a valuable adjunct to assessment training, especially for motivated individual assessors who do not have the time, lack access to in-service training or have limited resources (like limited staffing) to attend a weekend workshop.

Webinars

Data analysis and description: The fourth category to emerge under "training opportunities" was raised by seven interviewees.

Discussion: Webinars are cheaper to conduct, but still involve an impersonal training mode with limited interaction. Webinars should be organised nationally, but should not replace weekend workshops. It may function as an adjunct to assessment training but attendance may, again, be a challenge due to lack of motivation for the same reasons that were mentioned for online training. Furthermore, it is more difficult to keep the attention of an audience that is invisible to the presenter. Webinars would not be a sensible manner of mentoring moderators.

Formative assessments

Data analysis and description: The last category to emerge from the opinions of four assessors was the role of formative assessments as training opportunities.

Discussion: It was mentioned that formative assessments that are conducted by consultants during the radiology training programme can also contribute and serve as training opportunities for assessors of the summative assessment. Because assessor training then becomes a continuous process that involves different interfaces, it requires that *"you need to be a teacher in an academic environment"* [MR1]. Such formative assessments can be followed by in-departmental discussions to suggest improvements and

to give continued guidance and training to junior assessors who may, in the future, be presented as assessors to the examination body. Following formative assessment training, summative assessment then becomes *"merely an extension of what you have been doing"* [MR1].

The training body

Data analysis and description: Six assessors suggested who should be responsible for providing training opportunities to assessors and moderators of the radiology summative assessment.

Discussion: It became clear that assessment training should be conducted by a certified training body at an institutional level. Ideally, it should be presented by educators associated with the universities' health sciences education departments in alignment with the examination body. Alternatively, workshops on assessment could also be presented by the examination body.

4.3.7.2 Theme 2: Motivation

The second theme to emerge related to the **Motivation** of assessors and moderators to participate in the radiology summative assessment. Four categories were identified, namely, **Continued professional development points**, **Certification**, **Continued awareness by the consultant body** and **Personal drive** (cf. Table 4.8).

Continued professional development points

Data analysis and description: Six of the interviewees in this group made reference to the relevance of CPD points as an incentive to support the summative assessment.

Discussion: CPD points will be beneficial in motivating assessors to become part of the summative assessment; as one of the interviewees stated: *"I cannot think of anything other than CPD"* [AR1]. CPD points rewarded for ethics will even be more valuable because it is difficult to attain the required number of ethics points as prescribed by the HPCSA within the prescribed time frame. Obtaining ethics points usually requires the attendance of at least one conference to acquire enough ethics points, which makes it relatively

expensive to acquire enough ethic points. Therefore, it will definitely be a good motivational factor to offer a certain number of ethics points for every assessment that is conducted.

Certification

Data analysis and description: This category emerged from the opinions of seven of the interviewees. Four subcategories were identified, namely, The relevance of certification, Certification as a prerequisite for an assessor, The benefits of certification and Requirements for certification.

Discussion: It may become a prerequisite of the examination body to show proof of attending a recognised assessor training course for both public and private health sector assessors. Certification would therefore be needed as proof of completion of such a course. It is important that there should be no formal assessment at the end of the assessment training course (like sitting an examination) for this would demotivate assessors to complete the course and subsequently may lead to fewer assessors who are motivated to participate in the radiology summative assessment. Certification of assessment training can also be seen as a means of career enhancement. Assessors who opposed certification were of the opinion that certification would not make a difference due to the limited number of assessors currently available for the summative assessment. Certification may, furthermore, lead to a core group of professional assessors and demotivate new assessors to join. The most likely scenario in the current setting would be to offer certification to show proof of completing assessment training as an adjunct to an assessor's CV and to further his/her career, but that it should not be a requirement from the examination body due to the limited number of assessors available.

Continued awareness by the consultant body

Data analysis and description: Three assessors made remarks in reference to the constant need for new assessors.

Discussion: Every academic radiology consultant should be given an opportunity to observe the radiology summative assessment. The aim would be to foster a culture of constant awareness of assessment processes as well as the need for assessors and moderators. Such an incentive may, further, lead to constructive dialogue on how to make further improvements to the assessment system. Junior assessors are constantly needed

to expand the assessor body and for the examination body to adjust to the changing needs of the summative assessment.

Personal drive

Data analysis and description: The last category to emerge under the theme of motivation identified personal drive as an important reason for becoming an assessor.

Discussion: It was suggested that academic departments should actively *"identify who wants to be examiners"* [AR2] and academically invest in those individuals. All consultants working in the public health sector should be motivated to actively teach radiology. This notion may even be promulgated in the private health sector among those individuals who experience the need *"to give back to radiology"* [AR2]. Being an assessor may be good for a radiologist's CV and for career progression, but the motivation should be larger than merely personal gain. It requires a sense of responsibility towards the radiology community at large to motivate someone to *"step up and do it"* [AU1]. Part of being an academic radiologist is embracing the opportunity to assess candidates who will ultimately end up as colleagues and future assessors and moderators. One of the interviewees summed it up by stating that, *"academics have never been about monetary value, it has always been about more"* [AU1].

A summative perspective on the seventh question: The seventh question identified the factors related to the possible training of assessors and moderators of the radiology summative assessment. First, the interviewees explained different training opportunities and suggested that practical observation is the main method for training junior assessors for the summative assessment. This practical observation should be supported by a theoretical assessment and moderation course, which was also perceived to be an important part of assessor and moderator training. Online training courses and webinars were suggested as adjuncts to the main theoretical course; this online training would serve assessors who do not have time or access to attend the main course. Formative assessments during the training period for candidates can also function as assessor and moderator training opportunities. Assessor and moderator training could be presented by both the universities and the examination body, but should be presented in the radiology context in a clear, enthusiastic understandable manner, ideally by a radiologist or educationist with radiology experience. Radiologists can be motivated to attend such courses by offering them CPD points, ideally ethics points and certification, and creating a

continued awareness of the need for assessor and moderator training among colleagues. None of this will be successful if the individual does not show an interest in assessment or lacks a personal drive for career advancement.

4.3.8 Identifying factors related to a uniform, national outcome-based curriculum

The eighth question in the interview guide that the researcher asked all the interviewees was: "What is your opinion about a uniform, national outcome-based curriculum in radiology?"

The responses of all the interviewees were analysed and arranged into themes, categories and subcategories. The themes that were identified were as follows:

- Theme 1: National curriculum;
- Theme 2: Development; and
- Theme 3: Implementation.

The themes with the coupled categories and subcategories are presented in Table 4.9 and will be discussed separately. To simplify the reporting each subcategory is followed by the coding of the respondent. Some of the responses may be direct quotes to enhance the credibility, dependability and confirmability of the study.

TABLE 4.9: IDENTIFYING FACTORS RELATED TO A UNIFORM, NATIONAL OUTCOME-BASED CURRICULUM [Table continues on next pages]

THEMES	CATEGORIES
1. National curriculum	The relevance of a national curriculum • There should be national minimum standards (learning outcomes) of basic general radiology that should be achieved. [AR2] • A national curriculum will help the academic departments. [AR1] • It must be one standardised curriculum because there is one exit examination. [AU2] • Wonderful idea if all the academic departments could present the same curriculum but unlikely to be practically achievable. [AU3] • Cannot have a standardised curriculum due to different resources. [AU4] • We cannot draw a line on what a candidate needs to know because radiology is a constantly evolving field and needs to adapt accordingly. [AU4] • At the rate of current radiology knowledge expansion, by the time a national curriculum is set, it is redundant. [AUR3]

- South Africa needs general radiologists but to lift the standard of care, one has to subspecialise because radiology knowledge is too broad. [AR1]
- Some countries already have a formal curriculum of what every registrar needs to know before they get to the examination. [AR1]
- All academic departments can be on a similar page by making use of specific online databases. [AR1]

The purpose of the curriculum

- "To ensure that everybody gets exposed to everything." [AUR3]
- "You don't know what you don't know, that's the problem." [AUR3]
- "There is a kind of expectation at registrar level that they will be told what they need to know." [AUR3]
- "They need to know what basic radiology is." [AU1]
- People get taught according to what the assessment body assesses. [MR1]
- Some academic departments set a curriculum that runs over a four-year period. [AU3]

Access to the curriculum

- A national curriculum, the learning outcomes are available on the college website. [AU1]
- There is a college curriculum available on the website. [MR1]
- "You can tick it off, but it is exhaustive and extensive." [AU1]
- Should be available online. [AUR1]
- An online curriculum should be continuously reviewed and updated. [AUR3]

Requirements for successful implementation

The knowledge level of the curriculum

- Should be at the level of a general radiologist. [AUR1]
- "Whatever is in print version in your textbook, you should be allowed to ask." [AU1]

Structuring of the curriculum

- Making the list is the easy thing, how we are going to train them is the challenge. [AUR3]
- Should be structured. [AUR1]
- Curriculum should be based on organ systems and radiological modalities. [AUR2]
- Every department needs to set up a modular programme. [AU1]
- Implement practical, viable teaching and learning activities relevant to the particular department. [MU1]
- Registrars should be exposed to all imaging modalities during interdepartmental meetings, especially if not currently working at a specific modality. [AU2]
- Include local, relevant radiology journals in the curriculum. [AU1]

Alignment with the learning outcomes

- Learning outcomes must be aligned. [AUR1]
- Curriculum should be aligned with the needs of the national health system, National Development Plan and national policies. [AUR2]
- Curriculum, teaching and assessment should be integrated. [AUR2]

Resources needed for accomplishing a curriculum

- "It is not to give us a national syllabus. It's staffing, it's resources, it's management of the department with formal assessments after every block and regular meetings with a formal annual report." [AU1]
- To ensure standardised exposure in different geographic departments, one needs proper staffing, proper IT support and similar equipment resources. [AU1]
- Won't be able to run a modular programme without proper staffing. [AU1]

	• Should be a proper balance between service delivery and teaching time. [AU1] The role of partnerships <u>Partnerships between academic departments</u> • Create partnerships between academic departments to ensure enough training opportunities. [MU1] • Partnerships will have to be formed to provide opportunities to candidates to be exposed to all modalities. [AR2] • Departments can learn from one another by having dialogue and creating partnerships. [AR1] • Create partnerships between academic departments, for example visiting consultants. [AU2] <u>Visiting consultants</u> • Visit other radiology departments to cross pollinate ideas on training. [MU1] • Can isolate specific workdays and cases for visiting consultants. [AU3] • Can collect specific cases for visiting consultant input. [AU3] • Visiting consultants can also assist in training new skills. [AU4] <u>Partnerships between registrars</u> • Registrars can share interesting cases. [AU2] • Rotating registrars can bring new knowledge and skills to the department. [AU4] • Rotation possibilities should be made clear when candidate is admitted to the training programme. [AU4] • Applicant candidates should know beforehand what will be expected of them during their radiology training. [AU4] <u>Partnerships between academic departments and private practices</u> • Create partnerships between academic departments and private practices by becoming involved with academic meetings and research. [AU2] • Shortcomings in infrastructural resources should be overcome by creating partnerships with allied academic departments or private practices. [AU3] • Registrars should travel to partnering academic departments or private practices to get exposure to all modalities. [AU4]
2. Development	Task team members • Should consist of experts. [AUR1] • A national curriculum or learning outcomes should be compiled by the heads of the academic radiology departments, with comments by registrars, clinicians and private radiologists. [AU2] • Consist of the heads of departments. [AUR1] • Involve faculty members. [AUR2] • Should involve all relevant stakeholders. [AUR2] • The examination body should be responsible for setting up a national curriculum including the HODs. [AR1]
3. Implementation	Academic radiology departments <u>The roles of departments</u> • "It is up to the academic department to execute it." [AU1] • Learning outcomes can be identified by the examination body but should be achieved by the academic departments. [AU3] • Learning outcomes may be identified by the examination body but the curriculum is the responsibility of the academic department. [MU1] • Curriculum remains the responsibility of the individual academic departments. [AU4] • The challenge lies with every academic department to expose their candidates to enough training opportunities to achieve the identified learning outcomes. [AUR3]

	• The academic department should ensure that registrars are exposed to enough teaching and learning activities to pass the assessment. [MU1] <u>Quality assurance of departments</u> • Should be monitored. [AUR1] • Should be accredited departments. [AUR1] • "If you have a teaching department you must be able to offer all the modalities." [MR1] • "All the radiology academic departments are not at the same level." [AR2] • "In a training hospital we, have to have a good number of consultants." [AUR3] <u>Utilising different resources, universities, regions and curricula</u> • "It boils down to different universities in different regions and resources in the different universities." [AU1] • "There is such a huge resource, the university is supposed to guide them and show them this is what is important." [AU1] • Different academic programmes and different curriculums distinctive to every academic department. [MU1] • "All roads lead to Rome." [MU1]

4.3.8.1 Theme 1: National curriculum

The first theme to emerge, namely, a **National curriculum**, helped to explain **The relevance of a national curriculum**, **The purpose of the curriculum**, **Access to the curriculum**, **Requirements for successful implementation** of the curriculum and **The role of partnerships** in the implementation of a national curriculum (cf. Table 4.9).

The relevance of a national curriculum

Data analysis and description: This category emerged from the opinions of six of the assessors in this interview group.

Discussion: It was noted that minimum standards for learning basic, general radiology (learning outcomes) should be identified on a national level to help academic departments to train registrars. The reasoning behind a standardised curriculum comes from the fact that there is currently one national exit examination. It would be a wonderful idea if all the academic departments could present the same curriculum, but it is unlikely to be practically achievable due to differences in the availability of technological and human resources. Assessors who oppose a national curriculum argue that we cannot draw a line on what a candidate needs to know, because radiology is a constantly evolving field and needs to adapt accordingly.

The international trend in radiology is towards subspecialisation to lift the standard of care because radiology knowledge is too broad. This trend is also seen in the South African private sector and bigger public sector institutions. The problem that arises from setting a national curriculum is that at the rate of current radiology knowledge expansion, by the time a national curriculum is set, it will be redundant. Furthermore, it was added that some countries already have a formal curriculum of what every registrar needs to know before they get to the final examination. All academic departments can be on a similar page by making use of specific online databases and they should consider taking the step of adopting an international curriculum.

The purpose of the curriculum

Data analysis and description: This category emerged from the thoughts of four of the interviewees in this group.

Discussion: The main aim of a national curriculum would be *"to ensure that everybody gets exposed to everything"* [AUR3]. This means that every candidate in the training programme gets exposure to enough teaching and learning opportunities. *"You don't know what you don't know"* [AUR3] unless somebody tells you what is expected of you. *"There is a kind of expectation at registrar level that they will be told what they need to know"* [AUR3]. *"They need to know what basic radiology is"* [AU1]. All candidates are taught according to what the assessment body assesses. Therefore, the summative assessment drives the curriculum by influencing the teaching of basic radiology. A number of radiology departments are presenting a four-year curriculum, and others a five-year curriculum, therefore, it may be beneficial to standardise the curriculum nationally to a five-year training period.

Access to the curriculum

Data analysis and description: This category was voiced by four of the interviewees in this interview group.

Discussion: Currently, a national curriculum and learning outcomes are available on the website of the examination body. *"You can tick it off, but it is exhaustive and extensive."* [AU1]. The problem that may arise is that if the information that is provided is too generic,

it becomes practically useless. Therefore, an online curriculum should be continuously reviewed and updated.

Requirements for successful implementation

Data analysis and description: The next category that emerged from the question pertained to the requirements for a national curriculum as voiced by six of the interviewees in this group. Four subcategories were identified, namely, The knowledge level of the curriculum, Structuring of the curriculum, Alignment with the learning outcomes and Resources needed for accomplishing a curriculum.

Discussion: The training institution has to offer everything that is needed to train a registrar at the level of a general radiologist. *"Whatever is in print version in your textbook, you should be allowed to ask."* [AU1]. Making a list of what the candidates need to know is one part of the challenge, how we are going to train them is the more challenging part. It is important that the curriculum is structured and should therefore consist of a modular programme that is based on organ systems and imaging modalities. Practical, viable TLAs that are relevant to the particular department should be implemented. Such TLAs may include interdepartmental meetings, where registrars will be exposed to all the imaging modalities even if they are not currently working at a specific modality. Furthermore, relevant radiology journals should be included in the curriculum. The curriculum, teaching and assessment should be integrated to allow the curriculum to be aligned with the learning outcomes as well as with the needs of national policies.

The challenge lies with every academic department, which has to ensure that they are adequately staffed, have proper management for the department, conduct regular formative assessments and meetings with the registrars, compile annual reports and expose their candidates to enough training opportunities to achieve the identified learning outcomes. To ensure standardised exposure in different geographic departments, a department needs proper IT support and similar equipment resources. Lastly, but not least, the department should ensure a proper balance between service delivery and teaching time.

The role of partnerships

Data analysis and description: The category emerged from the responses of six of the interviewees to the question identifying factors related to a uniform national curriculum.

Four subcategories were identified, namely, Partnerships between academic departments, Visiting consultants, Partnerships between registrars and Partnerships between academic departments and private practices.

Discussion: Shortcomings in infrastructural resources should be overcome by creating partnerships with allied academic departments or private practices, to ensure enough training opportunities and to expose the registrars to all the imaging modalities. This may include involving private radiologists in academic meetings and research. Visiting consultants can also assist in training new skills by isolating specific workdays and cases for consultant input. Registrars should travel to partnering academic departments or private practices to create dialogue and cross pollinate ideas on training. It is therefore important that applicant candidates should know beforehand what will be expected of them during their radiology training and the possibility of subsequent off-site rotations should be made clear when candidates are admitted to the training programme. Rotating registrars can bring new knowledge and skills to the department, while inviting visiting consultants can provide exposure to the implementation of practical, viable TLAs relevant to the particular department. Registrars can furthermore share interesting cases with different radiology departments.

4.3.8.2 Theme 2: Development

The second theme to arise from this question, namely, **Development**, identified considerations relating to the development of a national curriculum, with one category emerging, namely, the **Task team members** to be involved (cf. Table 4.9).

Task team members

Data analysis and description: Four interviewees provided opinions that led to the emergence of this category.

Discussion: If a national curriculum is to be relevant it should be prepared and governed by a panel of experts. The panel should consist of HODs and should involve faculty members as well as all other relevant stakeholders, with comments from registrars, private radiologists and clinicians. The learning outcomes should be identified by the examination body but should be achieved by the accredited academic departments.

4.3.8.3 Theme 3: Implementation

The third theme to arise from this question, namely **Implementation**, identified considerations relating to the implementation of a national curriculum, with one category emerging, namely, **Academic radiology departments** (cf. Table 4.9).

Academic radiology departments

Data analysis and description: Eight interviewees voiced their opinions about the roles of academic departments in a national curriculum, including the need for quality assurance of departments. Regardless of differences, the end goal of training a competent radiologist remains the same. Three subcategories were identified, namely, The roles of departments, Quality assurance of departments and Utilising different resources, universities, regions and curricula.

Discussion: Because of easy access to a very wide literature base, academic departments need to guide the candidates on the theoretical knowledge that is important and that candidates should focus on. Mere availability of learning outcomes is not sufficient. The learning outcomes may be identified by the examination body, but *"it is up to the academic department to execute"* [AU1] the curriculum. Different universities at different geographic locations will have access to different resources. Every academic department is confronted with challenges regarding exposing their candidates to enough training opportunities to achieve the learning outcomes identified [AUR3] and, ultimately, to pass the summative assessment.

To accomplish this, a number of different academic programmes and curricula currently exist, each unique to an academic department. Because *"all roads lead to Rome"* [MU1], the different multi-tiered curricula may be acceptable as long as competent radiologists are produced, but *"all the radiology academic departments are not at the same level"* [AR2]. Therefore, the accreditation of the departments should be monitored. *If you have a teaching department you must be able to offer all the modalities* [MR1] and it should, furthermore, be a prerequisite to have enough consultants working in the department.

A summative perspective on the eighth question: The eighth question of the semi-structured interviews with assessors and moderators of the radiology summative

assessment investigated the relevance and viability of a national outcome-based curriculum for radiology. At first, the remarks were very supportive of such a curriculum, until it became clear that such a project would create several challenges. The examination body should be responsible for identifying the learning outcomes of the training programme. Every university's radiology department should, within the particular context, create a curriculum relevant to their resources, but should ensure that all the national learning outcomes are achieved. A national curriculum would still be ideal and, because of the current knowledge explosion in radiology, it was suggested that an online international curriculum should be adopted to prevent a national curriculum becoming redundant within a very short period of time.

4.4 CONCLUSION

Chapter 4 provided an overview of the responses to semi-structured interviews with nine assessors and two moderators of the summative radiology assessment. The semi-structured interviews served as data collecting method employed in this study, and were conducted at seven geographic locations representing public and private health sectors in radiology.

During the interviews with assessors and moderators of the summative assessment in radiology, the aim of the researcher was to investigate the factors that play a role in the assessment of postgraduate students in radiology, determining the criteria for directive documentation for summative assessment in radiology, determining guidelines for assessors and moderators and identifying principles and purposes of assessment to ensure quality in assessment instruments, methods and tools for the radiology summative assessment.

The researcher reported and discussed the findings on the readiness of a candidate for the summative assessment in radiology, the readiness of a candidate for independent radiology practice, the roles and qualities of an assessor in the radiology summative assessment, the roles and qualities of a moderator in the radiology summative assessment, factors playing a role in conducting the radiology summative assessment, assessment methods, instruments and tools to be used in radiology, factors related to assessment training of assessors and moderators, and factors related to a uniform national outcome-based curriculum.

By asking the interviewees eight questions the researcher was able to identify the factors that play a role in identifying a competent candidate prior to and during the summative assessment, which ultimately led to determination of criteria for a competent radiologist; the purpose of and principles to be considered in using various assessment instruments and tools in the radiology summative assessment; and the principles to be considered in conducting the radiology summative assessment and guidelines for assessors and moderators of the radiology summative assessment with the aim of ensuring quality in the profession.

After visiting 11 radiology training hospitals the researcher furthermore gained a better understanding of the current situation in radiology, including staffing and equipment resources, ideas for training and learning opportunities, radiology department planning, and the availability and access to radiological imaging in general. The public health sector is faced with many challenges, but employs motivated people who are constantly fighting to provide quality care to their patients.

In the next chapter, Chapter 5, entitled ***Findings of the semi-structured interviews with candidates that are within one year post summative assessment: analysis and discussion***, the researcher describes the semi-structured interviews and data gathered from interviews with candidates who completed the radiology summative assessment, before the researcher turns to reporting and discussing the findings.

CHAPTER 5

FINDINGS OF THE SEMI-STRUCTURED INTERVIEWS WITH CANDIDATES THAT ARE WITHIN ONE YEAR POST SUMMATIVE ASSESSMENT: ANALYSIS AND DISCUSSION

5.1 INTRODUCTION

This chapter deals with the findings of the semi-structured interviews that were conducted by interviewing candidates that were within one year after completing their summative radiology assessment, regardless of whether they had passed the examination. The intention was to approach at least six possible interviewees. An invitation to participate in the study, together with a demographic questionnaire, were sent as a bulk email to all the candidates who sat the second semester 2014 CR (CMSA) exit examination (36 in total), but only one candidate replied. This candidate was the first interviewee in this group to participate in the study.

The researcher then contacted candidates randomly according to their geographical parent training departments, ensuring that none of the training departments that were represented on the candidate examination list were excluded. When a candidate was untraceable, the researcher continued to search for the next candidate from that particular parent department. All of the individually invited candidates consented to participate in the study.

The researcher continued to contact candidates randomly until no new themes, categories or subcategories emerged and the data were then considered to be saturated. There was no plan involved in the way some candidates were interviewed in person, or via Skype, or telephone – this was due to logistical reasons.

Although the aim of the researcher was to include candidates who had failed the summative assessment, candidates who had failed were not specifically targeted. The researcher only learned of previous summative assessment failures during the interviews with those candidates who sat the 2014 second semester CR (CMSA) summative assessment. Prior to the interviews, only one candidate was known to the researcher to have failed a summative assessment.

In total, 10 semi-structured interviews were conducted to investigate the factors that play a role in the preparation for summative assessment in radiology. These factors include those that affect publication of a research article or writing a dissertation for submission prior to taking part in the exit examination, currently presented by the South African College of Radiologists. The factors also include those affecting preparation for the exit examination itself, and could involve recommendations for future examinations as well as investigations into the role of feedback mechanisms. The researcher gathered information on the experiences and opinions of the candidates who completed the summative assessment as "users" of the assessment process.

To add to the opinions of the assessor body the researcher investigated the criteria that define a competent radiologist and the opinions of the interviewees on the relevance of and factors to be considered in a national outcome-based curriculum for radiology training in South Africa (cf. Table 5.4). Finally, their opinions were sought on any other factors that should be considered in summative assessment in radiology (cf. Table 5.5).

The data that was gathered was analysed and interpreted according to the principles described in Chapter 3 (cf. Point 3.3.2.5). This was done by categorising the data into themes and categories and identifying subcategories, where applicable. Finally, the researcher discussed the data to illustrate the correlation between the data and the interview questions that were put to the interviewees.

The data for this study were gathered by interviewing candidates originating from seven academic radiology departments in South Africa that are involved in the radiology summative assessment. All the candidates were within one year post radiology summative assessment and were categorised according to whether they had passed the assessment at the first attempt or had failed at any previous attempts. At the time of the interviews all the candidates had ultimately passed the assessment.

The group of interviewees included six candidates who had passed the summative assessment at the first attempt and four who had failed at least once. Interviewees had received their radiology training at different institutions affiliated to academic departments located in Polokwane, Pretoria, Johannesburg, Pietermaritzburg, Bloemfontein, Stellenbosch and Cape Town. The researcher visited radiology departments at 11 hospitals that fall under the academic management of the above-mentioned seven departments where registrars are based and rotate during the training period, to gain a better

understanding of the current situation in radiology training. There were no geographical predilections for candidates who had passed or failed.

All the interviewees fulfilled the inclusion criteria (cf. Point 3.3.4.2):

- completed the summative assessment required to qualify as radiologists in South Africa within the year prior to being interviewed, regardless of whether they had passed or failed;
- did research in a radiology department, if the candidate had started specialising in radiology since January 2011;
- did not do research in a radiology department if the candidate started specialising in radiology prior to January 2011;
- were currently practising in South Africa (private or public sector);
- were registered with the HPCSA as independent practitioners; and
- had given the required informed consent.

A summary of the background information of the interviewees is represented in Table 5.1.

TABLE 5.1: BACKGROUND INFORMATION OF INTERVIEWEES

Code	Current access to an academic radiology department	Involved in public or private health-care	Interview via Skype, phone or in person	Registrar/consultant ratio during final year of preparation	Had done research in radiology	Highest qualification
GROUP 1: CANDIDATES WHO PASSED AT THE FIRST ATTEMPT						
CP1	No	Private	Skype	3:1	Yes	M.Med. (D.Rad.); FC Rad Diag(SA)
CP2	No	Private	Telephone	2:1	Yes	FC Rad Diag(SA)
CP3	No	Private	Skype	3:1	Yes	FC Rad Diag(SA)
CP4	No	Private	Skype	2:1	Yes	FC Rad Diag(SA)
CP5	Yes	Public	In person	3:1	Yes	FC Rad Diag(SA)
CP6	Yes	Public	Telephone	5:1	Yes	M.Med. (D.Rad.); FC Rad Diag(SA)
GROUP 2: CANDIDATES WHO FAILED AT THE FIRST ATTEMPT						
CF1	Yes	Public	In person	3:1	Yes	FC Rad Diag(SA)
CF2	Yes	Public	In person	3:1	No	FC Rad Diag(SA)
CF3	No	Public	Skype	3:1	Yes	FC Rad Diag(SA)
CF4	Yes	Public	Telephone	7:1	Yes	FC Rad Diag(SA)

Interviewing candidates from different geographical locations and different ethnic groups provided different perspectives, which gave the researcher a more in-depth view of the different realities involved in preparing for the radiology summative assessment.

5.2 DATA ANALYSIS OF THE SEMI-STRUCTURED INTERVIEWS

Data was gathered according to the principles and methods identified and explained in Chapter 3 (cf. Points 3.3.2.4 & 3.3.2.5). When the researcher received only one response from a bulk email that had been sent to 36 candidates, a new approach was necessary. A summary of this approach is as follows:

- Interviewees were first contacted by telephone and then by email, to invite them to participate in the interviews.
- The email included an invitation letter (cf. Appendix B1), informed consent form (cf. Appendix B2) and a demographic questionnaire (cf. Appendix B3) as well as an interview guide to demonstrate the type of questions that could arise during the interviews, to give interviewees the opportunity to prepare their responses during the interviews, with the aim of improving the dependability of the study.
- Due to logistical reasons that were determined by the geographical location and the "time of day" availability of the interviewees, three interviews were conducted in person by the researcher, three interviews were conducted telephonically and four via Skype.
- All the interviews were audio recorded and transcribed for referencing and coding.
- A semi-structured interview guide was used in all the interviews to contribute to the dependability of the study (cf. Appendix B4).

The data originating from the interviews was examined by the researcher according to the principles described in Chapter 3 (cf. Point 3.3.2.5). The researcher listened to the recordings while making field notes. This was followed by confirmation and comparison of the transcriptions and field notes, to systematically arrange the data into themes, categories and subcategories, where applicable.

The notes that were made during the interviews were limited as far as possible to improve communication, to ensure intent listening and to make eye contact with the interviewee where applicable. During the telephonic interviews, after each question, the researcher verbally summarised the response of the interviewee and repeated the information as a rephrased question to the participant to confirm the correct interpretation by the researcher and to give the interviewee the opportunity to correct any misunderstanding by the researcher. The above-mentioned techniques contributed to the credibility of the data gathered.

Some responses during the interviews were followed by follow-up questions to gain a better understanding of the gathered data. The follow-up questions were repeated throughout different interviews when they were found to be relevant and to contribute to the dependability of the study.

All the transcriptions were typed by two independent typists. These transcriptions were read and quality controlled by the researcher prior to being handed over to his promoters, who confirmed the correctness and authenticity of the coding of the gathered data, thereby enhancing the trustworthiness of the study further. The researcher followed the analysis approach explained by Labuschagne (2011:58), which was also used in Chapter 4 and which involves categorising the qualitative data into themes, identifying categories within these themes and demonstrating the relationships between the data and the interview questions. Subcategories were also identified within the categories, where applicable. This process was concluded through analysis control by the researcher's promoters.

After the recordings had been transcribed, checked for accuracy and quality controlled by an independent researcher, the data was themed and categorised by grouping similar concepts; this enabled the researcher to simplify the coding process. This was done meticulously by the researcher to guarantee truthful reporting of the responses with the aim of ensuring dependability of the study and thereby preventing bias.

The researcher assigned codes to all the interviewees to simplify the reporting process. Although the codes were assigned randomly to the interviewees according to the availability of the interviewees and timing of the interviews, the researcher did categorise the interviewees into:

- candidates who had passed the summative assessment at the first attempt [CP1-6]; and
- candidates who had failed the summative assessment at the first attempt [CF1-4].

The reader should note that all the interviewees ultimately passed the assessment, some after completing the assessment more than once, but the responses are nevertheless likely to be different because of the number of attempts needed to complete the assessment successfully by the time of the interviews. Therefore, the researcher divided the subjects into two groups, so that the reader can easily follow remarks by interviewees who had experienced two different assessment outcomes.

The same coding number was used for the same interviewee throughout the report. Direct quotes are often used, where applicable, to augment the trustworthiness of this study.

Similar to the interviews with the assessors and moderators, some of the interviews were conducted in Afrikaans and therefore the researcher translated any relevant direct quotes into English. Care was taken by the researcher to express the meaning of the original response. Direct quotes in the tables that were not translated are presented between double quotation marks. Translated direct quotes are presented similarly, but in italics. For example: "Nothing at all" is the interviewee's own words, but *"Is a very interesting field"* is a translated quote. In tables and text the themes are numbered, the categories are indicated in bold and the subcategories are underlined.

All the findings were tabulated to categorise the analysis of data into themes, categories and subcategories, where applicable.

5.3 REPORTING, DATA ANALYSIS, DESCRIPTION AND DISCUSSION OF THE FINDINGS OF THE SEMI-STRUCTURED INTERVIEWS

With the aim of simplifying the analysis and the reporting of the data, each question that was put to the interviewees will be discussed separately. This discussion will follow the chronology of the interview guide that was used during the semi-structured interviews.

5.3.1 Identifying the factors that influenced the candidates in their preparation for the radiology summative assessment

The first question that the researcher asked all the interviewees, according to the interview guide, was: "What are the factors that influenced you in preparation for the summative assessment?"

The responses of all the interviewees were analysed and arranged into themes, categories and, finally, subcategories, where applicable. The themes that were identified were as follows:

- Theme 1: Motivation to attempt and complete radiology specialisation;
- Theme 2: Influence of family;

- Theme 3: Time management for studying;
- Theme 4: Doubts experienced during specialisation;
- Theme 5: Experiences that may influence preparation for the assessment;
- Theme 6: Teaching and learning activities that influenced passing the assessment;
- Theme 7: Learning outcomes in radiology;
- Theme 8: The impact of the research project; and
- Theme 9: Formative assessments contributing to passing the assessment.

The themes, with the coupled categories and subcategories, are presented in Table 5.2 and will be discussed separately. Some of the responses may be given as direct quotes to enhance the credibility, dependability and confirmability of the study.

TABLE 5.2: IDENTIFYING THE FACTORS THAT INFLUENCED THE CANDIDATES IN THEIR PREPARATION FOR THE RADIOLOGY SUMMATIVE ASSESSMENT [Table continues on next pages]

THEMES	CATEGORIES
1. Motivation to attempt and complete radiology specialisation	Previous exposure to radiology prior to specialisation <u>Direct exposure to radiology</u> • <i>"Elective as a medical student."</i> [CP1] • Observed a radiologist working in practice. [CP4] <u>Indirect exposure to radiology</u> • Exposure to radiology at the trauma department. [CF1] • <i>"Worked next to the radiology department for a year."</i> [CP2] • Enjoyed radiology exposure working as a neurology registrar. [CF2] <u>No exposure to radiology</u> • Never had any exposure. [CP5] • No previous exposure to radiology. [CP6] • <i>"Nothing at all."</i> [CF4] • Had no previous exposure to radiology. [CF3] <u>Other exposure-related responses</u> • Important for motivation. [CP1] • <i>"I knew I do not want to be a general practitioner."</i> [CP4] • Previous exposure to science and technology. [CP1] Technological advances and development <u>Technological advances in radiology</u> • Dynamic, modern technological advances in radiology. [CF3] • A lot of different facets to radiology that are technologically driven. [CP4] • <i>"The science and technology that are involved in radiology."</i> [CP1] • <i>"The development in terms of technology."</i> [CP2] <u>Radiology is a dynamic field</u> • <i>"Will never stagnate."</i> [CP2] • <i>"Is a very interesting field."</i> [CP3] <u>Radiology plays a central role in medicine</u> • <i>"More extensive role to any discipline."</i> [CF1] • <i>"Radiology is the core for all."</i> [CF1] • Radiology is central to all other specialist disciplines. [CP5] • Radiology exposes you to all facets of clinical medicine, all specialities, to give you a broad perspective. [CP6] • No modern medical discipline can function without radiology. [CF3]

	Financial benefits <u>Financial benefits influencing the candidate's motivation</u> • <i>"Good remuneration."</i> [CP1] • Specialisation in general is financially beneficial. [CP2] <u>Financial benefits not influencing the candidate's motivation</u> • Money was never relevant, wanted to be happy in profession. [CP4] • Finance was never a consideration. [CP6] • Financial benefit was not a consideration. [CF3] • Was not important. [CF4] <u>Other responses related to financial benefits</u> • Time not necessarily linked to money. [CP2] • Necessary to take care of family. [CP3] Working environment <u>The working hours</u> • <i>"Better working hours."</i> [CP1] • <i>"Set hours."</i> [CP2] • Controlled working hours. [CP5] <u>The controlled environment</u> • <i>"Controlled environment."</i> [CP1] • More controlled environment. [CF1] • Radiology is a more controlled environment. [CF4] • "I liked the way he was working." [CF4] • Is appealing for a woman because it is a more controlled environment. [CF2] • Better choice of speciality for a mother. [CP5] • Physically a more secure environment. [CP3] <u>Limited patient interaction</u> • Partly away from patients but still some patient contact. [CP2] <u>Quality of life</u> • <i>"Quality of life."</i> [CP2] • "Quality of life." [CF1] • "Better quality of life." [CP5] • Better quality of life. [CP3] • Quality of life is better than in most specialised disciplines. [CF3] • <i>"Quality (patient) care."</i> [CP1] • Job satisfaction. [CP4] • <i>"More family time."</i> [CP3] • <i>"More family time."</i> [CP2] <u>Collegial support</u> • Shared responsibilities. [CP1] • Depends on the needs of the institution and patient numbers, more colleagues means better support. [CP5] • Radiologists work in a group providing better collegial support and opportunities for taking leave. <u>Other working environment benefits</u> • Flexibility of the system, getting exposed to different modalities and hospitals. [CP5] <u>Contradictory remarks on the working environment</u> • Working environment did not influence decision to specialise in radiology. [CP6]
2. Influence of family	Attempting and completing the summative assessment <u>The contribution of relatives with a medical background</u> • Relatives with medical background contributed. [CP1] • <i>"Many relatives are doctors."</i> [CP2] • Relatives in medical profession did contribute. [CP3] • Partner is in the medical profession. [CF1] • One of the parents is a specialist physician. [CP4] • The fact that the wife is also a specialist was a major benefit. [CP1]

	• <i>"I am privileged to be married to someone who has gone through medicine and specialisation."</i> [CP1] • Sibling is a general practitioner. [CF2] • Spouse is a general practitioner. [CF4] <u>The contribution of extended family support</u> • <i>"Was my support system."</i> [CF1] • <i>"You need somebody that understands what you're going through."</i> [CF1] • Family was a driving and supporting factor to be successful due to stress caused by being away from the family. [CP6] • Provided a lot of emotional support. [CF2] • Family helped by giving support, providing food and helping to relax when needed. [CP4] <u>No extended family support</u> • Family played no role in choosing radiology. [CF3] • Family played no role in motivation to pass. [CF3] • <i>"Family wasn't even aware what radiology is."</i> [CF4] • The spouse became supportive during specialisation but the rest of the family has no insight. [CF4] <u>Neglecting the family</u> • It is more challenging to specialise with dependants. [CP4] • Very difficult to balance specialisation and family. [CP5] • <i>"It comes with a lot of very big sacrifices."</i> [CP5] • <i>"One works hard, one studies hard and one neglects the family."</i> [CP1] • Neglecting family last two years. [CP1] • <i>"Saw my family rarely."</i> [CP3] • <i>"If one sees them so seldom, it is also motivation."</i> [CP3] <u>The impact of children on summative assessment preparation</u> • Children require attention and cannot wait. [CP1] • <i>"Children are demanding."</i> [CF1] • Children make a massive difference in preparing for the final examination. [CP2] • Finding study time was more challenging with children. [CP3] <u>The impact of motherhood on summative assessment preparation</u> • <i>"Was much easier to specialise before I had the child, specialising with a family is more challenging."</i> [CP5] • Challenge to balance the baby and working. [CP5] • <i>"Returning from maternity leave, I was clueless."</i> [CP5] <u>Other family-related factors</u> • Went through traumatic experience during training period. [CF2] • <i>"Have to manage your time explicitly."</i> [CF1]
3. Time management for studying	Intensive literature study prior to the summative assessment <u>Different perspectives on time</u> • Two years general text, last year intensive study every day. [CP1] • <i>"Some people set two years aside."</i> [CP2] • <i>"A year and a half that I started."</i> [CF1] • Started to focus 18 months prior to the final and 8 months of intensive studying. [CP4] • Eighteen months focused studying with one year intensive studying before the final examination. [CP5] • Eighteen months strict study timetable, last year very strenuous. [CF2] • Should start no later than 14 months prior to the final assessment. [CF3] • Last 14 months focused studying and last 8 months intensive. [CP3] • Last year intensive studying and last six months are crucial. [CP2] • 10 months intensive studying prior to the final assessment. [CP6] • An average of eight months intensive structured studying. [CF4] <u>Different approaches to different assessments</u> • Different time management approaches for different structured examinations (M.Med. and College). [CF1]

The impact of the candidate's level of knowledge

Time management improves with increase in knowledge

- Time management improves with increase in theoretical knowledge. [CP1]
- Time management improved as knowledge, confidence and experience increased during the training programme. [CP6]
- Time management improves as knowledge increases. [CF3]
- Increase in knowledge contributes to improved time management. [CP2]
- Increase in knowledge improved preparation for academic meetings. [CF1]
- Increase in knowledge helped to browse faster through some topics. [CF4]
- Looked through summarised articles much faster as knowledge increased over time. [CP4]
- Work and study much faster as knowledge and experience increase. [CF2]
- Better general knowledge does help. [CP3]
- Without a core base knowledge of radiology one will waste time during preparation for the summative assessment. [CF3]

Knowledge increases with time

- Write as late as possible because one's knowledge increases exponentially every six months. [CP4]

Knowledge increase leads to less study time during working hours

- Increase in knowledge and experience lead to more responsibilities, clinical consultations and less study time. [CP5]

The impact of the daily workload

Workload is imaging modality related

- At some imaging modalities one has to work till late. [CP2]
- Tired in the evening after working at demanding modalities like CT and MRI. [CP2]
- *"CT is always busy."* [CP4]

Workload limits study time

- Workload does influence one's ability to study at the end of the day. [CF1]
- Increased workload decreases study time. [CF3]
- The amount of work does influence study time negatively but one has to study around it. [CP6]
- *"We didn't get any time to study; there were just too much work."* [CF2]
- *"The workload is too much."* [CF4]
- *"By the time you get home, you're exhausted."* [CF2]
- *"When you go home you are flat."* [CF4]
- Returning from work, one has to study after only a brief rest period. [CF4]

Structured study plan helps

- Not a major impact with a structured study plan. [CP3]
- Work is done during the day and studies are conducted after hours; study schedule is adapted according to workload. [CF3]

Other related factors

- Responsibilities outside of work. [CP1]
- Travelling for tutorials is time consuming and demanding. [CF2]

Positive comments on the workload

- *"I thrive on working under pressure."* [CP6]
- Radiology is in-service training by making use of learning opportunities and exposure to pathologies. [CF3]

The impact of after-hours on-call work

After-hours work limits study time

- For every one night on call you lose two days of studying. [CF3]
- Recovering from exhausting after-hours work causes delays in study schedule. [CP4]
- Was sometimes tricky to study because of after-hours on-call work. [CP5]
- Episodic limited study time. [CP1]

Contradicting comments

- *"Never was an issue working long hours."* [CP3]
- *"It wasn't the working hours."* [CF1]

4. Doubts experienced during specialisation

Doubts experienced due to the candidate's level of knowledge

Increase in knowledge

- Increase in knowledge leads to more clinical consultations with an increase in workload that was experienced as too challenging. [CF4]

Lack of knowledge

- Experienced doubts during the early years because of lack of knowledge. [CP5]
- After tutorial sessions, experienced doubts about readiness for the summative assessment. [CP6]

Doubts experienced due to the consultant/registrar ratio

Fewer consultants means increased workload, less supervision and teaching

- Fewer consultants mean more responsibilities to the senior registrars forced to work independently and less teaching. [CP6]
- Not having enough consultants often leads to unsupervised working conditions that have a negative impact on the preparation for the assessment. [CF3]
- "The more registrars per consultant, the less teaching benefit they get." [CF1]
- Not enough consultants to provide enough support and supervision. [CP2]
- Very limited academic consultant input due to overburdened workload. [CF2]

More consultants augment experience, knowledge, guidance and interests

- "A lot of people may feel that there should be more consultants." [CP4]
- A bigger number of consultants contribute to exposing candidates to different levels of experience, knowledge and interests. [CF4]
- Having more consultants lead to regular, more directed guidance towards important topics, especially during the preparation for the summative assessment. [CF4]

The preferred number of consultants

- Two registrars per consultant are ideal. [CF1]

Doubts experienced due to failing the assessment

Failing may lead to depression

- Depressed psyche negatively influences effective studying. [CF1]
- "Was very difficult to pick myself up, especially (after) the second time." [CF2]

Failing may decrease confidence

- "It does definitely affect your self-confidence." [CF1]
- Is very humiliating amongst peers, consultants and family. [CF2]
- Led to anxiety, especially in the oral. [CF2]

Positive experiences

- Experience gained contributed to future success. [CF1]

Negative experiences

- Passed the written part but repeatedly failed the orals. [CF2]
- Was told moments before the oral that one should not sit the assessment before completing four years of training. [CF3]
- No feedback was given by the examination body. [CF4]

The possibility of bias

- The outcome of the assessment may be influenced by how other people perceive one's approach to the oral cases, opening up the possibility for personal bias. [CF3]
- Candidates coming from specific geographical venues may have an advantage in passing the assessment. [CF3]
- "How can one go from a cum laude in one room to a fail in another room?" [CF3]
- "I thought there was too much unfairness." [CF4]

Doubts leading to giving up

No doubts leading to giving up

- "Never." [CP1]

	• <i>"I never had any doubts."</i> [CP3] • <i>"I never experienced any doubts."</i> [CF3] • <i>"I didn't have doubts."</i> [CF1] • Never doubted radiology but sometimes lacked self-confidence. [CP4] • <i>"Never considered studying anything else."</i> [CP4] • Never considered quitting radiology. [CP6] <u>Reason for not having doubts</u> • "All I had was my radiology; I really wanted to make that work." [CF2] <u>Doubts experienced prior to specialising in radiology</u> • Do not know if one is ready for radiology. [CP2] • Long waiting period to get a post. [CP2] • Becoming older during specialisation and waiting for a post. [CP1] <u>Doubts experienced during specialising in radiology</u> • Every registrar doubts at some point in time. [CP2] • Some colleagues are not pulling their weight. [CP2] • Doubts regarding future workplace. [CP2] • "Having a child made me consider quitting." [CP5] • Considered giving up after failing the first attempt at the summative assessment. [CF4]
5. Experiences that may influence preparation for the assessment	Radiology experience <u>The value of radiology experience prior to specialisation</u> • <i>"It is priceless."</i> [CP2] • Developmental training as a radiology medical officer in a radiology department is valuable. [CP2] • Experience as medical officers in radiology should be introduced for every person because those guys are streets above the rest. [CF2] • Is not a necessity but it does help a lot. [CF1] <u>The reasons for gaining prior radiology experience</u> • Helps to found radiology as a career choice. [CP6] • Previous radiology experience plays an important role and is advantageous, especially to become integrated in the system. [CF3] • Important for motivation. [CP1] • One should complete the primary examination during the medical officer time. [CF2] <u>Experiences contributing to the summative assessment</u> • Basic principles are important in the final examination. [CP2] • Previous radiological experience more important than theoretical knowledge. [CP2] • <i>"Repetition is the way to remember."</i> [CP4] <u>Contradictory comments</u> • Previous radiology experience does not play a role at all in the preparation for the summative assessment. [CF4] <u>The value of after-hours work experience</u> • After-hours work is important to learn to work independently. [CP6] Clinical experience <u>The value of clinical experience (if it contributes)</u> • Important to help in deciding on radiology. [CP3] • A strong clinical base helps a lot in the daily radiological work. [CF3] • Clinical experience is valuable in diagnostic workup of patient. [CP1] • Clinical experience does play a role but less important than previous radiological experience. [CP2] • Not that important compared to theoretical knowledge. [CP1] <u>The relevance of clinical experience (how it contributes)</u> • Helps a lot to understand the relevance of the study and what is wanted from the study. [CF2] • To make decisions as a radiologist, one needs a good clinical background. [CP6] • Clinical experience helps to ask relevant questions on deciding the correct

	investigation. [CF1] • Clinical experience and knowledge is very relevant to understanding the clinical approach and what imaging findings to expect. [CF4] • Clinical experience is important to give clinically relevant reports. [CP4] • Clinical experience helps you to guide clinicians and deciding on the relevant imaging modality. [CP5] • May also contribute when doing research. [CP3] <u>The quality of clinical experience</u> • Depends on the level of exposure and the level of the institution. [CF1] Collegial support <u>Why the experience of collegial support is relevant</u> • Very long process trying to get a post. [CP2] • <i>"Takes months to get going."</i> [CP2] • Colleagues motivate to <i>"hang in there"</i>. [CP2] • Important for motivation and sharing. [CF1] • Colleagues contribute significantly by giving support and motivating one another constantly. [CP4] • Registrars are supporting one another. [CP3] • Colleagues give valuable support because one cannot study radiology in isolation. [CF4] • It provides a lot of psychological support. [CP5] • Academically stronger registrar body contributes to success. [CF2] <u>How the experience of collegial support is relevant</u> • Teamwork plays a major role. [CP1] • You need a good team to guide and motivate you. [CP6] • Divide into smaller subgroups to prepare for the examination. [CP5] • Collegial support in a smaller group is very important. [CP5] • Colleagues helped a lot in giving advice. [CF2] • Supporting one another helps to produce good candidates, especially when showing interesting cases. [CF3] Consultant input <u>The relevance of consultant input</u> • Consultant remarks are a major influencing factor, whether negative or positive. [CF1] • Good consultants contribute positively and bad consultants negatively. [CF3] • Positive and negative remarks should be balanced and one should learn to deal with it. [CP6] • Some consultants enjoy teaching and some do not. [CP4] <u>The relevance of destructive input</u> • Some consultants are not supportive. [CP3] • <i>"Some consultants are very harsh."</i> [CF4] • <i>"One of them was super-critical and kind of almost rude in the tuts."</i> [CF2] • <i>"I don't think it is the right way to teach."</i> [CF2] • Consultants' derogatory remarks can be destructive, especially close to the assessment. [CP4] <u>The relevance of humiliation</u> • <i>"I do not learn well if I am humiliated; where I would really thrive if somebody encourages you."</i> [CF2] • Should not be humiliated in front of colleagues. [CF1] • <i>"How you deal with humiliation is what matters."</i> [CP6] <u>The relevance of constructive input</u> • Improved consultant input leads to more focused studying. [CF4] • Good tutors play a major role in guiding trainees. [CP2] • Essential to have guidance from a consultant regarding readiness to sit the final assessment. [CF2] • Played a major role in guiding the approach to and presentation of examination cases, as well as examination technique. [CP4]

	• Consultants play an important role in motivating the candidates. [CF4] • A mentor also guides towards future career goals. [CP4] <u>The relevance of consultant experience of the summative assessment</u> • Consultants with experience as assessors help by identifying gaps in knowledge. [CP4] • "It is essential to have consultants involved, also consultants who know what is happening in the exams." [CF2] <u>The relevance of consultants staying up to date</u> • Consultant experience is important in providing relevant academic exposure. [CF4] • Consultants need to stay up to date with modern trends. [CF4] <u>The relevance of individual feedback</u> • Quarterly individual interviews with head of department to discuss progress and training issues. [CP4] <u>The relevance of favouritism and racism</u> • Racism and favouritism was not a factor. [CF3] • No place for favouritism. [CP4] Language • It is a big factor trying to come to terms with things throughout your training. [CP6] • Answering questions in English as your second language is challenging. [CP6] • Everyone is used to working in English so language should not be an issue anymore. [CF3] • Used to English. [CF4]
6. Teaching and learning activities that influenced passing the assessment	Didactic presentations <u>The value of didactic presentations (if it contributed)</u> • Academic presentations contributed. [CP3] • Academic presentations do help a lot, especially those presented at conferences aimed at specific subdisciplines. [CF3] • Structured academic programme is helpful. [CP5] • Structured academic programme contributed to success. [CP2] • Structured academic programme is an important positive factor. [CP1] • Organ-system based, structured, 4-year academic programme was valuable. [CP4] • Preparing for the presentations contributed. [CF1] <u>The relevance of didactic presentations (how it contributed)</u> • Topics should be relevant. [CF2] • If you exercise effective, sufficient preparation for the academic meetings, you do not need to repeat studying those topics. [CF3] • Presentations help you to address certain relevant, important topics in radiology. [CP6] • Preferable to listen to an expert or a consultant when listening to a didactic presentation. [CF3] <u>The time involved in didactic presentations</u> • Presentations take a lot of time to prepare. [CP1] • Preparing presentations is very time consuming. [CP3] • Is very time consuming. [CF2] • Time consuming but very educational. [CP3] • Academic presentations are time consuming, especially in the last year, and may create stress. [CP4] • Some irrelevant academic responsibilities take away your time. [CP6] • Constantly preparing for presentations due to limited registrar pool, leading to less focused study time. [CF4] • "That was a bit of a deterrent sometimes." [CF1] • "With a limited registrar body, we had a lot of presentations to prepare for, I found it extremely taxing." [CF2]

Tutorials

The value of tutorials (if it contributed)

- Tutorial oral sessions and short case discussions contributed to success. [CP2]

- *"Helped a lot."* [CP3]

- Tutorials are essential. [CF2]

Tutorials encourage continued studying

- The different activities coerce continued studying throughout the training period. [CP2]

- *"It forces you to do a bit of learning."* [CF1]

- Sometimes have to review literature after a tutorial session. [CP4]

Tutorials help in the preparation for the summative assessment

- Valuable to get exposed to rapid reporting and long cases to practise for final examination. [CP5]

- Tutorials are important to get guidance on how to approach cases and on preparing for the examination. [CP6]

- Tutorials are very important to prepare for the orals. [CF3]

- One-on-one tutorials with a consultant are a big contributory factor in passing the assessment. [CF4]

- Valuable and aimed at baseline essential cases, more challenging cases and examination technique. [CP4]

- Tutorials are important for teaching of fundamental principles. [CP2]

Outreach to other health facilities

- Contributes to family stress. [CP1]

- Contributes to managerial role. [CP1]

- Contributes to independent thinking and building confidence. [CP1]

- Good indicator of readiness for summative assessment. [CP1]

- Frustrating because one is away from home, but it is a good learning experience if supervised. [CP6]

Interdepartmental meetings

The value of interdepartmental meetings

- Interdepartmental meetings contribute to success. [CP2]

- Only valuable if properly structured. [CP3]

Receiving guidance from the clinical disciplines

- During interdepartmental meetings presents to professors from other specialties. [CP2]

- Other clinical departments helped in guiding on what is expected from the radiological reports. [CP5]

- Helps you to get a feel for what the clinicians are looking for and if you are able to answer the clinical question. [CP6]

- Good practice for the assessment, one is put on the spot, relevant feedback from the clinicians. [CF2]

Assessing the candidate's knowledge

- *"You apply your knowledge."* [CF1]

- Is very valuable, but should guard against going at fellowship level. [CP4]

- Teaching cases was discussed at the interdepartmental meetings. [CF3]

Practising how to manage a stressful situation

- Being put on the spot in front of colleagues made a difference. [CP2]

- The candidate learns to manage a stressful situation in front of unfamiliar people in preparation for the assessment. [CF4]

Interdepartmental meetings should not be humiliating

- Should not be humiliating or destructive critique. [CF1]

Journal clubs

The value of journal clubs (if it contributed)

- Weekly journal clubs contributed to success. [CP2]

- *"I found that journal articles were essential to pass."* [CF2]

- Valuable, saves time. [CP3]

	<u>The relevance of journal clubs (how it contributed)</u> • "It teaches you how to think." [CF1] • Was aimed at important topics that may come up in the assessment. [CP4] • Was very helpful to see new developments in radiology. [CF2] • Journal clubs direct the candidate to gather more in-depth knowledge on a specific topic. [CF4] <u>Journal clubs should be structured</u> • Articles are summarised on one page for future quick reference. [CP4] • Is a waste of time if not enough time allocated and not well prepared. [CP5] • Journal clubs are not useful if not properly structured. [CP6] Case studies • <i>"Were very valuable to me."</i> [CP3] • "I found them very, very helpful." [CP5] • Is very helpful, especially when knowledge is shared. [CP6] • "You start sharing." [CF1] • "Gives you an approach." [CF1] • Should not focus only on rare cases, but include common important cases. [CP4] • Is studied extensively during preparation for the presentation and is therefore also covered for the assessment. [CF4] Online databases <u>Preferred online databases</u> • "I would go to RADPrimer." [CF1] • I used RADPrimer a lot to guide me, it was very helpful." [CP5] • RADPrimer and STATdx are the most important resources in learning radiology. [CF3] • "We used RADPrimer, STATdx and Radiology Assistant a lot but mainly RADPrimer." [CF4] • "I used Radiology Assistant and Radiopaedia a lot." [CP6] • <i>"My main base was Radiopaedia."</i> [CP4] • Radiopaedia, Radiology Assistant and the Royal College database were very helpful. [CF2] <u>Online databases provide a structured approach</u> • A structured, systematic learning approach to the pathology helps a lot. [CP4] • It helps you to give a summarised approach to pathology. [CP6] Core textbook <u>During the training period</u> • Identify a core text and add information as needed to save time later on. [CP1] • Decide on one core text and add on. [CP2] • Study a core handbook early in training to build on during training. [CP4] • "Find a core book and try to understand what is going on." [CP6] • "Just choose one core text and add to that." [CF2] • Should work through one core text book to have a foundation. [CF3] • "It is very important to have one book as your note book and add on to that." [CF4] <u>Prior to the summative assessment</u> • <i>"One source just prior to examination."</i> [CP1] • <i>"Pull it together."</i> [CP1] • Looked at old papers and studied the textbook. [CF2] • It is crucial to have a good general overview of radiology before starting the final preparation for the summative assessment. [CF3]
7. Learning outcomes in radiology	The effect on the preparation for the summative assessment <u>The candidates' ignorance of the learning outcomes</u> • <i>"Did not know about learning outcomes on the website."</i> [CP1] • "I wasn't aware." [CF2]

	• <i>"I didn't know about it."</i> [CF3] • <i>"I wasn't aware that there was that learning outcomes on the website."</i> [CF1] <u>The candidates' awareness of the learning outcomes</u> • <i>"I knew about it."</i> [CP2] • Knew about it. [CP3] • <i>"I have seen it."</i> [CP6] • Knew about it in my final year. [CP4] • Knew about it. [CP5] • The consultants need to be familiar with it to incorporate it in the curriculum. [CP2] <u>The value of the learning outcomes (if any)</u> • May hypothetically contribute. [CP1] • May have helped. [CF2] • <i>"If I knew about it earlier, it would have been a compass."</i> [CP4] • In a limited resource setting (e.g. few consultants) learning outcomes will have to feature more. [CP2] <u>The relevance of the learning outcomes (nature of contribution)</u> • Did not trust it to be reliable. [CP3] • Did not use it in preparation for the final assessment. [CP5] • <i>"It was an eye opener, but I did not use it. I trusted the system."</i> [CP2] • <i>"It is a very broad general guide that doesn't help much."</i> [CP6] • The learning outcomes on the webpage are not helpful because it is too generic and not specific enough. [CF4]
8. The impact of the research project	Future research <u>Candidates who are not enthusiastic</u> • <i>"Have had enough of research for a few years."</i> [CP1] • <i>"I am not a person for doing research."</i> [CP2] • <i>"I will not attempt something like this again."</i> [CP3] • <i>"I am not into doing research, it didn't change my opinion, but some people would like that kind of thing."</i> [CP6] <u>Candidates who are enthusiastic</u> • <i>"I want to do a possible follow up."</i> [CP4] <u>The value of conducting future research</u> • <i>"Research needs to be done."</i> [CF1] • <i>"Nice to contribute to the academic pool."</i> [CP1] • Did learn how to do research and therefore relevant if one wants to stay in the academic fraternity. [CF3] • Need to gain experience to do good research and to give back to the field of radiology. [CF3] <u>The need to allocate time for doing research</u> • Suggest allocated time for doing research during the training period. [CP4] Lessons learned <u>The value of the research project (if it contributed)</u> • <i>"It contributes, it's a way of giving back."</i> [CF1] • <i>"It doesn't contribute to the training of a radiologist as such."</i> [CP6] <u>The relevance of the research project (how it contributed)</u> • Initiates critical thinking. [CP1] • Helps in critically assessing other articles. [CP3] • Contributed to improved service delivery. [CP2] <u>Understanding research principles</u> • <i>"Good understanding of research."</i> [CP1] • Creates respect and appreciation for published research. [CP1] • <i>"I can see why it is important."</i> [CP3] • Learned a basic understanding of research terminology and principles. [CF4] <u>The time used for the research project</u> • <i>"A lot of work, time consuming, a lot of effort."</i> [CP1]

	• "It is time consuming." [CF1] • It is time consuming. [CF4] • Very time consuming. [CP2] • "Very cumbersome and a waste of time." [CP6] • It is obstructive and time consuming when studying for the final assessment. [CP4] • <i>"It was a massive drainage of time that I could have used to study."</i> [CF3] • It is very stressful, it disturbs the studying momentum. [CP5] <u>When to complete the research project</u> • Complete early in training period. [CP3] • "Should be done within the first two years." [CF1] • Do it immediately and finalise by the end of year three. [CF3] • Need to have structured support in the academic department to finalise it before studying for the final assessment. [CP5] • Better to be completed early in the training period, or after passing the summative assessment as a prerequisite prior to registration as a specialist. [CF4]
9. Formative assessments contributing to passing the assessment	Written assessments <u>Encourage continued studying</u> • Important for motivating frequent studying and as measurement of progress. [CP1] • Enforces continued studying. [CP2] • Very valuable because one is forced to study. [CP3] <u>Contributes to preparation for the summative assessment</u> • Assessments are done monthly to simulate the summative assessment and include written questions, rapid reporting and long cases. [CF4] • Includes long cases and rapid reporting to practise for final assessment. [CP4] • A mock examination to simulate the final assessment also helped. [CP4] • The mock examination does help to prepare for the final assessment. [CP5] • Aim of the mock examination is to identify readiness for the final assessment. [CP5] <u>Provides constructive guidance</u> • Gives guidance and reassurance to stay on track. [CP4] • Contributes to identifying and achieving outcomes. [CP1] • Useful to check progress in theoretical knowledge. [CP4] • Contributes to building confidence. [CP1] <u>Other responses</u> • Only very recently implemented. [CF2] Practical assessments • "We had practical tests." [CF4] • Some are continuous and some are fixed assessments. [CP5] • Different scenarios that include observation of skills, a mini-oral, a written component or all of it. [CF1] • Done after every modality rotation block. [CP4] • No practical assessments. [CF2] The portfolio <u>The time needed for the portfolio</u> • Is time consuming to compile. [CP1] • Time consuming to compile. [CP3] • It takes time. [CF1] • It is time consuming. [CP4] <u>The value of the portfolio (if it contributed)</u> • Valuable in giving an idea of academic work that was done during training period. [CP1] • May be of value only in a smaller assessment system, insight into an individual's background. [CP3]

	<u>The relevance of the portfolio (how it contributed)</u> • Can be used to assess other CanMEDS roles. [CP1] • May include Basic Life Support Course. [CP1] • Serves as motivation prior to final examination. [CP2] • It helps to show progress during the training period. [CP5] <u>The portfolio as an adjunct to a curriculum vitae</u> • It contributes to your CV. [CF1] • Is very good for your CV. [CF2] • Very important to be able to complete a detailed CV, especially for applying abroad. [CP4] • Relevant for people who plan to go overseas, not relevant for local use. [CP6] <u>The reliability of the portfolio</u> • Cannot be used to compare institutions due to different challenges in resources. [CP5] The logbook <u>The logbook identifies hard workers</u> • Difference between quantity and quality of reports. [CF3] • Very effective measurement tool of number of cases done. [CP1] • Should see an upward trend. [CF1] • "Is valuable to set a standard." [CF1] • Identify "dodgers and divers". [CF1] • "At least it shows that you have not been slacking in the department." [CF2] <u>The logbook has limited value</u> • Do not see any role for it. [CP6] • "It is useless." [CF4] • Do not need logbooks if the HOD signs off the candidate's rotations. [CF4] <u>The time needed to compile the logbook</u> • Time consuming. [CP1] • Is time consuming. [CP4] • They are cumbersome. [CP6] • Is time consuming but easier with PACS. [CF2] <u>The value of proving a high number of cases</u> • High number of cases suggests at least some level of competency. [CP1] • A larger number of cases more likely suggest a safe radiologist. [CP3] • Good to see number of investigations done as motivational factor prior to final examination. [CP2] • Everyone who has rotated in radiology would have done more than the required number of cases due to the current workload. [CF4] <u>Logbooks should be checked regularly</u> • Should be updated regularly and checked quarterly. [CP4] • Should be checked regularly. [CF2] • Not necessary to check logbooks if the work lists were completed. [CF3] <u>The prescribed requirements for logbooks should be reviewed</u> • Requirements should be reviewed and increased. [CF3] • Requirements for number of general radiograph reading are too lenient. [CF2] Quality control sessions by the consultants <u>The purpose of quality control sessions</u> • It is quite important to identify missed findings, correct errors and to teach. [CP6] • Functions as a form of formative assessment to identify weaknesses and take remedial action. [CP2] • Consultants will advise to postpone if the candidate is not ready for the summative assessment. [CP2] • One learns a lot from a consultant by asking, observing and listening. [CP4] • Quality control by consultants is very important, especially for junior

	registrars, and should not be limited to reviewing cases, but should include practical skills training as well as the reviewing and teaching of radiology report writing. [CF4] <u>Quality control sessions are valuable</u> • One-to-one training opportunity. [CP2] • Will definitely be valuable. [CP3] • Continuous quality control is informative and important to ensure candidate progresses towards the final assessment. [CF3] • Never had quality control sessions, definitely would have helped. [CF2] <u>Challenges experienced in rendering quality control sessions</u> • Tend to be lesser consultant quality control at junior rotations, like ultrasound and fluoroscopy. [CP4] • May get wrong guidance from senior registrars in absence of a consultant. [CP4] • Consultants are very helpful but sometimes one has to work unsupervised due to the lack of consultants. [CP5]

5.3.1.1 Theme 1: Motivation to attempt and complete radiology specialisation

The first theme that emerged, namely **Motivation to attempt and complete radiology specialisation**, referred to the candidates' main reasons for specialising in radiology and the factors that motivated them to complete the training programme. Four categories emerged as reasons for specialising and completing radiology, namely, **Previous exposure to radiology prior to specialisation**, **Technological advances and development**, **Financial benefits** and the **Working environment** (cf. Table 5.2).

Previous exposure to radiology prior to specialisation

Data analysis and description: Nine of the 10 participants referred to the role of previous exposure to radiology, however only two interviewees had direct previous exposure to radiology and three interviewees indirect previous exposure. Four subcategories were identified, namely, Direct exposure to radiology, Indirect exposure to radiology, No exposure to radiology and Other exposure-related responses.

Discussion: Previous exposure to science and technology cultivates an interest in radiology and contributes to the candidate's motivation to attempt and complete radiology specialisation. Exposure to a radiology department as a medical student was relatively limited, and little understanding of the realm of radiology was reported. This exposure and understanding can be strengthened by direct exposure to the radiology department while rotating through the radiology department as an elective medical student, or by observing a radiologist in practice while working in the department. Indirect exposure, such as

working next to the radiology department, also contributes to an interest in radiology, especially while working in the trauma or neurology departments, which regularly come into close contact with radiology. Four of the candidates did not have any previous exposure to radiology, but started specialising for other reasons, for example, *"I knew I do not want to be a general practitioner"* [CP4].

Technological advances and development

Data analysis and description: This category was identified from the remarks of six of the candidates who passed at the first attempt, and two of the candidates who failed at the first attempt. Three subcategories were identified, namely, Technological advances in radiology, Radiology is a dynamic field and Radiology plays a central role in medicine.

Discussion: It is clear that dynamic, modern technological advances in science and particularly radiology motivated the majority of candidates to complete radiology specialisation. Radiology is a very dynamic field and was described as *"a very interesting field"* [CP3] that *"will never stagnate"* [CP2]. Radiology plays an extensive role in modern medical practice and is central to all other specialist disciplines. *"Radiology is the core for all"* [CF1] and exposes the individual to all facets of clinical medicine and all specialities, thereby giving the candidate a broad perspective that ranges from diagnostic work to interventional procedures, while offering further super-specialisation opportunities. It is difficult to consider how any modern medical discipline will function without radiology.

Financial benefits

Data analysis and description: Seven of the interviewees in this group commented on the financial benefits of specialising in radiology and the way it influenced their motivation in attempting and completing their preparation for the summative assessment. Three subcategories were identified, namely, Financial benefits influencing the candidate's motivation, Financial benefits not influencing the candidate's motivation and Other responses related to financial benefits.

Discussion: Although it was mentioned that there is *"good remuneration"* [CP1] in radiology and that the actual amount of time spent at work is not linked to the financial benefits (compared to a sole practice, where no work means no pay), it was never the motivation for specialising in radiology for even one of the participants. It is fair to say that

one should be able to take care of your family and that specialisation in general is financially beneficial, but money is never relevant when an individual wants to be happy in the profession. Therefore, it appears from the interviews that, although financial benefits are present, it is not a motivational factor for attempting and completing the preparation for the summative assessment.

Working environment

Data analysis and description: Everyone in the interview group voiced their opinions on the working environment of radiologists, particularly how it served as a motivational factor for attempting and completing the preparation for the summative assessment and ultimately completing radiology specialisation. Seven subcategories were identified, namely, The working hours, The controlled environment, Limited patient interaction, Quality of life, Collegial support, Other working environment benefits and Contradictory remarks on the working environment.

Discussion: The main point that emerged was that radiologists can work in a controlled environment with better working hours and a more physically secure setting. This makes radiology even more appealing for female candidates – making radiology a good specialisation for a mother. A radiologist is exposed to a variety of patients but not so many that s/he feels overwhelmed. In radiology it is possible to provide quality care to all the patients, resulting in greater job satisfaction, which, in turn, contributes to the candidate's motivation to complete the summative assessment. Responsibilities are shared between colleagues and depend on the needs of the institution and patient numbers. However, more colleagues mean better support when it is needed. Another benefit of radiology as a career is the flexibility of the system, as radiologists are exposed to different medical modalities and hospitals. Radiology lends itself to better quality of life than most other specialised disciplines, with more family time, as mentioned by one of the interviewees: *"I liked the way he was working"* [CF4]. All of the above-mentioned factors contributed to a good working environment that motivated the candidates in their preparation for the summative assessment.

5.3.1.2 Theme 2: Influence of family

The second theme to emerge, namely the **Influence of family**, referred to the way the candidate's family influenced his/her preparation for the summative assessment. The only

category to emerge was the influence of family in relation to **Attempting and completing the summative assessment** (cf. Table 5.2).

Attempting and completing the summative assessment

Data analysis and description: All the participants made comments on the relevance of family in choosing and completing the specialisation in radiology. Seven subcategories were identified, namely, The contribution of relatives with a medical background, The contribution of extended family support, No extended family support, Neglecting the family, The impact of children on summative assessment preparation, The impact of motherhood on summative assessment preparation and Other family-related factors.

Discussion: Several of the participants commented that having relatives in the medical field served as a contributing factor to attempting and passing the summative assessment. One of the interviewees commented that *"many relatives are doctors"* [CP2]. Medical representation included parents, husbands, wives, siblings and uncles who are specialist physicians, gynaecologists, general surgeons, radiologists, orthopaedic surgeons, haematologists and general practitioners. Another interviewee commented, *"I am privileged to be married to someone who has gone through medicine and specialisation"* [CP1]. Only two candidates, both of whom had failed at the first attempt, did not have any medical relatives with any insight in radiology. One interviewee's comment was, *"family wasn't even aware what radiology is"* [CF4].

Specialisation tends to require candidates to neglect their families due to the amount of time needed to work and study, as summarised by one interviewee: *"One works hard, one studies hard and one neglects the family"* [CP1]. On the other hand, *"if one sees them so seldom it is also motivation"* [CP3] to complete the summative assessment. It is definitely much more challenging to specialise with dependants, and to balance specialisation and family. *"Children are demanding"* [CF1] and make a considerable difference to preparing for the final examination, because they require attention and cannot wait, making it much more challenging to find study time. Another interviewee explained that it *"was much easier to specialise before I had the child"* [CP5]. *"Specialising with a family is more challenging; it comes with a lot of very big sacrifices. Returning from maternity leave, I was clueless."* [CP5], which refers to the difficulty a mother returning from maternity leave experiences in catching up and adapting to the pressures of specialising in radiology.

A family can act as a *"support system"*[CF1] to motivate the candidate and support him/her in normal day-to-day living, like providing food and helping the candidate to relax when it is necessary. Psychological support becomes even more important if the candidate fails at the first attempt. *"You need somebody that understands what you're going through"*[CF1]. The family acts as a driving force, providing a great deal of emotional support in the attempt to achieve success, especially if the candidate has traumatic experiences during specialisation. Only one interviewee (who failed) mentioned that the family had no involvement at all.

5.3.1.3 Theme 3: Time management for studying

The third theme that emerged, namely, **Time management for studying**, addressed time management as a factor in preparing for the summative assessment. Four categories emerged from the interviews, namely, **Intensive literature study prior to the summative assessment**, **The impact of the candidate's level of knowledge**, **The impact of the daily workload** and **The impact of after-hours on-call work** (cf. Table 5.2).

Intensive literature study prior to the summative assessment

Data analysis and description: The first category emerged from the opinions of all the participants. Two subcategories were identified, namely, the Different perspectives on time and the Different approaches to different assessments.

Discussion: All the participants provided guidelines for what was perceived by the researcher as the least time needed for intensive study prior to the summative assessment. Intensive studying (the intensive phase) was identified as the period prior to the assessment, during which the candidate did not attend any social events, such as visiting friends, going out to see a movie, attending sports events or other recreational events. The opinions on intensive study time differed considerably. It involved focusing (the focused phase) on the reality of studying for the summative assessment from 18 to 24 months prior to the assessment, with the intensive structured phase (the intensive phase) ranging from 8 to 12 months prior to the assessment, and the last six months as crucial (crucial phase).

The impact of the candidate's level of knowledge

Data analysis and description: This category emerged from the opinions of all the participants. Three subcategories were identified, namely, that Time management improves with increase in knowledge, Knowledge increases with time and Knowledge increase leads to less study time during working hours.

Discussion: As expected, it was clear that the candidates' level of knowledge increased during the training programme. This increase in knowledge means that less time is needed to study specific topics and modules of the curriculum, as well as that the candidate is able to complete tasks related to workload in a timelier manner. This experience leads to better time management overall, and more time available for better preparation. The increase in knowledge, experience and confidence leads to more consultations by clinical colleagues and junior registrars. It furthermore helps the registrar to browse journal articles faster and more effectively.

The researcher calls this phenomenon the positive knowledge loop, whereby starting study preparation earlier leads to an increase in knowledge, which leads to more effective time management, which creates the opportunity to study more effectively, leading to an exponential increase in knowledge as time passes. The positive knowledge loop is therefore characterised by an exponential increase in knowledge during the later phases of the training period, provided that the student covered baseline general knowledge as an overview during the early phases of the training period, even if not in great depth.

Therefore most of the interviewees suggested that a candidate should work through a core general radiology text as soon as possible, because this would contribute to more effective time management during the later phases of specialisation. Candidates also suggested that the candidate should attempt the summative assessment as late as possible, towards the end of the training period, as this would increase the chances of success tremendously, provided that s/he continued performing throughout the training period.

The impact of the daily workload

Data analysis and description: All the candidates in this group referred to the current workload as a factor in the preparation for the summative assessment. Five subcategories were identified, namely, that the Workload is imaging modality related, the Workload limits

study time, a Structured study plan helps, Other related factors and Positive comments on the workload.

Discussion: At some imaging modalities a candidate needs to work after hours to complete the list for that day. This means the candidate is exhausted after working at tiring modalities like Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) during the day. *"CT is always busy"* [CP4]. The daily workload does influence one's ability to study at the end of the day. Some of the interviewees were of the opinion that a lot of work is an inescapable part of specialisation and that one should be able to study around it. Another interviewee mentioned that a structured study plan makes it manageable. The daily workload does not take into account that the candidate may have other responsibilities outside normal working hours. Travelling to attend tutorials outside the training department is time consuming and demanding. This is often required because of the shortage of radiologists in the public sector and because radiology resources are shared between departments or because of partnering with private radiologists to conduct tutorial sessions. *"We didn't get any time to study; there were just too much work. By the time you get home, you're exhausted."* [CF2].

One of the interviewees made an upbeat remark: *"I thrive on working under pressure"* [CP6]. The general opinion of other interviewees was not as optimistic. *"The workload is too much. When you go home you are flat."* [CF4]. The reality is that a greater workload does lead to less study time. Another interviewee summed up that radiology is in-service training and the candidate should make use of learning opportunities and exposure to pathologies. Work is done during the day and studies are conducted after hours and therefore the study schedule should be adapted according to the workload.

The impact of after-hours on-call work

Data analysis and description: This category flowed from the previous category and was mentioned by six of the 10 participants in this interview group. Two subcategories were identified, namely, that After-hours work limits study time and some Contradicting comments.

Discussion: Recovering from an exhausting after-hours on-call episode causes delays in the study schedule. It was mentioned that every night of doing exhausting on-call work after hours costs the candidate two days of study time (the on-call night plus one night),

which is understandable. The researcher calculated that most of the candidates work, on average, five on-call nights per month, leading to a loss of 10 nights of study time per month, averaged to four months annually, or more than a year over a five-year training period! In the researcher's opinion it sounds extreme, and he trusts that not all after-hours on-call work is that exhausting. Further, candidates do have vacation leave periods too, but the reality is that service delivery definitely demands its pound of flesh from every candidate. Nevertheless, the interviewees agreed that it was sometimes tricky to study because of after-hours on-call work, though two of the interviewees said that it *"never was an issue working long hours"* [CP3] and *"It wasn't the working hours"* [CF1]. So what was it, then? This brings the researcher to the following theme that emerged from the interviews.

5.3.1.4 Theme 4: Doubts experienced during specialisation

The next theme that arose, namely, **Doubts experienced during specialisation**, guided the researcher to more sensitive factors influencing the candidates during their preparation for the summative assessment. Four categories emerged, namely, **Doubts due to the candidate's level of knowledge**, **Doubts due to the consultant/registrar ratio**, **Doubts due to failing the assessment** and **Doubts leading to giving up** (cf. Table 5.2).

Doubts experienced due to the candidate's level of knowledge

Data analysis and description: This category emerged from the opinions of two candidates who passed and one candidate who failed the first attempt of sitting the assessment. Two subcategories were identified, namely, the candidate's Increase in knowledge and the Lack of knowledge.

Discussion: Candidates often experience doubts about their new career choice due to their lack of knowledge at the beginning of the training period. In the researcher's opinion candidates, starting off at a new work place with new hopes, dreams and mostly unrealistic goals, may experience doubts due to the fact that few candidates have realistic perceptions of what practising radiology requires when they apply for a post. From the interviews it became clear that this incorrect impression is mainly caused by a lack of prior exposure to radiology, and failure to realise the amount of academic knowledge needed to perform the workload that goes with day-to-day radiology practice. From the researcher's perspective,

this is even more the case when older medical practitioners, who have been outside the academic fraternity for a number of years, are faced with the current challenges of specialising in radiology. At this point the reader may consider the theoretical perspectives mentioned in Chapter 2, on adult learning (cf. Point 2.8.1).

Some of the interviewees experienced doubts due to their lack of knowledge as identified during tutorial sessions and, more importantly, their lack of knowledge identified during tutorial sessions that were conducted closer to the summative assessment as an indicator of their readiness for the summative assessment (cf. Points 2.8.1.9 & 4.3.1.5). Reciprocally, one interviewee commented that her increase in knowledge led to more consultations by clinical colleagues which led to an increase in her workload and raising doubts on whether she will be able to cope with the daily workload experienced when practicing radiology independently.

Doubts experienced due to the consultant-registrar ratio

Data analysis and description: Seven of the interviewees mentioned the consultant-registrar ratio as a factor influencing their preparation for the summative assessment. All four candidates who failed at the first attempt mentioned it as a factor but it was mentioned by only three of the six candidates who passed at the first attempt. This study is qualitative and therefore every interviewee's opinion is relevant. Three subcategories were identified, namely, Fewer consultants mean increased workload, Less supervision and teaching, More consultants augment experience, knowledge, guidance and interests and The preferred number of consultants.

Discussion: The general opinion was that there are currently not enough consultants in the public sector to provide adequate teaching and supervision to all the candidates in all the radiology training departments because the consultants are overburdened with work. This is perhaps the most demoralising factor of them all. *"The more registrars per consultant, the less teaching benefit they get"* [CF1]. The interviews identified two registrars per consultant as the ideal ratio. Currently a ratio of four registrars per consultant is accepted for accreditation (UFS 2011:1) by the HPCSA.

"A lot of people may feel that there should be more consultants" [CP4]. Fewer consultants mean more responsibilities for the senior registrars, who are forced to work independently, do less teaching and, in the researcher's opinion, probably higher medico-legal risks. Fewer

consultants often means unsupervised working conditions, which have a negative impact on preparation for the assessment. A greater number of consultants would provide greater exposure of candidates to different levels of experience, knowledge and interests. According to Hudson (2011:20), who published a news article in *The Bulletin*, an annual journal of the HPCSA, radiology has been linked to the "danger list" of specialties due to the shortage of medical practitioners in South Africa. Although not focusing on radiology, the Scarce and Critical Skills Research Project, commissioned by the Department of Labour South Africa that was drafted in November 2007 (Breier 2007:Online) and reported in March 2008, paints an even bleaker picture of the general shortage of medical doctors in South Africa. Several challenges, with suggestions for addressing the health crisis in South Africa, were reported at the time and serves for interesting reading.

Doubts experienced due to failing the assessment

Data analysis and description: All four candidates who failed voiced their opinions on failing the assessment. Five subcategories were identified, namely, Failing may lead to depression, Failing may decrease confidence, Positive experiences, Negative experiences and The possibility of bias.

Discussion: A variety of sentiments were expressed. One interviewee referred to the negative psychological impact of failing the assessment. *"It does definitely affect your self-confidence"* [CF1]. A depressed psyche influences effective studying negatively. The positive outcome of failing is that experience can be gained from failure, which can contribute to future success if feedback and proper guidance and support is given. *"Was very difficult to pick myself up, especially (after) the second time"* [CF2]. It is humiliating to fail amongst peers, consultants and family. Passing the written part of the assessment, but repeatedly failing the orals, leads to anxiety about the oral part of the assessment.

Two candidates voiced opinions on possible bias, but this will be discussed under another category that follows later in this report. *"How can one go from a cum laude in one room to a fail in another room?"* [CF3]. *"I thought there was too much unfairness"* [CF4]. The reason for these feelings, mentioned by one candidate, was lack of proper feedback by the assessment body.

Doubts leading to giving up

Data analysis and description: From the above discussion the next category emerged from the opinions of all the interviewees in this group. Four subcategories were identified, namely, No doubts leading to giving up, Reason for not having doubts, Doubts experienced prior to specialising in radiology and Doubts experienced during specialising in radiology.

Discussion: Few of the interviewees considered giving up radiology specialisation. The general sentiment was well summarised in the response of one of the interviewees: "*Never*" [CP1]. One reason for considering giving up was the scarcity of available radiology registrar posts, leading to long waiting periods before interested candidates could start specialising. Reasons for this situation, as identified from the interviews, would include the limited number of radiologist consultants working in the public sector, as well as limited funding, leading to unequal distribution of salaries and working conditions between the public and private sectors – refer to the discussion above on the shortage of medical doctors in South Africa (Breier 2007:18).

Another reason that was voiced as a reason for doubts about completing radiology related to consideration of a future workplace. Although rare, it does happen that candidates are unsure about where they will end up practising radiology. With limited available competitive consultant posts, a junior radiologist is left with only two remaining options: entering the private sector or leaving the country.

Family responsibilities may be another reason for quitting radiology specialisation – this has already been discussed. "*Having a child made me consider quitting*" [CP5]. Failing the summative assessment repeatedly was another reason for considering quitting radiology.

5.3.1.5 Theme 5: Experiences that may influence preparation for the assessment

The fifth theme to emerge, namely, **Experiences that may influence preparation for the assessment**, gave the researcher a better understanding of the candidate's previous experiences that contributed positively or negatively to preparation for summative assessment. The categories that emerged from the interviews were **Radiology experience**, **Clinical experience**, **Collegial support**, **Consultant input** and **Language** (cf. Table 5.2).

Radiology experience

Data analysis and description: This category was mentioned by eight of the 10 participants in this group. Five subcategories were identified, namely, The value of radiology experience prior to specialisation, The reasons for gaining prior radiology experience, Experiences contributing to the summative assessment, Contradictory comments, and The value of after-hours work experience.

Discussion: For the sake of preventing bias the researcher must report that only one candidate, who did not have any previous experience in working in radiology and who failed the summative assessment at the first attempt, mentioned that previous radiology experience plays no role at all in preparation for the summative assessment.

The rest of the group shared positive opinions on previous radiology working experience. Previous radiology experience, prior to starting specialisation in radiology, was mentioned as a positive motivational factor that contributes to successful preparation for the assessment. This can be seen as *developmental training* (a term coined by the researcher), which can be defined as working within a HPCSA-accredited academic radiology department under direct supervision of a qualified radiologist as a radiology medical officer for at least one year. Developmental training is valuable for any medical practitioner who is interested in a registrar post in radiology. According to the researcher's knowledge such opportunities are very rare, but it presents the candidate with an academic radiology environment to prepare for the primary examination, CR (CMSA) Part 1 (cf. Point 2.5.1.1) while s/he acquires basic radiology knowledge and skills that, in the end, will put the candidate at a much higher level of competency than his/her counterparts who start off in radiology as registrars. *"Experience as medical officers in radiology should be introduced for every person because those guys are streets above the rest"* [CF2].

It was mentioned by one of the interviewees that basic principles are very important in the final examination. It was even said, further, that previous radiological experience is more important than theoretical knowledge. *"It is priceless"* [CP2]. Another candidate mentioned that previous radiology experience is not a necessity, though it does help a lot. *"Repetition is the way to remember"* [CP4]. Furthermore, it helps the candidate to start radiology as a career. Working after hours also creates an opportunity for working independently in radiology, which is important as a learning activity. Exposure to general radiology over a one-year period as a medical officer helps the candidate to become integrated into an

academic training department quickly and efficiently. In the researcher's experience, in some cases developmental training also creates the opportunity to do research and to publish at least one case study in radiology.

Clinical experience

Data analysis and description: This category emerged from the opinions of all the interviewees and created another opportunity for triangulation with the opinions of the assessors and moderators mentioned in Chapter 4 (cf. Point 4.3.1) under the discussion on readiness of the candidate for the summative assessment. Three subcategories were identified, namely, The value of clinical experience (if it contributes), The relevance of clinical experience (how it contributes) and The quality of clinical experience.

Discussion: Clinical experience is valuable in the diagnostic workup of the patient – it may be less important than theoretical radiology knowledge, and it was mentioned as less important than previous experience working in a radiological department. If the researcher continues the previous discussion, according to the interviewees this makes previous radiological work experience more important than acquired radiology knowledge, which is more important than previous clinical experience. Clinical experience plays an important role in deciding to specialise in radiology, and will also help when it comes to doing research.

The quality of clinical experience depends on the level of exposure and the level of the institution. The most important factor is the fact that quality clinical experience helps the candidate to ask relevant clinical questions during radiological investigations or interventions, and realising what is required from the study. Clinical experience guides the candidate towards what s/he should expect to find and furthermore helps to provide clinically relevant reports and guidance to the clinician.

Collegial support

Data analysis and description: This category was identified from the opinions of all the interviewees. Two subcategories were identified, namely, Why the experience of collegial support is relevant and How the experience of collegial support is relevant.

Discussion: Teamwork plays a major role in preparation for the summative assessment because colleagues motivate one another to "*hang in there*"[CP2]. Without prior radiology

work experience it *"takes months to get going"* [CP2], with individuals relying heavily on the support of their colleagues to teach them how to do the practical work. Because it takes a very long time to get a registrar post, psychological collegial support also helps candidates to stay motivated. Colleagues contribute a great deal, by giving support and motivating one another constantly during preparation for the summative assessment. In a big registrar circuit it may be advisable to divide the candidates into smaller subgroups that can provide collegial support rather than not giving or getting support at all. This may cultivate a stronger academic registrar body, which also contributes to success. Supporting one another helps to produce good candidates, especially when the candidates share interesting cases. One cannot study radiology in isolation – receiving support from colleagues and providing support to other registrars is an essential element.

Consultant input

Data analysis and description: This category emerged from the contribution of eight of the interviewees. Eight subcategories were identified, namely, The relevance of consultant input, The relevance of destructive input, The relevance of humiliation, The relevance of constructive input, The relevance of consultant experience of the summative assessment, The relevance of consultants staying up to date, The relevance of individual feedback and The relevance of favouritism and racism.

Discussion: Consultants play an important role in motivating the candidates. A good tutor plays a major role in guiding the registrars and therefore consultant remarks can be a major influencing factor, whether negative or positive. Some consultants are not supportive because certain individuals enjoy teaching and others do not. Consultants can play a major role in guiding candidates on ways to approach and present examination cases, and acquiring proper examination technique. Consultants with experience as assessors can help candidates by identifying gaps in their knowledge. *"It is essential to have consultants involved, also consultants who know what is happening in the exams"* [CF2]. It is therefore valuable to get guidance from a consultant regarding the candidate's readiness to sit for the final assessment.

Every consultant should realise that there is no place in an academic department for favouritism towards any candidates. It is as important as realising that a consultant's derogatory remarks can be destructive to a candidate, especially close to the summative assessment. *"One of them was super-critical and kind of almost rude in the tuts [tutorials]."*

I don't think it is the right way to teach."[CF2]. Positive and negative remarks should be balanced and every candidate should learn how to manage constructive criticism. *"Some consultants are very harsh"*[CF4]. Candidates should never be humiliated in front of other colleagues. *"How you deal with humiliation is what matters"*[CP6]. *"I do not learn well if I am humiliated; where I would really thrive if somebody encourages you"*[CF2].

Regular individual interviews with the head of the department may help to discuss the candidate's progress and to identify any training issues. Such interviews will furthermore foster a culture of continued performance. The HOD and other consultants can provide mentorship by guiding the candidate towards career goals. Therefore, consultant experience plays an important role in providing relevant expert academic exposure with the candidate's further intellectual development in mind. For this reason consultants need to stay up to date with modern trends.

None of the candidates made remarks that identified any experiences or the possibility of racism towards candidates or among colleagues.

Language

Data analysis and description: Three candidates made comments on the training language as a factor during the preparation for summative assessment.

Discussion: One candidate who passed the summative assessment at the first attempt mentioned that English as the primary training language was a big factor throughout the training period and that it was challenging to answer questions in English as this was the candidate's second language. The other two interviewees, who both failed the assessment at their first attempt, noted that everyone is used to working in English and that it should not be a problem anymore. From the researcher's experience, all the radiology literature is in English and all radiology reports are done in English. Furthermore, all academic radiology meetings and interdepartmental meetings are conducted in English at all the departments that the researcher visited while collecting data for this study.

5.3.1.6 Theme 6: Teaching and learning activities that influenced passing the assessment

The next theme that emerged, namely, **Teaching and learning activities that influenced passing the assessment**, addresses the TLAs that contributed to preparation

for the summative assessment. The categories that emerged under this theme were **Didactic presentations, Tutorials, Outreach to other health facilities, Interdepartmental meetings, Journal clubs, Case studies, Online databases** and a **Core textbook** (cf. Table 5.2).

Didactic presentations

Data analysis and description: All the participants in this interview group made comments related to didactic presentations. Three subcategories were identified, namely, The value of didactic presentations (if it contributes), The relevance of didactic presentations (how it contributes) and The time involved with didactic presentations.

Discussion: Preparing presentations that are presented at an academic day (cf. Point 2.8.1.2) is very time consuming. *"That was a bit of a deterrent sometimes"* [CF1]. If the registrar body comprises many candidates the responsibility can be spread out, but if there are a limited number of registrars, it becomes challenging. *"With a limited registrar body, we had a lot of presentations to prepare for, I found it extremely taxing"* [CF2]. This responsibility could create a great deal of stress for candidates, especially in the last year prior to the summative assessment. Therefore, it is important to select topics that are relevant, so that the presentation can function as a type of preparation for the assessment. This can be achieved with a structured academic programme – an organ-system-based four-year academic programme will be suitable. Areas that need special attention or subdisciplines that are important can be addressed in this way. If a candidate prepares optimally for the academic presentations, s/he does not need to repeat those topics, or can just browse through it prior to the assessment. The didactic presentations can be expanded by the contribution of visiting consultants or even experts who present papers at conferences or via webinars.

Tutorials

Data analysis and description: This category emerged from the positive remarks of all the interviewees in this group. Three subcategories were identified, namely, The value of tutorials (if it contributes), Tutorials encourage continued studying and Tutorials help in the preparation for the summative assessment.

Discussion: Tutorial oral sessions and short case discussions *"helped a lot"* [CP3] to ensure success in the assessment. The different activities encourage continued studying throughout the training period and remain important for the teaching of fundamental principles of radiology. *"It forces you to do a bit of learning"* [CF1]. It often happens that the candidate needs to review the literature after a tutorial session. Tutorials guide the candidate to identify baseline cases and challenging cases and to practise examination technique. The one-on-one type of tutorial has been identified as a significant contributory factor to passing the summative assessment.

Outreach to other health facilities

Data analysis and description: This category emerged from the thoughts of only two of the participants.

Discussion: From the researcher's perspective outreach to other health facilities is not relevant to many of the radiological departments due to the workload experienced at the parent site. Evidence from the interviews suggests that outreach is something that happens sporadically and should not be considered unless consultant supervision is available at the host facility. Outreach contributes to family-related stress for candidates, especially if there are dependants involved. Candidates experience frustration if they must work away from home, but it is a good learning experience, if they are supervised. Outreach can contribute to independent thinking and building confidence, as well as developing the managerial experience of a candidate. It can furthermore serve as a good indicator of a candidate's readiness for the summative assessment.

Interdepartmental meetings

Data analysis and description: The category emerged from the opinions of nine of the interviewees. Five subcategories were identified, namely, The value of interdepartmental meetings, Receiving guidance from the clinical disciplines, Assessing the candidate's knowledge, Practising how to manage a stressful situation and Interdepartmental meetings should not be humiliating.

Discussion: Interdepartmental meetings contribute to success in the summative assessment. During interdepartmental meetings the candidate presents to consultants from other specialties, who put the candidate on the spot in front of unfamiliar people. *"You*

apply your knowledge" [CF1]. This forces the candidate to practise presenting cases with confidence and managing a stressful situation. An interdepartmental meeting should be structured to be of value to the candidates. It should not lead to humiliation or destructive criticism and should not be at the fellowship level of knowledge. Interdepartmental meetings can guide candidates on what clinicians expect from radiological reports and how to answer clinical questions. Furthermore, it serves to provide feedback from clinicians on what the final diagnosis was or the final management of the patient involved.

Journal clubs

Data analysis and description: The category emerged from the comments of eight of the interviewees. Three subcategories were identified, namely, The value of journal clubs (if it contributes), The relevance of journal clubs (how it contributes) and Journal clubs should be structured.

Discussion: Journal clubs in general was seen as a contributory factor to passing the summative assessment. *"I found that journal articles were essential to pass"* [CF2]. It is valuable and saves time if several registrars contribute and summarise the essentials of an article on one page for future quick reference. Therefore the summary should be structured well, and should involve relevant topics that may come up in the assessment, and should therefore be well prepared. Journal clubs are useful to cover new developments in radiology. Journal clubs direct candidates to gather more in-depth knowledge on a specific topic. *"It teaches you how to think"* [CF1].

Case studies

Data analysis and description: The category emerged from the opinions of six of the 10 interviewees in this group.

Discussion: Case studies are very useful, especially when *"you start sharing"* [CF1] knowledge between registrars. The presenting candidate studies the case in depth, covering that part of the curriculum for the summative assessment and thus saving time in the long run. *"I found them very, very helpful"* [CP5]. One of the major benefits of doing case studies is that it *"gives you an (structured) approach"* [CF1] to specific pathologies. However, it is important not to focus on rare cases but to cover common important topics too.

Online databases

Data analysis and description: This category emerged from the opinions of seven of the interviewees. Two subcategories were identified, namely, Preferred online databases and Online databases provide a structured approach.

Discussion: In the researcher's opinion, due to the rapid expansion of knowledge and technology in radiology it becomes ever more challenging to keep up. Therefore, it has become imperative for a radiologist to have easy, immediate access to an online database while s/he is busy reporting on a case. It is only in the last five to 10 years (if that long ago) that databases have become the norm for radiology registrars. Online databases also provide good quality and easy access to images showing several examples of the same pathology. These cases can be used for preparing for the summative assessment. From the interviews it became clear that radiology databases give candidates access to a systematic, structured imaging-based approach to any known pathology in the human body. Databases that were commonly used included RADPrimer, Radiopaedia, STATdx and Radiology Assistant. The Royal College database was also mentioned as being very helpful.

Core textbook

Data analysis and description: The last category under this theme was mentioned by seven of the interviewees. Two subcategories were identified, namely, the relevance of a core textbook During the training period and Prior to the summative assessment.

Discussion: It was mentioned in general that *"it is very important to have one book as your notebook and add on to that"* [CF4] as needed to save time later, during the preparation for the summative assessment. A candidate should *"find a core book and try to understand what is going on"* [CP6]. One interviewee suggested that the candidate should have *"one source just prior to examination"* to *"pull it together"* [CP1]. This core text should be studied early on in training as a foundation to build on during the training period. It is crucial to have a good general overview of radiology before starting the final preparation for the summative assessment. It is furthermore beneficial to refer to old papers that featured in previous assessments, to get an idea of the topics that are considered as generally important.

5.3.1.7 Theme 7: Learning outcomes in radiology

The next theme to emerge, namely, **Learning outcomes in radiology**, was a follow-up question by the researcher to explore the opinions of the candidates, and it served as a type of triangulation to compare the responses from the candidates with the findings of the interviews that were conducted with the assessors and moderators. One category emerged from the interviews, namely, **The effect on the preparation for summative assessment** (cf. Table 5.2).

The effect on the preparation for summative assessment

Data analysis and description: All the interviewees responded to the follow-up question on learning outcomes in radiology. During the interviews with the assessors and moderators it was mentioned that the learning outcomes are available on the website of the examination body. Four subcategories were identified, namely, The candidates' ignorance of the learning outcomes, The candidates' awareness of the learning outcomes, The value of the learning outcomes (if any) and The relevance of the learning outcomes (nature of contribution).

Discussion: It appeared that most of the interviewees *"did not know about learning outcomes on the website"* [CP1], as reflected by several remarks: *"I wasn't aware that there was that learning outcomes on the website"* [CF1], *"I wasn't aware"* [CF2], *"I didn't know about it"* [CF3]. One interviewee stated that if s/he had known about it, it could, hypothetically, have contributed to preparation for the summative assessment. Another interviewee commented: *"If I knew about it earlier, it would have been a compass"* [CP4]. The few candidates who had known about the learning outcomes did not make use of it, because it was too generic. *"I have seen it; it is a very broad general guide that doesn't help much"* [CP6]. *"I knew about it, it was an eye opener, but I did not use it. I trusted the system"* [CP2]. In a system with limited resources, learning outcomes may become important and should be more at the forefront of training registrars. Consultants need to be familiar with the learning outcomes, and to incorporate it in the curriculum.

The purpose of the learning outcomes is to identify exactly what a candidate should achieve to be deemed a competent general radiologist (cf. Point 2.4). Learning outcomes should be written for each level of the teaching modules forming part of the radiology curriculum.

These learning outcomes should include critical cross-field outcomes, qualification-specific outcomes, module-level outcomes and unit-level outcomes, as described by the researcher in an unpublished portfolio for the assessment and moderation module in Health Professions Education (Hurter 2013:37). It may, furthermore, be of value to the reader to review the outcome-based education inventory (OBEI) suggested by Harden (2007a:667) to evaluate the progress of OBE in an institution (cf. Table 2.3).

5.3.1.8 Theme 8: The impact of the research project

The eighth theme to emerge from the interviews identified **The impact of the research project** on preparing for the summative assessment. Two categories emerged from the interviews, namely, the candidates' opinions on **Conducting future research** and **Lessons learned** from the research project (cf. Table 5.2).

Conducting future research

Data analysis and description: Seven of the participants commented on the impact of the research project on conducting future research. Four subcategories were identified, namely, Candidates who are not enthusiastic, Candidates who are enthusiastic, The value of conducting future research and The need to allocate time for doing research.

Discussion: The disappointing realisation of this researcher was that the research project, in general, did not stimulate enthusiasm in the candidates to conduct future research. *"I am not a person for doing research"* [CP2]; *"I will not attempt such a thing again"* [CP3]; *"I am not into doing research, it didn't change my opinion, but some people would like that kind of thing"* [CP6]. One of the interviewees mentioned that the research project was a good experience: *"I want to do a possible follow up"* [CP4]. Most of the interviewees were of the opinion that doing research is important and that it serves the purpose of giving something back to the field of radiology. *"Research needs to be done"* [CF1]. The main purpose of conducting research as part of the M.Med. is to give the candidate the opportunity to learn how to do research. To make it more viable and probably more enjoyable it was suggested that specific time slots should be allocated for the candidates to work on their research projects. The reality is that, if a radiologist wants to work in an academic environment, s/he will have to conduct good research. It is *"nice to contribute to the academic pool"* [CP1].

Lessons learned

Data analysis and description: The same seven interviewees voiced their opinions on lessons that they learned from conducting the research project. Five subcategories were identified, namely, The value of the research project (if it contributes), The relevance of the research project (how it contributes), Understanding research principles, The time involved with the research project and When to complete the research project.

Discussion: Research was described by one interviewee as *"a lot of work, time consuming, a lot of effort"* [CP1]. One of the interviewees mentioned that doing the project creates a great deal of respect and appreciation for published research. It furthermore initiates critical thinking and contributed to improved service delivery. *"I can see why it is important"* [CP3]. The suggestion was that the project should be completed early in the training period to give the candidate more time to study closer to the summative assessment. *"It is time consuming, should be done within the first two years"* [CF1]. One of the interviewees said it was obstructive and caused stress for the candidate studying for the summative assessment. It was requested that research should be done in a structured fashion and that the academic department should provide support to enable candidates to finish the research prior to the summative assessment. Two interviewees had strong opinions about the research project: *"Very cumbersome and a waste of time, it doesn't contribute to the training of a radiologist as such"* [CP6]. *"It was a massive drainage of time that I could have used to study"* [CF3].

Another suggestion was that, if the research project had not been completed by the end of the third year, that it should be completed after passing the summative assessment but as a prerequisite to registering as a specialist. The general view gathered by the researcher was that the candidates did gain a basic understanding of research terminology and principles, even though the process was very time consuming.

5.3.1.9 Theme 9: *Formative assessments contributing to passing the assessment*

The last theme to emerge from this question, namely, **Formative assessments contributing to passing the assessment**, related to the different types of formative assessment that the interviewees experienced during their training period and the way it

contributed to their preparation for the summative assessment. Five categories emerged from the interviews, namely, **Written assessments**, **Practical assessments**, **The portfolio**, **The logbook** and **Quality control sessions by the consultants** (cf. Table 5.2).

Written assessments

Data analysis and description: Seven of the interviewees voiced opinions relevant to written formative assessments. Four subcategories were identified, namely, that written assessments Encourage continued studying, Contribute to the preparation for the summative assessment, Provide constructive guidance and Other responses.

Discussion: Written assessments are important for motivating the candidate to study frequently and served as a measurement of progress during the training period. It contributed to identifying and achieving the learning outcomes and helped the candidate to build confidence. The written assessments include long cases and rapid reporting as a way of simulating the summative assessment, and provided guidance to the candidates and identified the candidates' readiness to sit the summative assessment. It can be done monthly but may become laborious for the consultants. Therefore, it can be split into sections that are done monthly and delegated to different consultants, or it can be conducted as a joint quarterly assessment. A mock examination can also be presented to help the candidate to prepare for the summative assessment.

Practical assessments

Data analysis and description: This category was identified from the opinions of five of the interviewees.

Discussion: *"We had practical tests"* [CF4]. Usually practical evaluations are done after every modality rotation block. Some of the evaluations are continuous and some are fixed assessments. Practical assessments may include different scenarios, such as observation of skills, a mini-oral, a written component or all of these. From the limited number of responses the researcher had to wonder how often practical assessments were conducted overall in academic radiology departments, and how many practical assessments were conducted annually in a specific department.

The portfolio

Data analysis and description: Eight of the interviewees commented on the portfolio as a factor in preparing for the summative assessment. Five subcategories were identified, namely, The time associated with the portfolio, The value of the portfolio (if it contributes), The relevance of the portfolio (how it contributes), The portfolio as an adjunct to a curriculum vitae and The reliability of the portfolio.

Discussion: A portfolio is valuable as an instrument for providing proof of all the academic work that had been done by a candidate during the training period. It is time consuming to compile, but can be used to assess some of the CanMEDS roles (cf. Point 2.3.2) that cannot be assessed as part of the summative assessment. It was suggested that the portfolio should, at least, include proof of completion of a basic life support (BLS) course. A portfolio can serve to motivate the candidate prior to the summative assessment to show him/her what has been done up to that point. A portfolio gives the assessor some insight into the candidate's background, but is probably only reviewed in a smaller assessment system. A portfolio becomes very important if a candidate needs to complete a detailed CV when s/he applies for a post abroad. It cannot be used to compare institutions, due to differences in resources.

The logbook

Data analysis and description: Nine of the 10 interviewees commented on the role of a logbook in preparation for the summative assessment. Six subcategories were identified, namely, that The logbook identifies hard workers, The logbook has limited value, The time associated with compiling the logbook, The value of proving a high number of cases, Logbooks should be checked regularly and The prescribed requirements for logbooks should be reviewed.

Discussion: Logbooks are time consuming to compile (though it is made easier by PACS), but is an effective measurement instrument of the number of cases that was done. A high number of cases suggests at least some level of competency. It can serve as motivational support to the candidate just prior to the summative assessment to see how many cases s/he has reported throughout the training period. A larger number of cases more likely suggest a safe radiologist, at least when it comes to practical skills. *"Is valuable to set a standard"*[CF1]. It can be used to identify underperforming candidates. *"At least it shows*

that you have not been slacking in the department" [CF2]. Every candidate should show an upward trend in the number of cases reported as the training programme progresses. Therefore, it is important to check the logbook regularly.

The requirements for the number of general radiographs that has been read are too lenient and should be reviewed and increased. A logbook does not evaluate the quality of reports. One of the interviewees was of the opinion that logbooks are redundant and that the HOD can just check the work lists as proof of work that has been reported on. Another interviewee said that, due to the current workload, everyone who has rotated in radiology would have done more than the required number of cases.

Quality control sessions by consultants

Data analysis and description: The final category under the first question emerged from the thoughts of eight of the participants in this interview group. Three subcategories were identified, namely, The purpose of quality control sessions, Quality control sessions are valuable and Challenges experienced in rendering quality control sessions.

Discussion: Quality control sessions are important for identifying missed findings, correcting errors, and for teaching. It provides a one-on-one training opportunity that is highly valued and can function as a form of continued assessment to identify weaknesses and guide the candidate towards taking remedial action. The consultant can advise the candidate to postpone his/her attempt at the summative assessment if readiness for the assessment has not yet been achieved. Consultant-based quality control at junior rotations, such as ultrasound and fluoroscopy, tend to be less readily available. Although a candidate can learn a great deal from a consultant by asking, observing and listening, it may happen that a junior registrar has to work unsupervised and may receive the wrong guidance from a senior registrar due to the lack of available consultants. Some of the interviewees never experienced any quality control sessions. Quality control by consultants is very important, especially for junior registrars, and should not be limited to reviewing cases, but should include practical skills training as well as reviewing and teaching of radiology report writing.

A summative perspective on the first question: The aim of the first question was to identify the factors that influenced the candidates in their preparation for the radiology summative assessment. All perspectives in the summary were those of the interviewees,

unless specified as being those of the researcher. Interviewees' previous exposure to radiology, whether direct or indirect, and their work as medical officers in radiology departments, which the researcher called developmental training (cf. Point 5.3.1.5), are important motivational factors for starting and completing radiology specialisation as a career - it provides the opportunity for doing research, gaining several radiological competencies early on in training and completing the diagnostic assessment. Candidates are motivated to complete radiology because it is a dynamic field with constant technological developments, and it plays a central role in modern medicine. Specialisation is associated with financial benefits, which are needed to care for one's family, but money alone was never a motivational factor for the individual who wishes to be happy in his/her profession.

Radiology is practiced in a controlled working environment with a variety of patients, who are given quality care, and this leads to job satisfaction for the radiologist. Responsibilities are shared between colleagues; the sharing leads to better quality of life, flexible work scenarios and more family time. Having relatives in the medical field contributes to choosing radiology and completing the summative assessment. Specialisation and preparing for the summative assessment cause neglect of family, due to the amount of time needed to work and study, but this also acts as motivation to complete specialisation. Specialisation is challenging if a candidate has dependants, especially children, and it is particularly difficult for mothers with babies. Therefore, the candidate must manage his/her time explicitly during preparation for the summative assessment. The family also provides psychological support to motivate the candidate.

The different phases of study time prior to the summative assessment were identified by the researcher from the data gathered. Focused study time (focused phase) should commence 24 to 18 months prior to the summative assessment, and the intensive structured phase 12 to 8 months prior to the assessment, although different approaches may be followed when preparing for different types and components of summative assessments. The last six months involves the critical phase. From the interviews it became clear that the increase in knowledge contributes favourably to time management and creates a phenomenon that the researcher calls the positive knowledge loop, whereby early onset in studying leads to increase in knowledge that leads to more effective time management, creating the opportunity to study more effectively, again leading to an exponential increase in knowledge as time progresses. According to the interviewees the candidate should work through a core general radiology text as soon as possible and

attempt the summative assessment as late as possible. Further increase in the level of knowledge may lead to more clinical consultations and responsibilities. The daily workload is influenced by the imaging modality that is worked at and an increase in workload limits study time. A structured study plan is essential to counteract this effect. Other factors that limit study time include travelling for tutorials and responsibilities outside of the work environment. Workload contributes to preparing for the summative assessment as case-based learning.

After-hours on-call work causes delays in studying when the candidate is confronted by a heavy workload. Candidates experience doubt due to lack of knowledge at the beginning of the training period; these doubts are caused by lack of prior exposure to radiology, underestimating radiology specialisation, a workload that is too heavy and a lack of consultants in the public sector, who should provide adequate teaching and supervision for all the candidates. If there are more consultants, their guidance augments different levels of experience and learning, and they can foster special interests. The lack of radiology registrar posts, long waiting periods before specialisation can start, and uncertainty about a future workplace were other reasons for experiencing doubt. The responsibilities of motherhood was another reason given for considering quitting radiology specialisation during preparation for the summative assessment.

Failing the assessment has a negative psychological impact, and could lead to depression, loss of confidence and anxiety. Failing may be seen as an opportunity to gain experience, which could contribute to future success. The possibility of bias in the summative assessment was mentioned by two interviewees who failed at their first attempts. Radiology experience prior to specialisation and working independently after hours contributes to preparing for the summative assessment. Quality clinical experience is also valuable to several aspects, as already discussed, of the diagnostic workup of the patient. Teamwork and collegial support play a major role in preparation for the summative assessment. Consultant input (especially consultants who are involved in the summative assessment) can be a major influencing factor, whether negative or positive. Candidates should never be humiliated, especially not prior to the summative assessment. Consultants should stay up to date and can provide guidance to candidates by identifying gaps in knowledge and tutoring in examination technique.

There is no place for favouritism, and regular individual interviews with the head of the department are essential. English is the preferred language and should no longer be a

problem. Preparing for presentations is time consuming and therefore the topics selected should be relevant. Tutorial sessions, short case discussions, interdepartmental meetings, journal clubs and case studies contribute to passing the summative assessment. Outreach to other health facilities is not relevant to most of the radiological departments. Candidates should have easy and immediate access to an online database, should study a core textbook and add information as needed.

Few of the interviewees were aware of the learning outcomes on the examination body's website, or used it. In general, the research project did not stimulate enthusiasm in the candidates to conduct future research, but gives a candidate the opportunity to learn how to do and to understand the principles of research. Written assessments motivate the candidate to study regularly and the assessments contribute to preparation for the summative assessment through constructive guidance. Given the limited responses in reference to practical assessments the researcher wonders how often practical assessments are conducted overall. A portfolio is time consuming to compile but is valuable for completing a detailed CV. Logbooks are also time consuming to compile and should be checked regularly; a logbook could provide motivational support prior to the summative assessment. Requirements for the number of reported general radiographs are too lenient and should be reviewed and increased. Quality control sessions by consultants are important for identifying missed findings, for correcting errors and for teaching, especially in the case of junior registrars. Quality control sessions should include practical skills training as well as review and teaching of radiology report writing.

Except for specific remarks about failing the assessment, the researcher did not identify trends from the opinions of candidates who had failed the summative assessment at the first attempt or those who had passed the assessment at the first attempt.

5.3.2 Identifying factors relevant to the examination process

According to the interview guide the second question the researcher asked all the interviewees was: "What are your thoughts and opinions on the examination process?"

The aim of this question was to identify specific factors relevant to the examination process.

The responses of all the interviewees were analysed and arranged into themes, categories and, finally, subcategories, where applicable, to simplify the reporting.

The themes that were identified were as follows:

- Theme 1: Candidates' experiences of the assessment processes;
- Theme 2: Spectrum of knowledge assessed in the assessment; and
- Theme 3: The relevance of feedback.

The themes, with the coupled categories and subcategories, are presented in Table 5.3 and will be discussed separately. Some of the responses may be given as direct quotes to enhance the credibility, dependability and confirmability of the study.

TABLE 5.3: IDENTIFYING FACTORS RELEVANT TO THE EXAMINATION PROCESS [Table continues on next pages]

THEMES	CATEGORIES
1. Candidates' experiences of the assessment processes	The fairness of the assessment <u>Experience of the assessment as fair</u> • If you have done your work over five years, you should be able to write something. [CP5] • Assessment was fair. [CP1] • Assessment was fair. [CP2] • Examination was fair. [CP3] • The examination was fair. [CF1] • "The examiners are fair." [CF2] • "I see the examination as fair." [CP5] • Questions were fair. [CP6] • <i>"I felt that it was a good assessment."</i> [CP4] <u>Experience of the assessment as unfair</u> • <i>"I do not think that radiology is a fair assessment."</i> [CF3] • "There was too much unfairness." [CF4] <u>Reasons given for the impression of unfairness</u> • There is personal bias because of personality clashes as well as geographical bias depending on which university hosts the assessment. [CF3] • The local candidates are more likely to pass. [CF3] • "It's not about what you know." [CF4] • "The rules are not strictly followed." [CF4] <u>Experience of the assessment as traumatic</u> • <i>"Was traumatic."</i> [CP3] <u>Reasons for the "traumatic" description</u> • <i>"It is very stressful."</i> [CP3] • Wakes up at night thinking that s/he has to go and sit the assessment. [CP3] Time as it relates to the assessment <u>The impact of previous experience</u> • Practical radiology and clinical experience aids in completing in time. [CP2] <u>The impact of a structured approach to answering the question</u> • Need to have a structured answer to complete timeously. [CP2] • It helps a lot to have a structured, written plan to answer the question. [CP4] • Need to practice a structured approach to all the components of the

	assessment. [CP5] • "If you have practised a system, then things become more obvious." [CP5] • Very challenging, one needs to practise beforehand by working through old papers. [CP6] <u>The role of time in the written part of the assessment</u> • Limited time during written examination. [CP2] • Written part, enough time. [CP3] • More than enough time for everything. [CF3] <u>The role of time in the long cases</u> • Long cases limited time. [CP3] • Long cases should be a realistic time frame and not too many images. [CF1] • There is not enough time in the long cases and the orals. [CF4] • The long cases require a lot of written information within a limited time frame. [CP4] • Digital recording in daily practice but writing reports by hand during long cases assessment leads to time constraints. [CP3] • Examination feels very artificial due to time constraints. [CP6] • <i>"Too much time for the long cases in my opinion."</i> [CF3] The assessment instruments and tools <u>The written part of the assessment</u> • Question papers tested theoretical knowledge. [CP1] • Written papers function as a sifting mechanism for the oral part of the examination. [CP2] <u>Short-type questions</u> • A bigger number of short type questions are better than a few long essay-type questions. [CP2] • Shorter questions are better, use different instruments. [CP6] • Short questions are fairer because it assesses a wider range of knowledge. [CF4] • Essay questions have been replaced by short questions. [CP4] <u>Multiple choice questions</u> • "Studying for an MCQ is different to studying for an essay-type written question." [CF1] • MCQs should be correctly structured and at the correct level of knowledge. [CF1] • MCQs should not be a language test. [CP4] • MCQs are difficult to compile and should be trialled as unidentified questions, not counting marks. [CP4] • MCQs test a wide spectrum of specific knowledge. [CP5] • MCQs become unfair if they are formulated in a confusing manner and should preferably not include values or percentages. [CF4] <u>The practical part of the assessment</u> • <i>"The long cases, rapid reporting and orals assess working knowledge, how one thinks."</i> [CP1] <u>The long cases</u> • Long cases aim to create a "real world" scenario. [CP4] • Number of images for long cases should be tailored. [CP4] • Long cases are not in keeping with reality and therefore very time constrained. [CF2] • "There were just too many images to get through." [CF2] • Important to keep to the examination body's guidelines regarding the number of images. [CF3] <u>The rapid reporting</u> • Rapid reporting are upfront cases. [CF1] • Should have a standardised number of images with a moderated standardised memorandum on all the oral cases, to prevent bias. [CF3] The logistics of hosting the assessment • Infrastructure in general is very good. [CP6]

	• Infrastructure is good in general. [CF3] • Short notice communication to a candidate should be confirmed by telephone. [CF1] • Good directions to examination venue imperative. [CF1] • Enough physical personal space for the rapid reporting and long cases should be guaranteed. [CF1] • "Our oral setup was beautiful, nice examination room, no problems with quality of images." [CF1] • The quality of images on PowerPoint slides is good but not ideal. [CP4] • The assessment should not be assigned to a single university, to prevent bias; the concept of alternating between north and south will be good enough. [CF3]
2. Spectrum of knowledge assessed in the assessment	Coverage of the curriculum <u>The assessment cannot cover everything</u> • Impossible to cover everything. [CP1] • Cannot cover the whole curriculum. [CP2] • Cannot cover everything, radiology is very wide. [CP3] • It is impossible to cover everything. [CP5] • Impossible to cover the whole curriculum in the assessment. [CF4] • Radiology is too wide, you cannot test everything. [CF2] • "The volume is enormous, radiology is extremely broad." [CF1] • Questions are tailored according to which assessor submits from which university, rather than on covering the whole curriculum. [CF3] <u>The assessment covers a wide spectrum of the curriculum</u> • Modalities and organ systems are covered in general. [CF1] • The written assessment covered a wide spectrum. [CP4] • All the subdisciplines were covered. [CP5] • Well distributed, covering all systems. [CP6] • Making use of more short questions can contribute to wider coverage. [CF4] <u>Candidates can pass with incomplete knowledge</u> • Possible to pass the assessment with incomplete knowledge. [CP1] • "People can get through without knowing enough, if they are lucky." [CF2] <u>Suggestions for improving coverage of the curriculum</u> • Candidates should be evaluated throughout the training period and not just at the final examination. [CF2] • Previous experience plays an important role in passing the summative assessment. [CP2] • Questions should cover standardised imaging modalities that are generally available at training institutions. [CF4] • Too many questions come from journals. [CF4] • More questions should come from the prescribed textbooks. [CF4]
3. The relevance of feedback	Feedback from the examination body to candidates who pass • "I (would) like feedback." [CP3] • "I would have appreciated feedback." [CP2] • "Often the candidates who passed don't care, but I still would have liked to know." [CF2] • Feedback has different values to it, even if you passed. [CF1] • Feedback to passing candidates would be ideal. [CF4] • Feedback of marks achieved is enough. [CP1] • Feedback to successful candidates will help them to improve guidance in preparing other registrars. [CP5] Feedback from the examination body to candidates who fail <u>Feedback currently received</u> • There is no post-examination feedback, except for the results. [CF4] • Just getting a mark is not good enough. [CF2] • "I have never been given any feedback by anyone." [CF1] • "There is no feedback from anyone, it doesn't exist." [CF3]

	• Currently a void in feedback to candidates. [CP2] <u>Probable reasons for not getting feedback</u> • <i>"They cannot give feedback because it will implicate them in all the cracks in how they mark it."</i> [CF3] <u>Feedback is important to failing candidates</u> • <i>"Feedback is important"</i>. [CP3] • Feedback would have been tremendously valuable. [CF3] • <i>"They should have sat me down and said, right, let's do this."</i> [CF1] • No feedback contributes to anxiety. [CF2] <u>Feedback is a learning opportunity to guide future performance</u> • To guide future improvement. [CP3] • More detailed feedback is important for future individual development. [CP1] • <i>"You can help someone even if they failed."</i> [CF1] • Is lacking, especially feedback on how to improve yourself not to repeat the same mistakes. [CP6] • Will help failing candidates to know what they did wrong. [CP5] • <i>"It would be so helpful to know where you went wrong."</i> [CF2] • <i>"I would have gained more by knowing in which segment of my exam I messed up."</i> [CF1] • Without feedback, the HOD will not be able to give proper guidance to the individual or improve the training programme. [CF4] <u>Who should give feedback</u> • One-to-one feedback by the head of department. [CP3] • Feedback should be given by the head of department. [CP5] • Would have liked individual feedback from the examination body via the head of department or the convenor. [CF4] • Important to have a consultant who is actively involved in the exit examination to give feedback. [CF2] • Representatives should give feedback. [CF3] <u>The tools needed for giving feedback</u> • Memorandums are essential to give feedback. [CP2] • Breakdown of marks achieved for written questions did help. [CF1] • Feedback should include the scripts and marking sheets. [CF4] • Marking sheets and answer sheets with comments should be given to the candidates but will not happen because it will lead to queries. [CF3] <u>When to give feedback</u> • Feedback ideally immediately after the oral. [CP3] Feedback to candidates who are preparing for the assessment <u>The value of feedback to candidates who are still preparing</u> • Feedback is also important to guide candidates currently preparing for the assessment. [CP2] • <i>"Feedback would help for those upcoming registrars."</i> [CP5] • Feedback to candidates preparing for the assessment is most important. [CF3] • Feedback is important to improve the assessment process as well as the training of candidates. [CP2] <u>Providing guidance to candidates</u> • Guidance about the assessment structure and software used at the assessment. [CF1] • Feedback on examination technique, structured responses. [CF1] • Guidance from assessors on mark allocation and answering of questions helps during preparation for the assessment. [CP4] • Important to guide present candidates in their preparation to focus more on specific challenges e.g. long cases. [CF4] <u>Feedback arising from previous question papers</u> • Working through previous question papers helps to identify important topics as well as a systematic approach. [CP4]

	• Practised old examination papers, knew what to expect, not stressed about written papers. [CF2] <u>Other comments on feedback to preparing candidates</u> • Newly qualified candidates returning from the final assessment made a difference by giving feedback to their colleagues. [CF2] • Learning that a memorandum is flexible was a surprise. [CP4] • Feedback is currently only given during the mock examination. [CP6] Feedback from candidates to the examination body <u>Creating the opportunity to give feedback</u> • Everyone should have the opportunity to respond. [CP3] • Candidates should be able to give feedback on the examination to the examination body. [CF1] <u>Giving feedback on the fairness of the assessment</u> • If they feel that they have been treated unfairly. [CP3] • Feedback should be given on the fairness of the cases and the structuring of the assessment. [CP6] <u>Feedback should be in writing</u> • Should be in writing. [CP3] • Can be done anonymously in writing if the candidate is afraid of the possibility of victimisation. [CF4] <u>Feedback should be without fear of victimisation</u> • "If you start to stir, you will definitely fail the next time." [CF3] • "You cannot victimise me anymore, I can do it openly." [CF4]

5.3.2.1 Theme 1: Candidates' experiences of the assessment processes

The first theme to emerge from this question, namely, **Candidates' experiences of the assessment processes**, identified the experiences of the candidates during the summative assessment. The four categories that emerged from the responses of the interviewees are **The fairness of the assessment**, **Time as it relates to the assessment**, **The assessment instruments** and **The logistics of hosting the assessment** (cf. Table 5.3).

The fairness of the assessment

Data analysis and description: The first category summarises conflicting comments of all 10 the interviewees on the fairness of the assessment. Five subcategories were identified, namely, Experience of the assessment as fair, Experience of the assessment as unfair, Reasons given for the impression of unfairness, Experience of the assessment as traumatic and Reasons for the "traumatic" description.

Discussion: The majority of the participants experienced the assessment as fair when they referred to the written questions, the assessors and the practical part of the assessment. *"The examiners are fair"* [CF2]. *"I see the examination as fair"* [CP5]. One

interviewee described the assessment as a traumatic experience because it was very stressful; s/he reported still waking up at night, well after the assessment, thinking that s/he has to go to the assessment. Another interviewee mentioned that, if a candidate has done his/her work for five years, s/he should be able to write something when answering the questions.

Two of the candidates who failed at the first attempt were of the opinion that the assessment was unfair. One interviewee commented that *"I do not think that radiology is a fair assessment"* [CF3]. The individual was of the opinion that there is, firstly, personal bias because of personality clashes, and secondly, geographical bias, depending on which university hosts the assessment; this interviewee believed that local candidates are more likely to pass. Another interviewee was of the opinion that *"there was too much unfairness, it's not about what you know"*, and that *"the rules are not strictly followed"* [CF4].

In the researcher's opinion, in theory, these remarks do not make sense if one takes into account the structure and processes of the summative assessment. The same arguments that the researcher discussed in the previous chapter apply (cf. Point 4.3.5.4). The same assessors from different geographical locations assess at different locations over a certain period of time; all the candidates are anonymous when the assessors mark the scripts of written questions, long cases and rapid reporting; the candidates are anonymous when they are presented for the orals and are identified only by their examination numbers; no candidate is assessed by an assessor from his/her own institution during the oral part of the assessment; during the post-examination meeting candidates' marks are reviewed anonymously and candidates are only identified at the post-examination meeting by the representative of the parent department after an in-depth discussion about whether the candidate should fail.

This topic will be explored further in following categories that emerged during the interviews (cf. Point 5.3.5.2).

Time as it relates to assessment

Data analysis and description: Eight of the interviewees made comments that led to this category being identified. Four subcategories were identified, namely, The impact of previous experience, The impact of a structured approach to answering the question, The role of time in the written part of the assessment and The role of time in the long cases.

Discussion: One of the participants experienced that there was not enough time to complete the written part of the assessment, while two interviewees were of the opinion that there was enough time allocated for answering the written papers. It was suggested that previous radiological and clinical experience contributes to completing the written papers timeously. The interviewees furthermore emphasised the value of employing a structured approach to answering the questions to complete in time. It is advisable to practise beforehand by working through old papers. One interviewee reiterated that, *"if you have practised a system, then things become more obvious"* [CP5]. A number of interviewees were of the opinion that there was not enough time allocated to the long cases. A contributing factor to the latter was that candidates need to give a great deal of information and have to write the reports by hand. It was also mentioned that there were too many images per long case, while another candidate said: *"Too much time for the long cases in my opinion"* [CF3]. One candidate expressed the opinion that there is not enough time for the orals either. This leads the researcher to conclude that the perception of time is relative to the individual candidate, and may be influenced by several factors, among which the artificial environment for the long cases and orals, the presence of anxiety, lack of knowledge, absence of a structured approach and lack of confidence.

The assessment instruments

Data analysis and description: The next category emerged from the opinions of nine of the participants. Six subcategories were identified, namely, The written part of the assessment, Short-type questions, Multiple choice questions, The practical part of the assessment, The long cases and The rapid reporting.

Discussion: The question papers assessed theoretical knowledge and functioned as a sifting mechanism prior to the oral (practical) part of the assessment. A larger number of shorter-type questions than essay-type questions were asked because the former assessed a wider range of knowledge and were experienced as more fair. *"The long cases, rapid reporting and orals assess working knowledge, how one thinks"* [CP1]. The aim of the long cases was to create a real-world scenario, but it remained artificial due to the large number of images and the associated time constraints. *"There were just too many images to get through"* [CF2]. It is important to keep to the guidelines of the examination body regarding the number of images allowed in the different sections of the assessment. The rapid reporting presented day-to-day radiology cases.

The MCQs should be structured correctly and at the correct level of knowledge (the level of a general radiologist). *"Studying for an MCQ is different to studying for an essay-type written question"* [CF1]. MCQs should be formulated clearly and should not become a language test. One remark was that, because MCQs are difficult to compile, the format should be trialled as part of the written papers in the summative assessment, not for marks. The benefit of MCQs is that this type of question assesses a wide spectrum of knowledge. According to the interviews, MCQs become unfair if they are formulated in a confusing manner, and MCQs should preferably not include any values or percentages.

Lastly, it was suggested that the assessment should include a standardised number of images, together with a standardised memorandum on all the oral cases, to prevent bias.

Logistics of hosting the assessment

Data analysis and description: The last category of this theme emerged from the opinions of four of the interviewees in this group.

Discussion: Any short-notice communication from the examination body to any candidate prior to the assessment should be confirmed telephonically because candidates tend to ignore their emails in the days prior to the assessment in an attempt to remain focused. They prefer not to be derailed by unimportant notices. Good directions to the examination venue are imperative. Enough physical personal space should be guaranteed for each candidate during the long cases and rapid reporting. One interviewee stated: *"Our oral setup was beautiful, nice examination room, no problems with quality of images"* [CF1]. Another interviewee was of the opinion that the images presented on PowerPoint slides were good, but were not ideal. The ideal scenario would be to present uncompressed digital images on a high-resolution radiology reporting station. However, in the researcher's opinion, this would make the equipment very expensive. The general opinion was that the infrastructure was very good. One interviewee suggested that, to prevent the possibility of geographical bias; the radiology summative assessment should not be assigned to a single university but that it should be alternated between north and south (Johannesburg and Cape Town).

5.3.2.2 Theme 2: Spectrum of knowledge assessed in the assessment

The second theme, namely, the **Spectrum of knowledge assessed in the assessment**,

flowed from the previous theme and identified the spectrum of knowledge that was assessed in the summative assessment as it was experienced by the candidates. One category emerged from the interviews, namely, **Coverage of the curriculum** (cf. Table 5.3).

Curriculum

Data analysis and description: All 10 interviewees gave their opinions on how well the curriculum was assessed during the assessment. Nine comments were noted from six candidates who passed at the first attempt and 11 comments from four candidates who did not pass at the first attempt. Four subcategories were identified, namely, The assessment cannot cover everything, The assessment covers a wide spectrum of the curriculum, Candidates can pass with incomplete knowledge and Suggestions for improving coverage of the curriculum.

Discussion: It became clear from the interviews that it is impossible to cover the whole of the curriculum during the summative assessment, to the extent that it was mentioned that a candidate can pass the assessment with incomplete knowledge. This may sound appalling, but in the researcher's opinion this is a fair remark, as no one can know everything unless one knows everything about nothing. From this perspective the researcher posits that general radiology becomes a delicate balance between being safe, knowledgeable and efficient. This brings the researcher back to the question of competency, which will be discussed under the third question that was asked to all the interviewees (cf. Point 5.3.3).

The challenge lies in the fact that radiology has become too wide a field to cover in one assessment. Candidates should, therefore, be assessed throughout the training period and not only at the summative assessment. *"The volume is enormous, radiology is extremely broad"* [CF1]. For this reason, *"people can get through without knowing enough, if they are lucky"* [CF2]. The challenge that remains to identify exactly what is meant by "knowing enough". It is obvious, from the interviews, that a radiologist should be safe, and one of the aims of this thesis is to identify what is meant by "safe". It was suggested several times by interviewees that previous experience, both radiological and clinical, is a major contributory factor to passing the summative assessment.

Three interviewees who passed and one interviewee who previously failed said that a wide spectrum of all the imaging modalities, individual subdisciplines and organ systems were covered in general. It was suggested that asking more short questions could lead to a wider spectrum of knowledge being covered. One interviewee who failed at the first attempt suggested that more questions should come from the prescribed textbooks and that the questions should focus on standardised imaging modalities that are generally available at all the training institutions, and not on technologies or software-aided modalities that are not generally available. The interviewee furthermore claimed that too many questions come from journals. Questions should not be tailored according to one assessor who comes from a specific university, but should cover as much as possible of the curriculum.

5.3.2.3 Theme 3: The relevance of feedback

The third theme that emerged, namely, **The relevance of feedback**, identified the interviewees' general opinions about the relevance of feedback. Four categories emerged from the interviews, namely, **Feedback from the examination body to candidates who pass** the summative assessment, **Feedback from the examination body to candidates who fail** the assessment, **Feedback to candidates who are preparing for the assessment** and **Feedback from candidates to the examination body** (cf. Table 5.3). The responses include candidates' own personal experiences but also their opinions on the process of feedback in general; this covers the various categories identified. The reader should note that the candidates who failed the summative assessment at the first attempt did ultimately pass the assessment and therefore expressed opinions that fall into different categories.

Feedback from the examination body to candidates who pass

Data analysis and description: This category was identified from the opinions of seven of the interviewees.

Discussion: One of the interviewees was satisfied with only a summary of the marks achieved. Feedback has different values, and may therefore be valuable even to candidates who have passed the assessment. *"Often the candidates who passed don't care, but I still would have liked to know"* [CF2]. *"I would have appreciated feedback"* [CP2]. Feedback to successful candidates will help them to give better guidance to those registrars who are

still preparing for the assessment. From a practical point of view, in the researcher's opinion, it may be difficult to give feedback to every candidate who passes the assessment. The researcher finds it more feasible to provide copies of the written papers, marking scripts and rubrics on request by the candidate.

Feedback from the examination body to candidates who fail

Data analysis and description: Nine of the interviewees expressed their opinions on feedback to candidates who failed the summative assessment. Seven subcategories were identified, namely, Feedback currently received, Probable reasons for not getting feedback, Feedback is important to failing candidates, Feedback is a learning opportunity to guide future performance, Who should give feedback, The tools needed for giving feedback and When to give feedback.

Discussion: *"Feedback is important"* [CP3]. Although it would be useful for candidates who fail to receive a summary of their marks, more detailed feedback is required to ensure future individual development. *"I have never been given any feedback by anyone. I would have gained more by knowing in which segment of my exam I messed up. You can help someone even if they failed"* [CF1]. To make this feasible it is important to have a memorandum for every question, with copies of the answer sheets and rubrics showing a breakdown of the marks. It was suggested that feedback should be given immediately after the assessment, but in the researcher's opinion this would be impractical due to time constraints and logistical reasons. Individual feedback by the candidate's HOD, to guide future improvement, is more realistic.

Candidates who fail want to know why and how they failed. *"It would be so helpful to know where you went wrong"* [CF2]. They want to know how to improve and to prevent repeating the same mistakes. To achieve this a consultant (representing the parent department) who is actively involved in the summative assessment, should instigate accurate communication with the HOD. Failing to provide any feedback to a candidate causes anxiety and, in the researcher's opinion, may create the possibility of failure in the next assessment. One candidate commented that, *"there is no feedback from anyone, it doesn't exist"* [CF3]. The same candidate offered a possible reason for the lack of feedback: *"They cannot give feedback because it will implicate them in all the cracks in how they mark it"* [CF3]. Without feedback, the HOD will not be able to give proper guidance to the candidate or eliminate shortcomings in the training programme.

Feedback to candidates preparing for the summative assessment

Data analysis and description: This category emerged from the opinions of eight of the participants. Four subcategories were identified, namely, The value of feedback to candidates who are still preparing, Providing guidance to candidates, Feedback arising from previous question papers and Other comments on feedback to preparing candidates.

Discussion: *"Feedback would help for those upcoming registrars"* [CP5] who are still preparing for the summative assessment, to guide them on what to expect in the assessment and to give advice on examination technique. Feedback would help to improve the assessment process and the training of new candidates. At some centres feedback to candidates who are still preparing for the assessment is lacking. Guidance should be given on the assessment structure, mark allocation, answering of questions and the software that is used during the assessment, and there should be a focus on specific challenges. Working through previous question papers helps to identify important topics and to learn a systematic approach to answering the questions. Such an approach helps to minimise stress, because candidates will then be familiar with the format of the written papers. Currently, feedback is given mostly by newly qualified candidates who recently passed the assessment, or during the mock examinations. From such feedback one interviewee learned that a memorandum can be flexible.

Feedback from candidates to the examination body

Data analysis and description: Five of the interviewees voiced their thoughts on giving feedback to the examination body. Four subcategories were identified, namely, Creating the opportunity to give feedback, Giving feedback on the fairness of the assessment, Feedback should be in writing and Feedback should be without fear of victimisation.

Discussion: Candidates should have an opportunity to give feedback on the assessment to the examination body, especially if they believe that they have been treated unfairly. Feedback should ideally be given on the fairness of the cases and the structuring of the assessment. This should be done in writing and may be done anonymously if the candidate is afraid of the possibility of victimisation. Two of the interviewees had strong opinions on feedback to the examination body: *"If you start to stir, you will definitely fail the next time"* [CF3], and *"You cannot victimise me anymore, I can do it openly"* [CF4].

A summative perspective on the second question: The second question was asked to identify factors that are relevant to the processes involved in the summative assessment. All perspectives in the summary were those of the interviewees, unless specified as those of the researcher. The interviewees expressed views on their personal experiences during the examination process, the spectrum of knowledge that was assessed during the summative assessment and the relevance of feedback as they experienced it. Comments were also made on the relevance of feedback to the candidates who completed the assessment as well as the candidates who are preparing for the assessment. The majority of the participants experienced the assessment as fair, except for two of the candidates, who were of the opinion that the assessment was unfair because of personality clashes, geographical bias and failure to follow the rules of the examination body strictly. Some candidates reported that they did not have enough time, while others reported that they did have enough time. Perceptions regarding time is relative to the candidate and may be influenced by several factors, such as an artificial environment, anxiety, lack of knowledge, whether a structured approach to the questions is followed, and confidence. It is important that a candidate has a structured approach if s/he is to complete in time. Time constraints were mostly experienced in the long cases, because there were too many images and reports had to be written by hand.

It is impossible to cover the complete curriculum during the summative assessment. According to the interviewees, candidates should therefore be assessed throughout the training period and not just at the summative assessment. The question papers assess theoretical knowledge and functions as a sifting mechanism prior to the oral (practical) part of the assessment. It is preferable to ask shorter-type questions to assess a wider range of knowledge. The purpose of the long cases, rapid reporting and orals is to assess deeper knowledge, logical reasoning skills and structured thinking. MCQs should be structured correctly and be at the level of a general radiologist. More questions should come from the prescribed textbooks. Questions should focus on standardised imaging modalities. Previous experience, both radiological and clinical, is a major contributory factor in passing the summative assessment.

Short-notice communication prior to the assessment should be confirmed telephonically. Good directions to the examination venue are imperative. Enough physical personal space should be guaranteed in the examination room. During the orals digital images should ideally be presented on a high-resolution radiology reporting station. The general opinion was that the infrastructure was very good. Another suggestion was that the summative

assessment should be alternated between Johannesburg and Cape Town to prevent the possibility of geographical bias.

According to information gathered during the interviews, feedback on the assessment has different values and, in the researcher's opinion, feedback is valuable to candidates who passed the assessment, candidates who failed, and candidates who are currently preparing for the summative assessment, as well as from the candidates to the examination body.

5.3.3 Identifying criteria for defining a competent radiologist

The third question, according to the interview guide, involved the researcher asking all the interviewees: "How would you define a competent general radiologist?"

The responses by all the interviewees were analysed and arranged into themes, categories and, finally, subcategories, where applicable.

The themes that were identified were as follows:

- Theme 1: Achieving knowledge;
- Theme 2: Level of competence; and
- Theme 3: CanMEDS roles.

The themes, with the coupled categories and subcategories, are presented in Table 5.4 and will be discussed separately. Each category is followed by the coding of the respondent to simplify the reporting. Some of the responses may be given as direct quotes to enhance the credibility, dependability and confirmability of the study.

TABLE 5.4: IDENTIFYING CRITERIA FOR DEFINING A COMPETENT RADIOLOGIST [Table continues on next pages]

THEMES	CATEGORIES
1. Achieving knowledge	The level of knowledge required to practice <u>Theoretical knowledge is needed</u> • Theoretical knowledge is important. [CP1] • Need to be knowledgeable to be able to practice radiology. [CP6] • "You can't be a radiologist without the theory." [CF2] • "You can only see what you know." [CF2] <u>A broad general knowledge base is required</u> • Should have a broad basic knowledge of radiology. [CP3] • Should know what is expected from a general radiologist. [CF2] • Need to have general knowledge of everything, know basics as well as

	sources of reference. [CP6] • A good general radiologist should have a good general knowledge of radiology. [CP4] • Should be at an acceptable level of knowledge about basic general radiology without consulting the internet. [CF4] • Not necessary to know rare syndromes by heart. [CP3] • "You basically have to know a little bit about a lot instead of knowing everything about one topic." [CF1] <u>At international standards</u> • Should be at international level. [CF3] • <i>"Any radiologist who can pass the American, British and South African examinations will be good enough."</i> [CF3] <u>Theoretical knowledge on its own is not enough</u> • Theoretical knowledge is not enough to become a competent radiologist. [CP1] • Should be a balance between theoretical knowledge and skills. [CP1] • Theoretical knowledge is important, but experience is most important. [CP2] <u>A structured approach is required</u> • You've got to have a good general structured approach and cover all modalities. [CF1] • You need to have a structured approach. [CP5]
2. Level of competence	Patient safety is most important <u>Being a safe radiologist</u> • <i>"Should be a safe radiologist."</i> [CP1] • <i>"A radiologist should be safe."</i> [CP2] • You've got to be safe. [CF1] • "A competent radiologist would be a safe radiologist." [CP5] • Person needs to be safe. [CP6] <u>Knowing one's own limitations</u> • Know your limitations and never be arrogant. [CP3] • "Know what your boundaries are." [CF1] • One should know your own limitations. [CP4] • "He must know his limitations." [CP5] • Always know your limitations, you will never know everything. [CF2] <u>Avoiding arrogance</u> • "Arrogance doesn't really help you in radiology." [CF1] • Should be confident but not arrogant, be able to accept failure. [CP6] <u>Exercising quality improvement practices</u> • Constantly exercise quality improvement skills. [CP4] • <i>"You're a creature of habit."</i> [CP4] <u>Making the correct diagnosis</u> • Should not be making wrong diagnoses or should at least include the correct diagnoses in the differential list. [CF4] • Should be able to make a reasonable diagnosis, as expected from a reasonable radiologist, to be considered safe. [CF3] <u>Limiting radiation</u> • Should always be mindful of limiting radiation exposure to staff and patients. [CF4] Should have good observation skills <u>The relevance of good observation skills</u> • <i>"Cannot work without good observational skills."</i> [CP3] • Need to have good observational skills. [CF4] • <i>"Is very important, practise, practise, practise."</i> [CP4] • "He must pick up the pathology." [CP5] • "Absolutely". [CP6] <u>The radiologist should not miss findings</u> • Should miss nothing that is on the level of a general radiologist. [CF3]

	• Anyone can make mistakes but one should not miss elementary diagnoses. [CF3] • <i>"If you cannot see the pathology, you cannot diagnose it."</i> [CP1] • <i>"Should not miss obvious findings."</i> [CP2] • <i>"Should not miss basic stuff."</i> [CP3] <u>The radiologist should have a structured approach</u> • Structured system to look at imaging. [CP4] Should be able to function independently • Should be able to work independently. [CP3] • You must be independent and confident. [CF2] • Should be able to function independently. [CF3] Demonstrate practical competence • Should have good practical skills at the level of a general radiologist. [CP3] • <i>"Interventional skills also have to be covered."</i> [CF1] • Give a differential diagnosis relevant to the clinical history. [CF1] • <i>"The more you see, the more you do, the better you will become."</i> [CF2] • Should be effective. [CF3] • Should approach a case in a confident radiological (structured, logical) manner to present a relevant differential diagnosis. [CF4] Demonstrate reflexive competence • <i>"Should be able to think out of the box."</i> [CP3] • Should be able to manage any situation. [CP4] • <i>"Competent radiologist"</i> is a function of speed versus accuracy. [CF3] • Should be able to do a massive amount of work in a limited time without missing anything. [CF3]
3. CanMEDS roles	Lifelong scholar <u>The relevance of being a lifelong scholar</u> • <i>"You never stop learning."</i> [CF1] • <i>"Need to be willing to learn, radiology is a very broad field."</i> [CP6] • <i>"You can't be a radiologist if you're not going to study for the rest of your life; you've got to keep reading."</i> [CF2] <u>Asking somebody</u> • <i>"If you do not know, ask somebody or search for the answer."</i> [CP1] • <i>"One can always ask somebody."</i> [CP3] • <i>"Ask somebody that knows better than me."</i> [CF1] • Can always ask for advice. [CP4] • <i>"Be prepared to ask for help."</i> [CF2] • Should not be overconfident not to ask advice. [CP2] • <i>"If you do not know something or are not confident about it, try to consult other consultants."</i> [CF4] <u>Reviewing the literature</u> • Read and consult the literature. [CP3] • Know when to read or refer. [CP5] • Consult or read when necessary. [CF3] • One can read on the internet, need to continue reading articles and continue to attend congresses to learn about new developments. [CF4] Team player <u>The relevance of teamwork</u> • Be able to work as part of a team. [CP3] • <i>"You are part of a team."</i> [CF1] • <i>"We do things properly, together."</i> [CF4] • <i>"Radiology is not an island; if you cannot work with other people, radiology is not for you."</i> [CF3] • One cannot function alone in radiology without the opinions of colleagues. [CF4] <u>The relevance of interpersonal skills</u> • Should have good interpersonal skills. [CP1] • Should be able to build good interpersonal relations. [CP3]

	• Always try to help the clinician promptly without being obstructive. [CP4] • Explain if you refuse something and offer an alternative investigation. [CF2] Manager • Managerial skills needed. [CP1] • Important to be a good manager. [CP3] • Be accessible and provide guidance to staff. [CP5] • Should not waste resources. [CF3] Communicator <u>The relevance of being a communicator</u> • Communication and interpersonal skills are very important because clinicians do not like it if a radiologist is asking clinical questions. [CF4] • Should be a good communicator. [CF2] <u>Communicating with patients, clinicians and colleagues</u> • Should be able to communicate with clinicians. [CP3] • Should be able to communicate with clinicians. [CP5] • "Need to have a good relationship with the clinician to better understand the background of the patient." [CP6] • "You have to have communication skills with your patient and with your colleagues." [CF1] <u>Communicating relevant findings</u> • Should know what to say and what not to say. [CP1] • Should be able to describe what you see. [CF1] • Should be able to communicate, convey urgent findings and ask for more clinical information. [CP4] • Communicate important findings speedily. [CF2] • One should be able to effectively communicate the findings to the referring clinician, who is actually the client. [CF3] Professional • Should be able to work under pressure. [CP1] • Should always remain professional by having good communication and interpersonal skills within the radiology department towards staff. [CF4] • <i>"We are working together, not against one another."</i> [CP4] • Do not pretend to know it all. [CP5] • Should care about the patient. [CP5] • Always act in the best interest of the patient. [CP6] • Professionalism and interpersonal skills should be assessed during the training period. [CF1] Expert <u>The radiology report should be trustworthy</u> • Radiological report should be trustworthy. [CP3] • "They should trust your reports." [CF2] • You must be able to instil confidence in the clinicians regarding your opinion. [CF2] <u>The relevance of becoming an expert</u> • Do not focus on the assessment, but focus on becoming an expert. [CP4] • One should be an expert and better than anybody else in your own field. [CF3] • Need to be good at what they do. [CP5] Health advocate • "Need to guide and protect the public and clinicians." [CP6]

5.3.3.1 Theme 1: Achieving knowledge

The first theme to emerge from this question, **Achieving knowledge**, identified the only category within this theme, namely, **The level of knowledge required to practice** as a

competent general radiologist (cf. Table 5.4).

Level of required knowledge

Data analysis and description: All the interviewees commented on the level of knowledge needed to be a competent radiologist. Five subcategories were identified, namely, that Theoretical knowledge is needed, A broad general knowledge base is required, that the knowledge should be At international standards, Theoretical knowledge on its own is not enough and A structured approach is required.

Discussion: Theoretical knowledge is important, but it is not enough for becoming a competent radiologist. Knowledge should be balanced with several skills as well as experience. A competent radiologist needs to show a broad basic knowledge of radiology. Not knowing rare syndromes is not that important and this can be reviewed in the literature. Therefore, it is also important to know where to search for the relevant information but one should at least be able to come up with something without constantly consulting the internet. *"You basically have to know a little bit about a lot instead of knowing everything about one topic"* [CF1]. This basic knowledge should be applied by having a good general, structured approach to cover all modalities. The aim should be to have enough knowledge to survive at international level. *"Any radiologist who can pass the American, British and South African examinations will be good enough"* [CF3].

5.3.3.2 Theme 2: Level of competence

The following theme that emerged from the question identified the **Level of competence** needed to become a radiologist. Five categories emerged from the interviews, emphasising that **Patient safety is most important**, that the radiologist **Should have good observation skills**, **Should be able to function independently**, should **Demonstrate practical competence** and **Demonstrate reflexive competence** (cf. Table 5.4).

Patient safety is most important

Data analysis and description: The first category was mentioned by all the participants in this group. Six subcategories were identified, namely, Being a safe radiologist, Knowing one's own limitations, Avoiding arrogance, Exercising quality improvement practices, Making the correct diagnosis and Limiting radiation.

Discussion: It was commented by several of the interviewees that *"a radiologist should be safe"* [CP2]. The radiologist should know his/her own limitations and should never be arrogant. *"Arrogance doesn't really help you in radiology"* [CF1]. A radiologist should constantly exercise quality improvement skills by implementing several mechanisms, routines or a structured approach to ensure that nothing is missed. *"You're a creature of habit"* [CP4]. A successful radiologist should, furthermore, be able to accept failure and must realise that s/he will never know everything. The individual should be able to make a reasonable diagnosis, as expected from a reasonable radiologist, or should at least provide a differential list that includes the correct diagnosis. S/he should constantly be mindful of limiting radiation exposure to staff and patients.

Should have good observation skills

Data analysis and description: The following category emerged from the opinions of eight of the interviewees. Three subcategories were identified, namely, The relevance of good observation skills, The radiologist should not miss findings and The radiologist should have a structured approach.

Discussion: A competent radiologist *"should not miss obvious findings"* [CP2]. *"If you cannot see the pathology, you cannot diagnose it"* [CP1]; therefore, a radiologist *"cannot work without good observational skills"* [CP3]. Good observation skills can only be acquired through repetition – by looking at as many different variations of cases as possible. Radiologists must apply a structured approach to every case, to guarantee that they have looked at every segment of every image and have considered all possible pathologies. Anyone can make mistakes, but one should not miss elementary diagnoses that are on the level of a general radiologist.

Should be able to function independently

Data analysis and description: This category was identified from the opinions of three participants.

Discussion: A competent radiologist should be able to function independently and confidently.

Demonstrate practical competence

Data analysis and description: Five of the interviewees made comments related to practical competence.

Discussion: A competent radiologist should have mastered practical skills needed at the level of a general radiologist. *"Interventional skills also have to be covered"* [CF1]. Repetition was again mentioned as a contributing factor to acquiring competence. *"The more you see, the more you do, the better you will become"* [CF2]. Practical competence includes the correct application of acquired knowledge to present a differential diagnosis that is relevant to the clinical history. A competent radiologist should be effective and efficient, by managing several patients safely within a specific time frame and without missing a diagnosis.

Demonstrate reflexive competence

Data analysis and description: The above-mentioned led to the category of reflexive competence that was mentioned by three of the participants.

Discussion: A competent radiologist "should be able to think out of the box" [CP3] and should be able to manage any situation. One interviewee defined a competent radiologist as a function of speed versus accuracy. The participant commented that a radiologist should be able to do a massive amount of work in a limited time without missing anything.

5.3.3.3 Theme 3: CanMEDS roles

The third theme to emerge from this question reiterated several of the **CanMEDS roles** as part of the qualities of a competent radiologist. The opinions of the participants were grouped into seven categories. The interviewees voiced that a competent radiologist should be a **Lifelong scholar, Team player, Manager, Communicator, Professional, Expert** and a **Health advocate** (cf. Table 5.4).

Lifelong scholar

Data analysis and description: All 10 interviewees commented on the necessity of a competent radiologist remaining a lifelong scholar. Three subcategories were identified,

namely, The relevance of being a lifelong scholar, Asking somebody and Reviewing the literature.

Discussion: *"If you do not know, ask somebody or search for the answer"* [CP1]. A radiologist should not be overconfident and fail to ask for advice, and should review the literature regularly when confronted with pathology. *"You never stop learning"* [CF1]. It is important to realise when to read and when to refer. *"You can't be a radiologist if you're not going to study for the rest of your life; you've got to keep reading"* [CF2]. The radiologist should read on the internet, continue to read articles and attend conferences to learn about new developments. Radiology is a very broad field that keeps on expanding.

Team player

Data analysis and description: This category emerged from the opinions of seven of the interviewees. Two subcategories were identified, namely, The relevance of teamwork and The relevance of interpersonal skills.

Discussion: A competent radiologist should have good interpersonal skills and be able to build good interpersonal relations. *"You are part of a team"* [CF1]. If the clinician's request is incorrect the radiologist should always try to help as soon as possible, by guiding the clinician to the best imaging modality, without being obstructive. It is important to explain to the clinician why a specific investigation is refused and to offer an alternative investigation or intervention, when needed. *"Radiology is not an island; if you cannot work with other people, radiology is not for you"* [CF3]. One of the interviewees said simply: *"We do things properly, together"* [CF4].

Manager

Data analysis and description: The role of a manager emerged from the opinions of four interviewees.

Discussion: It was mentioned that a competent radiologist should show good managerial skills that make him/her accessible to the staff. S/he should furthermore provide guidance to the rest of the team and should not waste resources.

Communicator

Data analysis and description: The communicator role was identified from the remarks of nine of the interviewees. Three subcategories were identified, namely, The relevance of being a communicator, Communicating with patients, clinicians and colleagues and Communicating relevant findings.

Discussion: A competent radiologist should be able to communicate with clinicians and should know what should be said and what not when speaking to patients. *"You have to have communication skills with your patient and with your colleagues"*[CF1]. It is important to describe verbally and in the written report exactly what is seen on the imaging. The radiologist should know when to convey urgent findings and when to ask for more clinical information when relevant. Radiologists *"need to have a good relationship with the clinician to better understand the background of the patient"* [CP6]. Communication and interpersonal skills are very important because clinicians generally do not like it if a radiologist asks clinical questions.

Professional

Data analysis and description: The next CanMEDS role was identified from the opinions of six of the participants in this group.

Discussion: A competent radiologist should be able to work under pressure. S/he should remain professional by exhibiting good communication and interpersonal skills towards staff of the radiology department, regardless of the challenges that arise. *"We are working together, not against one another"*[CP4]. One should not pretend to know it all and should always act in the best interest of the patient. Professionalism and interpersonal skills should be assessed during the training period and cannot be assessed during the summative assessment.

Expert

Data analysis and description: This category was identified from the remarks of five of the interviewees. Two subcategories were identified, namely, The radiology report should be trustworthy and The relevance of becoming an expert.

Discussion: A competent radiologist needs to be good at his/her profession. It is therefore important that, during the training period, a candidate should not focus on the summative assessment but should rather focus on becoming an expert in radiology. The radiological report should be trustworthy and the radiologist should be able to instil confidence in the clinicians regarding his/her opinion. *"They should trust your reports"* [CF2]. The radiologist should be an expert and better than any clinician in the field of radiology.

Health advocate

Data analysis and description: The last category and CanMEDS role that was identified comes from a single remark of one of the interviewees. Although it is only one remark the researcher considers it to be important.

Discussion: Radiologists *"need to guide and protect the public and clinicians"* [CP6]. In the researcher's experience it often happens that a patient lacks insight into his/her illness and the radiologist has to explain the need for a specific diagnostic investigation or intervention. The researcher found that the radiologist also has to fight to develop diagnostic services on a bigger scale, to give patients access to expensive imaging modalities and interventions that are needed to provide better healthcare. The researcher found that such care is not limited to making a diagnosis, but involves developing and offering diagnostic screening programmes that will direct the early diagnosis and treatment of diseases, and which may lead to greater morbidity and/or mortality if it is neglected. Therefore, the researcher is of the opinion that screening programmes will, in the long run, not only save lives but also money, and contribute to better economic development.

A summative perspective on the third question: The third question, on identifying criteria for defining a competent radiologist, was asked to triangulate the perspectives of the candidates with the theoretical perspectives in Chapter 2 and the opinions of the assessors and moderators in Chapter 4, and will be discussed further in Chapter 6. All perspectives in the summary were those of the interviewees, unless specified as being those of the researcher. According to the interviews a competent radiologist needs to show a broad basic knowledge of radiology and clinical experience, coupled with interpersonal and managerial skills. The competent radiologist will have a good, structured approach to cover all modalities. The radiologist should be safe, should know his/her own limitations and should never be arrogant. The radiologist should constantly exercise quality improvement

skills while limiting radiation exposure to staff and patients. S/he should not miss obvious findings and should be able to function independently and confidently. The radiologist should have mastered practical skills needed at the level of a general radiologist, present a differential diagnosis that is relevant to the clinical history and, ultimately, must be able to manage a lot of work effectively and efficiently. The competent radiologist should realise when to read and when to refer. S/he should read on the internet, read articles and attend conferences to learn about new developments. The radiologist should be able to communicate effectively with clinicians and patients, work under pressure and remain professional. S/he should become an expert in radiology while constantly guiding and protecting the public as well as clinicians.

5.3.4 Identifying the relevance of and factors to be considered in a national outcome-based curriculum in radiology

The fourth question according to the interview guide that the researcher asked all the interviewees was: "What is your opinion on a uniform, national outcome-based curriculum?"

The responses of all the interviewees were analysed and arranged into themes, categories and, finally, subcategories, where applicable. The themes that were identified were as follows:

- Theme 1: Considerations in a national curriculum; and
- Theme 2: Create partnerships.

The themes, with the coupled categories and subcategories, are presented in Table 5.5 and will be discussed separately. Each category is followed by the coding of the respondent to simplify the reporting. Some of the responses may be given as direct quotes to enhance the credibility, dependability and confirmability of the study.

TABLE 5.5: IDENTIFYING THE RELEVANCE OF AND FACTORS TO BE CONSIDERED IN A NATIONAL OUTCOME-BASED CURRICULUM IN RADIOLOGY
[Table continues on next pages]

THEMES	CATEGORIES
1.Considerations in a national curriculum	The relevance of a national curriculum <u>A national curriculum is relevant</u> • A national curriculum is needed. [CP2] • Definitely room for a national curriculum. [CP1] • <i>"Will be a good thing."</i> [CP3]

	• "That would be ideal." [CP6] • There should be a national curriculum that is simple, easily accessible and at an international level. [CF3] • A standardised training programme would help but should be relevant in terms of patient population and resources. [CP5] <u>The reasons for a national curriculum</u> • Because of a national exit examination a five-year curriculum is advised due to the rapid expansion of radiology. [CP2] • Important to maintain high standards of training. [CP3] • "Because every university does their own thing." [CP6] • Protects the patient, serves as a compass to the assessors and serves as a guideline to the candidates. [CP4] • Identify the required depth of knowledge for a general radiologist. [CF1] • "You definitely need to know what's expected of you." [CF1] • "You need to know how much you need to know." [CF1] • "It really would help to have more support in knowing what you need to know." [CF2] <u>Suggestions on a national curriculum</u> • The easiest would be to adopt the curriculum as provided online by RADPrimer. [CF3] <u>A national curriculum is not relevant</u> • It is up to the candidate to structure his/her studies. [CP6] • A national curriculum is not relevant because the curriculum depends on the consultants in the training department. [CF4] • "We are using the same books and everything." [CF4] Factors playing a role in developing a national curriculum <u>The leadership in developing a national curriculum</u> • It will be a big project, bigger than just academic departments. [CP3] • Should come from a higher authority in radiology. [CP2] • Should consist of a committee of all the radiological subdivisions, including all provinces. [CF1] • Consultation should include all role players, from experienced to junior radiologists, public and private sectors. [CP3] <u>Challenges in developing a national curriculum</u> • Curriculums are taught differently due to different resources. [CF4] • "We need to work on the resources first." [CP5] • It would be a huge challenge because of the workload and shortages we have. [CF2] • Challenge is the lack of consultants in certain academic departments. [CP5] • Lack of enough consultants in some training departments will be a challenge. [CP2] • It would be possible if there were enough consultants. [CF2] • Difficult to implement because of lack of motivation. [CP2] <u>Alignment with the learning outcomes</u> • College should put forth the learning outcomes. [CP4] • Identified learning outcomes should drive the curriculum. [CP2] • Academic departments should accomplish the learning outcomes through their curriculums. [CP4] <u>Prerequisites for a national curriculum</u> • Should have continuous assessment throughout the training period to ensure that a candidate follows the complete online programme. [CF3] • Should not compromise on the final product. [CP5] • New technological advances in some departments are not the norm and not relevant for a national curriculum. [CP2] <u>The current feasibility of a national curriculum</u> • Do not attempt to formulate a new national curriculum; do not let somebody continue after three years if they do not pass 45% of all the

	disciplines of an online curriculum. [CF3]
2. Create partnerships	Partnerships between registrars • Registrars can share academic presentations or articles. [CP1] • A student exchange programme is not practical. [CF1] • Summarised journal club articles are shared online. [CP4] • Networking via digital media. [CP5] • Make contact with registrars from other universities and share information via online media. [CF2] Partnerships between academic departments <u>To share ideas</u> • Share ideas on teaching and learning activities. [CP1] • Interdepartmental cross-pollination of ideas and solutions to challenges. [CP5] <u>To share experience</u> • Sharing of experience because of limited registrar/consultant ratios. [CP1] • Sharing consultant presentations through webinars. [CP1] <u>To share cases</u> • Sharing of interesting cases between academic departments via an online, integrated digital museum. [CP2] • Interdepartmental tutorials are also valuable to guide final-year candidates during their preparation for the summative assessment. [CF4] • Interaction should be constructive. [CF1] <u>To share infrastructure</u> • Some infrastructural limitations can be compensated for with theory, but imperative modalities should be guaranteed. [CP4] • Exposure to different infrastructural technologies through a registrar exchange programme. [CP1] • Works well if different academic departments are working together to offer access to different imaging modalities. [CF4] • Interim focused partnerships between departments until resources have improved. [CP5] Partnerships between academic departments and private practice • Expose registrars to technologies and resources if not available in an academic department. [CP6] • If some modality is not available in the public sector, it is available in private; create public-private academic partnerships to train registrars. [CF3] • Tutorials given by private radiologists help a lot during preparation for the summative assessment. [CF4]

5.3.4.1 Theme 1: Considerations in a national curriculum

The first theme to emerge from this question, namely, **Considerations in a national curriculum**, identified a number of factors to be considered in a national curriculum. Two categories emerged from the interviews, namely, **The relevance of a national curriculum** and **Factors playing a role in developing a national curriculum** (cf. Table 5.5).

The relevance of a national curriculum

Data analysis and description: The relevance of a national curriculum was addressed by all 10 of the interviewees in this group. Four subcategories were identified from the different opinions, namely, that A national curriculum is relevant, The reasons for a national curriculum, Suggestions on a national curriculum and the opposing opinion, that A national curriculum is not relevant.

Discussion: Six interviewees stated that a national curriculum would be relevant and *"will be a good thing"* [CP3]. Such a national curriculum should be relevant in terms of patient population and available resources. According to one interviewee a national curriculum should be easy to understand, easily accessible and at an international level. A number of reasons were given for developing a national curriculum. The first reason is that there is currently a national summative assessment. *"Because every university does their own thing"* [CP6] it is important to maintain high standards of training, to protect the patient, to serve as a compass to the assessors and to serve as a guideline to the candidates [CP4]. The curriculum should run over five years due to the rapid expansion of the field of radiology. It would be valuable to identify the depth of knowledge needed to pass the summative assessment and *"it really would help to have more support in knowing what you need to know"* [CF2].

One interviewee was of the opinion that a national curriculum is not relevant because the curriculum depends on the consultants working in the department. *"We are using the same books and everything"* [CF4] and, in the end, it remains the responsibility of the candidate to structure his/her own study programme.

The researcher concluded from the remarks that different training sites follow different curricula due to different available resources, which is inevitable. The registrars, on the other hand, are in need of specific guidance regarding what is expected of them on a national level and therefore they ask for a clear national directive. A solution to the problem was suggested by one of the interviewees, namely, that the easiest would be to adopt an international curriculum that is currently available online. This remark makes sense to the researcher, because such a curriculum is constantly updated with the most current evidence-based knowledge and is easily accessible to every candidate, putting everyone on par with what they need to know for the summative assessment. In the researcher's

opinion, ultimately, the assessment, the curriculum and the learning outcomes need to be aligned.

Factors playing a role in developing a national curriculum

Data analysis and description: Eight of the participants commented on factors playing a role in the development of a national curriculum. Five subcategories were identified, namely, The leadership in developing a national curriculum, Challenges in developing a national curriculum, Alignment with the learning outcomes, Prerequisites for a national curriculum and The current feasibility of a national curriculum.

Discussion: According to the interviews the leadership for developing a national curriculum should come from a higher level than the academic departments. It should consist of all the subdivisions in radiology and represent all the provinces. Consultation should include all role players, from experienced radiologists to junior radiologists in both the public and private sectors. The interviews identified a number of challenges facing the development of a national curriculum. Curricula are taught differently due to variations in the availability of resources. Therefore, *"we need to work on the resources first"* [CP5]. It would be a huge challenge, because of the workload and current limited resources. The lack of enough consultants in some training departments is already a challenge that needs to be overcome. A national curriculum would furthermore be difficult to implement if there is a lack of motivation from the examination body and the academic departments.

Learning outcomes should be identified for each level of training, to drive the development of a curriculum. The learning outcomes should be identified by a higher authority in radiology – it would probably have to be the examination body. The different academic departments then need to accomplish the learning outcomes through their curricula. From the interviews three prerequisites were identified, namely, we should have continuous assessments throughout the training period to ensure that a candidate follows the complete online programme, we should not compromise on the final product, and modern technological advances are not the norm in all departments and will therefore not have an impact on developing a national curriculum at the level of a general radiologist.

Because of the above-mentioned challenges, requirements for setting up a national curriculum and the fact that curricula are taught differently due to different resources, interviewees finally suggested that we should not attempt to formulate a national curriculum

in the current setting. Instead, it was suggested that we do not allow candidates to continue after three years of specialising in radiology if they do not pass 45% of all the subdisciplines of a curriculum that are currently available online.

5.3.4.2 Theme 2: Create partnerships

The next theme that emerged from this question, namely, **Create partnerships**, refers to creating multilevel partnerships to guide candidates and help them to complete the curriculum within a resource-limited setting. Three categories emerged, identifying the different types of partnerships that could be created, namely, **Partnerships between registrars**, **Partnerships between academic departments** and **Partnerships between academic departments and private practice** (cf. Table 5.5).

Partnerships between registrars

Data analysis and description: The category of creating partnerships between registrars emerged from the opinions of five interviewees.

Discussion: It was stated unambiguously that a registrar exchange programme is not practical. The simplest way of creating partnerships among registrars would be networking via digital media. Registrars can make contact with registrars from other universities and share academic presentations or articles via online media. In the researcher's opinion risks that may arise and that will have to be monitored are plagiarism, internet security and patient confidentiality.

Partnerships between academic departments

Data analysis and description: Partnerships between academic departments were suggested by six participants in this group of interviewees. Four subcategories were identified, namely, To share ideas, To share experience, To share cases and To share infrastructure.

Discussion: Partnerships between academic departments with the aim of encouraging constructive interaction may be useful for sharing ideas on different teaching and learning activities. Experiences can also be shared on coping with limited registrar-consultant ratios. It was suggested that registrars can be exposed to different infrastructural technologies

through a registrar exchange programme, but this was slated as impractical in the previous category that was discussed. Consultant presentations can be shared via webinars. Interesting cases can be uploaded to an online, integrated digital museum. Some infrastructural limitations can be compensated for with theory, but imperative modalities should be guaranteed by the training department. If an academic department cannot offer a specific modality, for whatever reason, interim focused partnerships between departments should be created until the availability of resources has improved. Interdepartmental tutorials (between radiological departments as well as interdisciplinary tutorials) are also valuable for guiding final-year candidates during their preparation for the summative assessment.

Partnerships between academic departments and private practice

Data analysis and description: The last category to emerge under this theme was voiced by three of the interviewees.

Discussion: Partnerships between academic departments and private radiology practices can help to expose registrars to technologies and resources that may not be available in the academic department. Tutorials that are presented by private radiologists can also be valuable in assisting academic consultants to train registrars and to help candidates with their preparation for the summative assessment.

A summative perspective on the fourth question: The fourth question was aimed at identifying the candidates' opinions on a national curriculum. All perspectives in the summary were those of the interviewees unless specified as being those of the researcher. In general, the participants were of the opinion that a national curriculum, run over five years, is needed to maintain high standards of training. A national curriculum will help to identify the depth of knowledge needed to pass the summative assessment, help to protect the public and guide assessors of the summative assessment. A national curriculum should be relevant in terms of available resources, it should be easy to understand, easily accessible and at an international level. Registrars are currently in need of specific guidance on a national level. It would be easiest to adopt an international curriculum that is currently available online and that is updated constantly. Learning outcomes should be identified by the examination body, but it remains the responsibility of the academic departments to see to it that the learning outcomes are accomplished by the candidates. This is challenging because of the current workload and limited resources. Consultation on the curriculum and

learning outcomes should include all role players in both the public and private sectors. Because of all the challenges and logistics involved in setting a national curriculum it was suggested that it should not be attempted in the current setting. Candidates should rather complete continuous assessments throughout the training period to ensure that they follow the complete online adopted curriculum. Registrar exchange programmes are not practical. Several suggestions were identified from the interviews. Registrars can create academic partnerships via online digital media networking. Partnerships between academic departments should be created to share ideas about different teaching and learning activities and how to cope with limited registrar-consultant ratios. Consultant presentations can be presented via webinars. An online, integrated digital museum can be created. Partnerships between academic departments and private radiology practices can be created to expose registrars to technologies and resources that are not available in the public sector. Tutorials presented by private radiologists will also be valuable.

5.3.5 Identifying any other factors to be considered in summative assessment in radiology

The fifth question, according to the interview guide, that the researcher asked all the interviewees was: "Are there any other factors that should be considered in the summative radiology assessment?"

The responses of all the interviewees were analysed and arranged into themes and categories.

The themes that were identified were as follows:

- Theme 1: The assessment process;
- Theme 2: Prevent bias; and
- Theme 3: The assessment environment.

The themes, with the coupled categories are presented in Table 5.6 and will be discussed separately. Some of the responses may be given as direct quotes to enhance the credibility, dependability and confirmability of the study.

TABLE 5.6: IDENTIFYING ANY OTHER FACTORS TO BE CONSIDERED IN SUMMATIVE ASSESSMENT IN RADIOLOGY
(Table continues on next page)

THEMES	CATEGORIES
1. The assessment process	Restructuring of the current summative assessment process • Restructuring of the oral assessment according to subdisciplines to ensure complete coverage of the curriculum. [CP4] • Consider a continued assessment strategy on national level similar to the Netherlands because we are in a resource-limited country, we would prevent underperformance in rural settings. [CF3] • Consider renting an unbiased venue with reporting stations, give a certain number of cases to be reported on by all the candidates that cover all the modalities over one working day and mark the reports to see if they can do the work effectively and safely while working under pressure. [CF3]
2. Prevent bias	Prevent bias in oral assessments • Orals should focus on the depth of knowledge and not the number of cases. [CP4] • Ensure standardising the level of the oral assessments between different venues and assessors. [CP5] • "At some institutions you are more likely to fail the oral." [CP5] • "Your head should not stick out or be too low, be generic." [CF3] • "The system should be transparent." [CF4] • If possible, all the assessors should present the same level of cases in the orals or ideally the same image pool to all the candidates. [CF4]
3. The assessment environment	Relaxing the candidates • Try to calm and relax the candidates. [CF2] • Unnecessary waiting periods causes stress. [CF2] • Staff and assessors should be friendly. [CF2] • System should run smoothly. [CF2]

5.3.5.1 Theme 1: The assessment process

The first theme that emerged from the question covering any opinions that have not yet been discussed, namely, **The assessment process**, related to **Restructuring of the current summative assessment process** (cf. Table 5.6).

Restructuring of the current summative assessment process

Data analysis and description: Only two interviewees, one who passed and one who failed at the first attempt, voiced opinions that led to the emergence of this category.

Discussion: One suggestion was that the oral part of the assessment should be structured according to subdisciplines to ensure complete coverage of the curriculum. The second remark was that the assessment should change to a continued assessment strategy on national level, similar to that applied in the Netherlands, because we are in a resource-limited country, and we would prevent underperformance in rural settings. The last comment was that the examination body should consider renting an unbiased venue with reporting stations and present a certain number of cases to be reported on by all the

candidates, covering all the modalities. This should be done in one working day and then the reports should be marked to see if the candidates can do the work effectively and safely while working under pressure.

5.3.5.2 Theme 2: Prevent bias

The second theme that emerged from the question comprised comments made specifically to **Prevent bias**, and led to the only category, namely, to **Prevent bias in oral assessments** (cf. Table 5.6).

Prevent bias in oral assessments

Data analysis and description: Four of the participants made remarks that led to this category.

Discussion: It is important that the orals should focus on the depth of knowledge and not the number of cases that are shown. The moderators should ensure that there is standardisation of the level of the oral assessments between different examination venues and assessors. *"At some institutions you are more likely to fail the oral"* [CP5]. Interviewees requested that *"The system should be transparent"* [CF4]. It was suggested that all the assessors should present the same level of cases in the orals or, ideally, the same image pool to all the candidates. In the researcher's opinion, it would be very difficult to do the latter unless all the orals are done simultaneously, to prevent candidates from discussing the cases. A final comment from one of the interviewees was that it is better to be safe than to outperform the other candidates or to be close to failing the assessment. *"Your head should not stick out or be too low, be generic"* [CF3].

5.3.5.3 Theme 3: The assessment environment

The last theme to emerge pertains to **The assessment environment** in which the assessment should be conducted. The category that emerged focused on **Relaxing the candidates** (cf. Table 5.6).

Relaxing the candidates

Data analysis and description: Only one candidate voiced opinions that led to this category.

Discussion: The whole assessment process should run smoothly. All staff and assessors should be friendly and should constantly try to calm and relax the candidates. Unnecessary waiting periods should be prevented as this causes stress in the candidates.

A summative perspective on the fifth question: The fifth question in the semi-structured interviews with candidates within in one year post summative assessment created a final opportunity to all the participants to raise any issues or suggestions that had not been discussed. All perspectives in the summary were those of the interviewees unless specified as being those of the researcher. Suggestions arising from this question included that the oral part of the assessment should be structured according to subdisciplines to ensure complete coverage of the curriculum. The assessment should change to a continued assessment strategy throughout the training period on a national level. The examination body should consider renting an unbiased venue with reporting stations to present a certain number of cases to be reported on by all the candidates. The orals should focus on the depth of knowledge and not the number of cases that are shown. The moderators should ensure standardisation of the oral assessments between different examination venues and assessors. The whole assessment process should be transparent, the system should run smoothly, the staff and assessors should be friendly and calm and should try to relax the candidates. Unnecessary waiting periods should be prevented. In the researcher's opinion, although they were in the minority, a number of the individuals who had failed the summative assessment at the first attempt had strong opinions on the assessment process and the possibility of bias.

5.4 CONCLUSION

Chapter 5 provided an overview of the semi-structured interviews with candidates who completed the radiology summative assessment; these interviews were the third data collecting method employed in this study. The findings were reported and discussed.

In total, 10 semi-structured interviews were conducted to investigate the factors that play a role in the preparation for summative assessment in radiology. These factors included those playing a role in publishing a research article or writing a dissertation for admission to the exit examination currently run by the South African College of Radiologists. The factors also included those playing a role in the preparation for the exit examination itself, with recommendations for future examinations and investigation into the role of feedback mechanisms.

The responses to the first question that the interviewees were asked generated the majority of the findings that were reported in this chapter and identified a number of factors playing a role in the candidates' preparation for the summative assessment. A number of factors playing a role in the research project were also identified, including lessons that had been learned. The qualities of a competent radiologist were identified from the interviews, and compared with the opinions of the assessors and moderators of the radiology summative assessment, which were reported in Chapter 4. The questions furthermore identified the experiences of the candidates in the assessment process itself with reference to a number of components of the assessment as well as the role and relevance of feedback mechanisms. The relevance and feasibility of a national outcome-based curriculum were furthermore identified. Finally, the interviewees made suggestions that could be considered for future radiology summative assessment.

In the next chapter, Chapter 6, entitled **Summative assessment of postgraduate radiology to ensure quality in the profession**, the researcher will discuss recommendations summarising the principles and factors influencing the summative assessment. This will be done to ensure quality in assessment instruments, methods and tools, including guidelines for assessors, moderators and other role players that were identified from the data, to put forth a directive for summative assessment of student learning in postgraduate radiology. This will be done with the view to contribute to ensuring quality in the profession.

CHAPTER 6

SUMMATIVE ASSESSMENT OF POSTGRADUATE RADIOLOGY TO ENSURE QUALITY IN THE PROFESSION

6.1 INTRODUCTION

In Chapter 1 the researcher discussed the lack of a formally approved assessment directive and guidelines for assessors, moderators and students involved in summative assessment of student learning in postgraduate radiology. In this study the researcher identified guidelines for assessors, moderators and students involved in summative assessment in radiology by interviewing a number of assessors and moderators who are involved with the summative assessment, as well as candidates who completed the summative assessment, and reported on the findings.

It is important to present guidelines to assessors and moderators of the summative assessment, because it is unlikely that every summative assessment will be conducted by exactly the same set of assessors and moderators. Keep in mind that junior assessors are constantly joining the assessor body, thereby necessitating the need for guidelines to ensure standardisation of the assessment and guaranteeing a certain level of competency in the candidates who pass the assessment to ensure continued quality in the profession. Furthermore, guidelines are needed to ensure transparency in the summative assessment to guide a constantly changing group of candidates during their preparation for the assessment. Guidelines are needed to ensure that the environment in which the summative assessment is conducted is also standardised and the summative assessment is conducted in a fair and reliable manner.

Summative assessment aims, firstly, to prove competence of the candidate, so that the candidate can be allowed to work independently as a general radiologist; secondly, to identify the level of competence that has been achieved, and thirdly, to give feedback to the training departments that can improve the performance of candidates in the future (cf. Figure 2.1).

The researcher's opinions in this chapter originate from experiences gained during visits to and observations at several radiology training departments, experiencing a summative assessment in radiology first-hand, the theoretical perspectives on the topic (cf. Chapter 2)

and interviewing a number of assessors, moderators and candidates who were involved in the summative assessment (cf. Chapters 4 & 5). It is important to understand that the study is based on the principles of qualitative research and therefore all experiences are accepted as true (cf. Point 3.2). Qualitative research aims to provide a better understanding of the topic that is presented. These realities are all related to the summative assessment as observed by the researcher – not all findings will be exactly applicable to other scenarios. The researcher is satisfied that he is reporting credible findings that the reader should find transferable to his/her own realities, as a directive to ensuring quality in the profession.

In the first place, the researcher puts the summative assessment in radiology in context, to give the reader a better understanding of the summative assessment process in radiology, and then continues by conceptualising guidelines that were identified from the theoretical perspectives (cf. Chapter 2), the findings of the interviews (cf. Chapters 4 & 5) and his own perspectives on the summative assessment (cf. Point 6.2) aimed at assessors, moderators and other role players involved in the assessment. The researcher continues by presenting factors that play a role in the preparation of candidates for the summative assessment (cf. Point 6.3), criteria for presenting a candidate for the summative assessment (cf. Point 6.4), criteria to be considered when deciding that a candidate is ready (competent) for radiology practice (cf. Point 6.5), and a summary of recommendations to be considered in future radiology summative assessments (cf. Point 6.6).

6.2 CONTEXTUALISING AND CONCEPTUALISING PERSPECTIVES ON THE RADIOLOGY SUMMATIVE ASSESSMENT

Next, the researcher will contextualise the summative assessment with a view to enabling the reader to gain a better understanding of the radiology summative assessment process by following the process chronologically (cf. Figure 6.1). The purpose of following a chronological description of the summative assessment is to explain the assessment process to the reader who may not be familiar with the radiology summative assessment as it was observed by the researcher. The researcher will contextualise and conceptualise the summative assessment by integrating data that was gathered from the researcher's personal observations of the second part of the summative assessment, the theoretical perspectives for this study, the findings from the interviews and suggestions from the researcher's own perspectives throughout his research journey (cf. Points 6.2.1-6.2.6.5).

The researcher followed an inductive approach in this study, which involves observation of a phenomenon and conclusions being drawn from the observations (cf. Point 3.3). These observations were all made during personal experiences of the researcher, mostly involving interviewing the role players who are involved in summative assessment in postgraduate radiology. Following a constructivist paradigm, the purpose of an inductive research approach is to create theory that may be tested or used by others in future research (cf. Point 3.2).

Creating theory forms the basis of qualitative research, which induces the researcher to accept all responses and observations as the truth and to value each event or response as equally important (cf. Point 3.2). Ultimately, the researcher will not be able to enforce the outcome of the research as the only possible suggestion on how to conduct summative assessment, but will be able to present possible answers to the questions, with the aim of offering the academic radiology community guidelines and criteria that may be transferable to other contexts and that may contribute to future summative assessments in radiology to ensure quality in the profession (cf. Point 3.4.3).

The researcher's personal experiences involved the observation of a summative assessment in radiology during the second semester of 2014. The researcher had the privilege of being invited to the CR (CMSA), Part 2 oral and radiological cases summative assessment. He accepted and considered it a great honour to experience this life-changing event for many radiology registrars first-hand.

A diagrammatic representation of the main aspects of contextualising and conceptualising perspectives on the radiology summative assessment is presented in Figure 6.1. These aspects will be discussed.

Note: Comments originating from the theoretical perspectives are referenced as (cf. Point 2.x.y.z), findings originating from the interviews with assessors and moderators as (cf. Point 4.x.y.z) and findings from the interviews with candidates who completed the summative assessment as (cf. Point 5.x.y.z). The researcher's personal perspectives, opinions or comments do not have any references.

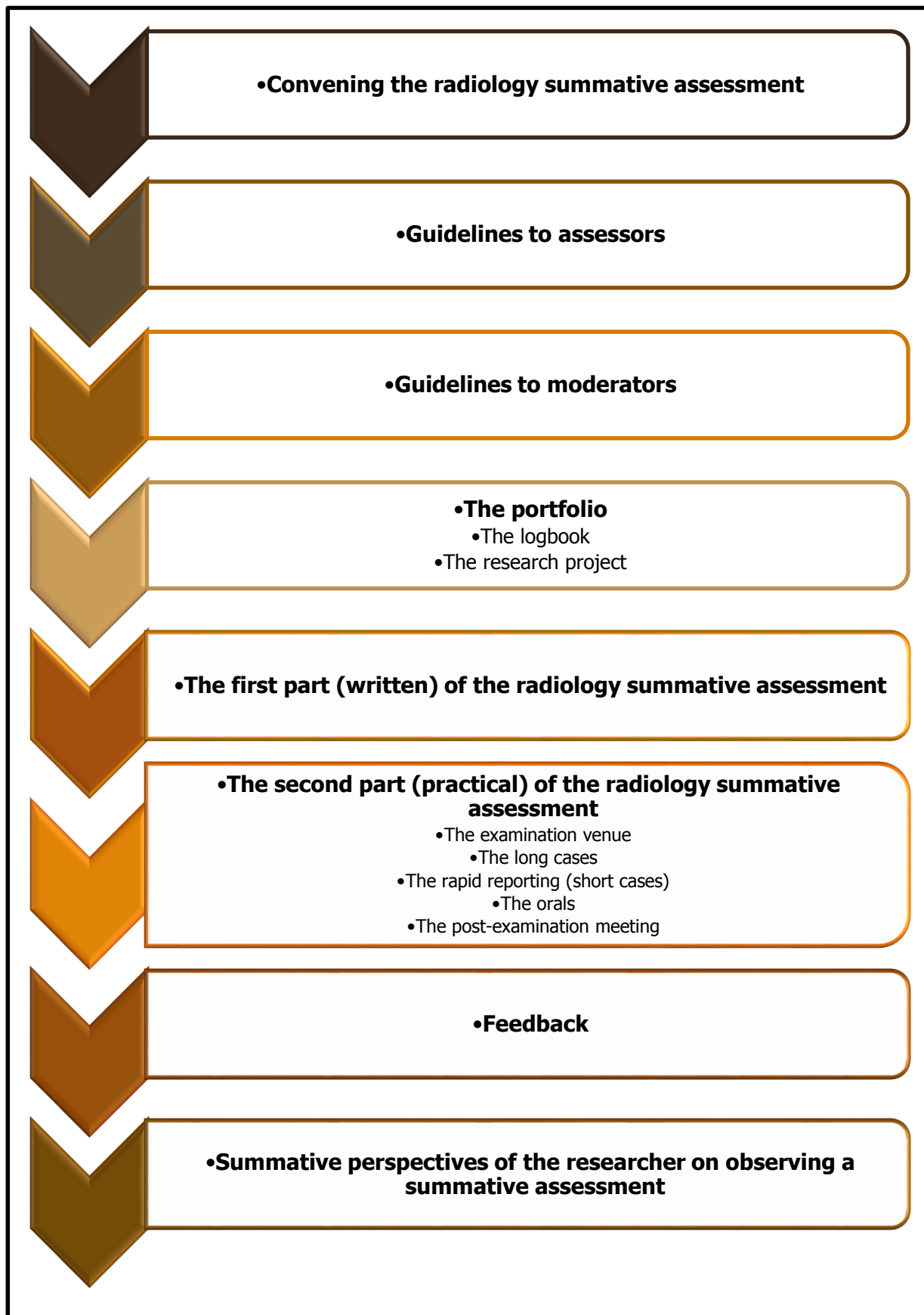


FIGURE 6.1: SUMMARY OF CONTEXTUALISING AND CONCEPTUALISING PERSPECTIVES ON THE RADIOLOGY SUMMATIVE ASSESSMENT
 [Compiled by the researcher: Hurter 2015]

6.2.1 Convening the radiology summative assessment

The convenor is the head of the academic department that is assigned by the examination body to host the summative assessment. The role of the convenor may be delegated to a consultant within the academic department if the head of the specific academic department is fulfilling another role in the assessment, e.g., acting as a moderator (cf. Figure 6.2). Written questions are presented by the assessors to the convenor in electronic format. Such submissions should be done timeously because it is a laborious process to set up and convene a summative assessment (cf. Point 4.3.5.1). Confidentiality of these questions is ensured by requiring different assessors to submit the questions to the convenor only.

The convenor selects the questions to be included in the written papers and forwards these questions to the moderators, who then decide whether these questions are fair, whether the marks are allocated correctly and whether the questions are pitched at the correct level of knowledge as expected of a general radiologist. The long cases and rapid reporting (short cases) are submitted to the convenor in a similar way, and s/he chooses the cases that will be used. The convenor presents all the selected cases, representing the different subdisciplines of radiology, to the moderators at a pre-examination meeting for moderation. If the moderators are of the opinion that any of the cases are not suitable, the convenor is required to present other cases at the pre-examination meeting. All the cases should be submitted together with a memorandum (cf. Point 2.5.3.3).

The convenor should submit an examination blueprint (cf. Table 2.13) together with each question paper to the moderators. Two questions per domain (subdiscipline) and three long cases per assessor are submitted, so that no assessor knows beforehand which questions are used in the written papers or which cases will be presented – this prevents bias and ensures confidentiality. A total of 12 domains are covered by eight assessors. This system provides the convenor with a bank of 24 questions and 24 long cases to choose from. From the very beginning different levels of access to information are built into the system to ensure that no person who is not appointed at a senior level in the assessment process has access to all the information. This mechanism serves as a form of security and contributes to the integrity of the assessment. Confidentiality should furthermore be ensured by using only mock cases for testing the computers and digital interface (cf. Point 4.3.5.1). All cases should be submitted in a digital format to the assessors, moderators and, during the assessment, to the candidates (cf. Point 4.3.3.5). All images, including

those that are presented in the oral part of the assessment, should be moderated (cf. Point 4.3.3.4).

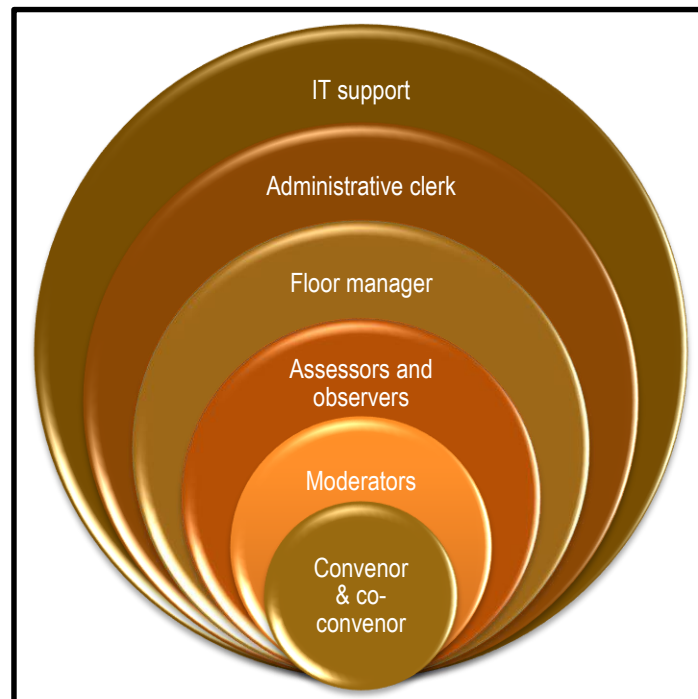


FIGURE 6.2: RELATIONSHIPS OF THE ROLE PLAYERS IN THE SUMMATIVE ASSESSMENT
[Compiled by the researcher: Hurter 2015]

Clear documentation should be made available by the examination body to the convenor, explaining how the assessment should be performed (cf. Point 2.5). In the researcher's opinion, such documentation should also include the procedures that need to be followed to manage any relevant documents (digital or hard copies, including using adequate antivirus software to prevent possible hacking of information), destruction of documents (e.g. using a shredder for hard copies or clearing the recycle bin if documents are deleted from a computer) and ensuring safe record-keeping, where applicable. Such a policy may be included when assessors are trained during a theoretical workshop, to clarify how a summative assessment should be convened. The help of another assessor may also be sought to provide such an individual with practical training to act as co-convenor and observer of the convening process (cf. Point 4.3.7.1). The directive documentation should be simple and economically as efficient as possible.

The hosting department should have enough support staff available (cf. Point 4.3.5.1 & Figure 6.2), who should have limited access to different levels of information. These staff members would include an administrative clerk who possesses typing skills, and, ideally, someone with background training in assessments who can also function as a floor manager (cf. Point 4.3.5.1) during the practical part of the assessment. Support staff is vital to

ensure proper and timely communication (cf. Point 4.3.5.1 & Figure 6.3) between the convenor, assessors and moderators, including other role players involved in the summative assessment, in planning follow-up consultations when needed, and secure management of relevant documentation, including photocopies, faxes, telephone calls and emails.

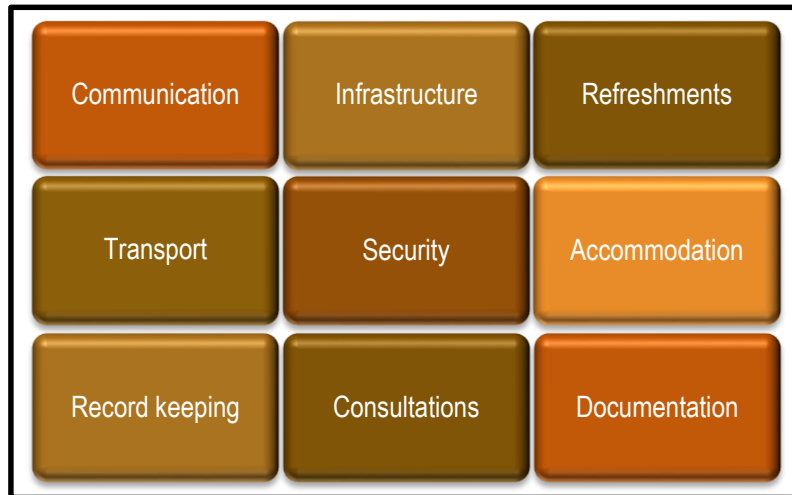


FIGURE 6.3: ROLES OF THE SUPPORT STAFF DURING THE SUMMATIVE ASSESSMENT
[Compiled by the researcher: Hurter 2015]

The support staff should be a small circle of reliable, trustworthy, friendly, calm, accessible individuals who are able to communicate effectively to prevent confusion throughout the convening and assessment process (cf. Point 4.3.5.1). Support staff is also needed for the safe and reliable transport of assessors and moderators during the second part of the summative assessment (cf. Point 4.3.5.1). Any unexpected but important short-notice communication prior to the assessment to assessors, moderators or candidates should be confirmed telephonically (cf. Point 5.3.2.1).

6.2.2 Guidelines for assessors

According to the theoretical perspectives (cf. Point 2.5.5) clear guidelines should be readily available for assessors on how to conduct the summative assessment as well as on training of assessors. At this point it is relevant to present the reader with guidelines that may be considered by assessors involved in the radiology summative assessment. A number of the guidelines may be similar to the theoretical perspectives (cf. Point 2.5.5) but several guidelines originated from the interview questions (cf. Point 4.3.3). The reader should note that, in the radiology summative assessment context, the guidelines would also apply to convenors of the assessment.

A diagrammatic representation demonstrating the main guidelines to assessors is presented in Figure 6.4.

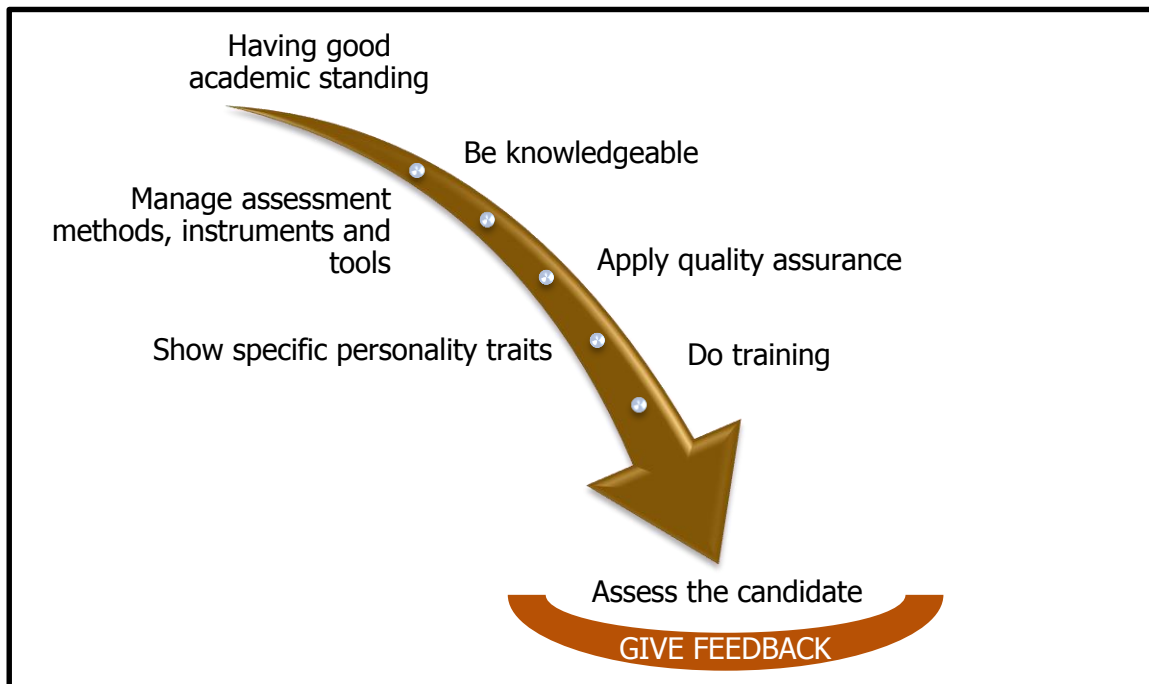


FIGURE 6.4: GUIDELINES FOR ASSESSORS
[Compiled by the researcher: Hurter 2015]

The academic training departments should be constantly involved with the selection, development and training of new assessors to ensure the viability of future assessments that are valid and reliable (cf. Points 4.3.4.1 & 4.3.7.2). All consultants working in the academic department should be encouraged to become involved in the summative assessment (cf. Point 4.3.7.2). This can be done by offering CPD points, especially ethical points (cf. Point 4.3.7.2), and by offering time that is ring fenced for the consultants to prepare for the summative assessment (cf. Point 4.3.5.2). Furthermore, consultants should be encouraged to attend workshops on assessment to acquire some form of certification that may serve as career-path progression (cf. Point 4.3.7.2). Every consultant should be given the opportunity to observe at least one summative assessment to culture a constant awareness within the department of the amount of energy, time and resources that goes into convening an assessment, as well as the needs and requirements for future staffing, assessors, moderators and infrastructure (cf. Point 4.3.7.2). The guidelines for assessors are suggested/summarised as follows:

The assessor should have good academic standing (cf. Points 2.5.5 & 4.3.3.3)

- by having an interest in education and assessment,
- by having at least five years' experience as a radiologist,

- by having up-to-date knowledge of the field of general radiology,
- by being actively involved in the training of radiology registrars,
- by submitting an academic portfolio to the examination body, and
- by showing an understanding of the requirements of the national healthcare system.

The assessor should be knowledgeable (cf. Points 2.5.4, 2.5.5 & 4.3.3.3)

- about the curriculum, and should not assess outdated knowledge,
- about the unit-level and module-level outcomes for radiology,
- about the exit-level outcomes for radiology,
- about the critical cross-field outcomes,
- about the assessment criteria that should be identified to ascertain the candidate's level of competence,
- about the guidelines, rules and regulations of the examination body,
- about the availability of technological resources at the various academic departments,
- about the principles of constructive alignment, and
- about the different types of assessment as well as the different methods, instruments and tools that are relevant for every type of assessment.

The assessor should manage assessment methods, instruments and tools (cf. Points 2.5.5 & 4.3.3.5)

- by deciding on the appropriate instruments and tools that are relevant for the summative assessment,
- by ensuring that the methods, instruments and tools are valid and reliable,
- by making use of several instruments to assess different levels of the cognitive domain,
- by submitting, together with each question, a memorandum or mark sheet that is clear and not confusing to the convenor,
- by clearly allocating the number of facts required for each mark on the memorandum and the question paper, and
- by being mindful of the time needed to answer the question.

The assessor should apply quality assurance (cf. Point 4.3.3),

- by being legally prepared, by making notes on the answer sheets if deemed necessary and submitting altered memorandums together with the marked answer sheets for record-keeping,
- by remarking the answer sheets of all the candidates if any amendments were made to the memorandum to include new facts that may have arisen,

- by collaborating with other assessors to present a spectrum of cases and questions to cover all subdisciplines in the curriculum,
- by checking the submitted questions for language and formatting errors,
- by seeing to it that no questions from previous assessments are repeated,
- by submitting standardised images in a digital format, completely anonymised and of good diagnostic quality, and
- by submitting a spectrum of cases, ranging from simple to difficult, and covering all subdisciplines in radiology at the level of a general radiologist.

The assessor should exhibit specific personality traits (cf. Point 4.3.3.6),

- by being consistent, fair and acting without bias,
- by having good interpersonal skills, being friendly, approachable and amenable,
- by being able to communicate with and learn from colleagues,
- by being able to work in a team and make joint decisions,
- by being able to manage criticism and not becoming aggressive,
- by being able to apply critical thinking and giving reasons for failing a candidate, and
- by being able to manage sensitive and confidential information.

The assessor should do training (cf. Point 4.3.7)

- by attending assessment training workshops to familiarise him/herself with the rhetoric and epistemology of assessments,
- by attending assessment training workshops to discuss the needs of future assessments, and
- by being willing to guide junior assessors.

The assessor should assess the candidate (cf. Point 4.3.3)

- by protecting the public,
- by assessing whether the candidate is safe and competent to work independently,
- by assessing the candidate's knowledge at the level of a general radiologist,
- by assessing the candidate's observation and interpretation skills,
- by assessing the candidate's logical thinking and structured approach to pathology,
- by being decisive and firm without intimidating the candidate,
- by remaining calm and helping the candidate to relax,
- by not leading the candidate towards the correct answer, and
- by listening to the candidate without becoming bored or fatigued.

The assessor should give feedback (cf. Point 4.3.3.4)

- by giving feedback to the assessor body on matters regarding the assessment process that may have arisen and that can be improved on,
- by giving feedback to the assessor body if any part of assessment was experienced as unfair,
- by giving feedback to the assessor body on candidates who have failed, and
- by giving feedback to the assessor body on identified gaps in knowledge that should be forwarded to the academic departments to address shortcomings in the curriculum.

6.2.3 Guidelines for moderators

The researcher will furthermore present guidelines that may be useful for moderators of the summative assessment in radiology.

A diagrammatic representation of the main guidelines for moderators is presented in Figure 6.5.

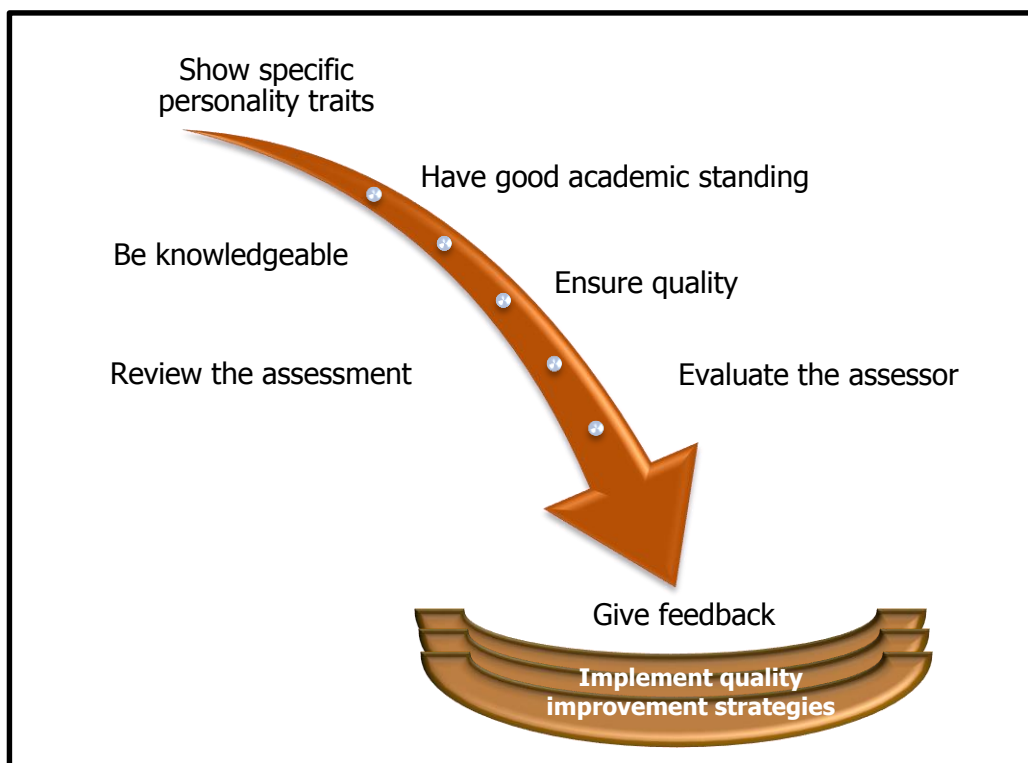


FIGURE 6.5: GUIDELINES FOR MODERATORS
[Compiled by the researcher: Hurter 2015]

The moderators are the sages of radiology and need to constantly and critically re-evaluate the radiology summative assessment through collaboration with the heads of the academic radiology departments, assessors, moderators, the examination body and other role players

in national health management, including radiologists in the private sector (cf. Point 4.3.4). Every generation is faced with new challenges and within the current era, which is characterised by an explosion of knowledge, it is vital that we train our candidates to acquire skills that will help them to propose solutions to challenges that do not yet exist. The purpose of moderation in general is to ensure that the summative assessment is of high quality (cf. Point 4.3.4.4), which will ensure that safe, competent radiologists are certified, and quality in the profession can be guaranteed.

The guidelines for moderators are summarised/suggested as follows:

The moderator should exhibit specific personality traits (cf. Point 4.3.4.1)

- by having good interpersonal skills without any personal bias,
- by being able to defuse a volatile situation,
- by being trustworthy and at a higher level of professional standing than the assessors,
- by being able to handle sensitive and confidential information,
- by having a strong personality as an independent thinker,
- by not being easily swayed by general opinion,
- by being amenable to reasonable argument from the assessor body,
- by creating a good working environment,
- by being careful not to influence the thoughts of others negatively,
- by being objective and unemotional,
- by upholding the rules of the examination body, and
- by being able to read the emotions of the candidates and the assessors.

The moderator should have good academic standing (cf. Point 4.3.4.3)

- by having many years of experience in summative assessment,
- by being an experienced radiologist, and
- by being involved with an academic radiology department.

The moderator should be knowledgeable (similar to the assessor) (cf. Point 4.3.4.3)

- about the curriculum,
- about the unit-level and module-level outcomes,
- about the exit-level outcomes for radiology,
- about the critical-cross-field outcomes,

- about the assessment criteria that should be identified to ascertain the candidate's level of competence,
- about the guidelines, rules and regulations of the examination body,
- about the availability of technological resources at the different academic departments,
- about the principles of constructive alignment, and
- about the different types of assessment as well as the different methods, instruments and tools that are relevant for every type of assessment.

The moderator should apply quality assurance (cf. Points 4.3.4.2 & 4.3.4.4)

- by overseeing the whole assessment process to ensure that the assessment is valid, reliable and fair,
- by ensuring that the assessment is transparent,
- by ensuring that the relevant assessment criteria have been identified and linked to the outcomes and are communicated to all the assessors,
- by ensuring that the curriculum is covered as widely as possible and at levels of the cognitive domain that are relevant to the summative assessment in radiology,
- by ensuring that the assessment is practicable and realistic,
- by ensuring that the assessment includes different methods, instruments and tools that are relevant for the assessment,
- by ensuring that the assessment is conducted in a suitable, comfortable non-threatening environment,
- by ensuring that the roles and responsibilities of the candidates, including any activities to be done by the candidates in the assessment, have been communicated clearly and timeously to every candidate,
- by ensuring that the candidates were informed about the nature, level, quality and quantity of evidence that should be provided to pass the assessment,
- by ensuring that enough time is available to collect the evidence from the candidates in every segment of the assessment,
- by ensuring that every candidate attempting the summative assessment has fulfilled the requirements of the diagnostic and formative assessments and has been signed off by the head of the training department,
- by ensuring that no candidate is intimidated, and
- by ensuring that assessors represent a good geographic variety.

The moderator should review the assessment (cf. Point 4.3.4.4)

- by reviewing the examination blueprint to ensure that it is up to date with current technological developments, covering the cognitive domain as well as the curriculum,
- by reviewing the questions
 - for validity, reliability and fairness at the level of a general radiologist,
 - for ambiguity as well as grammatical and formatting errors,
 - to ensure that there are no discriminatory questions, and
 - to ensure that no questions have been asked in previous papers,
- by reviewing the memorandums
 - to ensure they are structured properly and aligned with the questions,
 - to ensure they show the mark allocations clearly,
 - to enable any assessor to mark the question if the original assessor had to withdraw,
 - for adaptability to acknowledge extra correct facts that may arise from the candidate's answer,
 - to check the different weights of marks allocated to specific facts,
 - to improve the efficiency and consistency of marking,
 - to improve the reliability of the assessment, and
 - to check for means to prevent hedging by the candidates,
- by reviewing the rubrics for validity, reliability and fairness,
- by reviewing the images to be presented in the long cases, rapid reporting and orals for quality, standardisation and fairness at the level of a general radiologist, and
- by reviewing all the answer sheets if the candidates fail a specific question.

The moderator should evaluate the assessor (cf. Points 2.6 & 4.3.4.1)

- by confirming the academic standing of the assessor,
- by approving the assessors presented for the assessment by evaluating their academic standing and academic portfolios,
- by assessing the assessor for consistency in measuring and judging the evidence, and
- by assessing the assessor regarding adherence to the guidelines and rules of the examination body.

The moderator should give feedback (cf. Point 4.3.4.1)

- by identifying any possible improvements to the assessment,
- by giving feedback to the examination body, and

- by giving feedback to the assessors on ways to assess the different levels of knowledge and how to structure the assessment.

The moderator should implement quality improvement strategies (cf. Points 4.3.4.1 & 4.3.7.1)

- by being appointed for a long enough period of time to ensure continuity of assessors throughout the summative assessment,
- by guiding training of the assessors,
- by attending assessment training workshops, and
- by meeting with all role players (assessors, HODs, convenors, other moderators, the examination body) in the summative assessment to plan for new approaches to future assessments.

As mentioned previously, the moderator should ensure that the candidate has been signed off by the HOD for having successfully completed both the diagnostic and formative assessments and the research project prior to sitting the summative assessment (cf. Point 2.8).

6.2.4 The portfolio

Another prerequisite for entering the examination is online submission to the website of the CR (CMSA) of a portfolio that includes a logbook or proof of statistics on all radiological investigations and procedures that had been done during the training period (cf. Table 2.4). From the interviews the researcher concludes that the radiology training period is five years at the Universities of the Free State and Pretoria and four years at the Universities of Stellenbosch, Cape Town, Limpopo and Kwazulu-Natal. This training period is currently under revision by the radiology departments at the latter universities, which are considering extending the training period from four years to five years. Some of the departments may have already changed their training programme by publication of this thesis.

The Portfolio of Learning for the Fellowship of the College of Radiologists of South Africa (cf. Point 2.5.3.2) acts as a record to prove experience in a specific modality. The portfolio helps to identify any areas in training that did not receive enough attention and exposure, and which may be supplemented in future training. The portfolio is useful as an assessment instrument, to guide teaching staff during formative assessment and candidates, to determine whether they are up to date with the curriculum (cf. Point 2.5.3.2). It serves as

a minimum standard for admission to the summative assessment and is referred to by the CR (CMSA) as the *Critical Performance Portfolio* (cf. Table 2.4).

The current portfolio structure was implemented in January 2009 and all candidates have had to comply with the new format since January 2011 (cf. Point 2.4.2 & Figure 6.6).



FIGURE 6.6: COMPONENTS OF THE PORTFOLIO
[Compiled by the researcher: Hurter 2015]

The portfolio is assessed at the end of the training period, together with the examination results, and must be signed off by the head of the radiology department to certify that the course was completed satisfactorily (cf. Point 4.3.1.5).

As part of the portfolio, the candidate needs to record and verify all structured lectures and tutorials that s/he attended during the training programme, subcategorised according to every academic year of training (cf. Points 2.5.3.2 & 4.3.1.5). This is easiest to do by uploading the academic programme followed during the training period together with a verified summary of the attendance register kept at every academic meeting (cf. Point 4.3.1.5).

Part of the record may include all academic lectures and tutorials presented, either as part of coursework during the training programme, or publications, research or presentations at national or international forums (cf. Point 2.5.3.2). The candidate may include all medical journal reviews, done either personally or as part of a journal club (cf. Point 2.5.3.2 & CR (CMSA) 2014c:13).

Proof of practical work done is recorded in the form of hours for general reporting of black and white x-ray images (general radiography), but every case is recorded for all other modalities that include procedures and investigations done in urography, fluoroscopy, mammography, angiography, ultrasonography, CT, MRI and radio-nuclide imaging (cf. Point 2.5.3.2). Every modality is subdivided into body regions, e.g. brain, neck, thorax, musculoskeleton etc. (cf. Point 2.5.3.2 & CR (CMSA) 2014c:16-52).

Every candidate needs to show in the portfolio proof of biannual or quarterly global assessments, which grade the candidate as satisfactory or unsatisfactory with regard to applied general knowledge, clinical radiology skills and professional attributes (cf. Point 2.5.3.2). This form of assessment is known as competency-referenced assessment, where competency has been or has not been achieved leading to a "yes" or "no" answer, with no grading of the criteria identified (cf. Point 2.5.3.3). The mentioned global assessments should be submitted for every year of the training period (cf. Point 2.5.3.2 & CR (CMSA) 2014c:53-57).

The portfolio is completed by declarations from the candidate and the head of the department that the information contained in it is true and accurate as a record of the development and performance of the candidate throughout the training period.

This assessment method (presentation of an end product) can utilise the portfolio as a valuable assessment instrument if it is aligned with specific learning outcomes to be achieved throughout the teaching programme (cf. Point 2.5.3). Examples of such learning outcomes may include the attendance of conferences or the presentation of posters. It can also be used to assess self-reflection and critical thinking (cf. Point 2.4), for example, to allow the candidate to do an audit of his/her own radiology reports over a certain period of time by using the Bristol Radiology Report Assessment Tool (cf. Figure 2.6 & Wallis *et al.* 2013:1148).

Such reflection can be developed further to offer the candidate the opportunity to add a summarised self-reflection to the portfolio on his/her own experiences during the training programme, including reference to the different teaching and learning activities that were utilised. Although such reflection may serve as a type of feedback about the academic training department, the examination body should not use the protocols to compare different institutions, due to differences in resources at departments, which may lead to different teaching and learning activities to cover the curriculum (cf. Point 5.3.1.9).

Proof of the assessment of interpersonal skills, managerial skills and other CanMEDS roles (cf. Point 2.3.2) that cannot be assessed during the summative assessment can be presented by means of the portfolio. The attendance of short courses (e.g. BLS) or presentations on ethical topics may also be included (cf. Point 5.3.1.9). The possibilities are endless, as long as the assessment is aligned with the learning outcomes and the curriculum. A summary of such examples are included as Attributes in the learning outcomes of the CR (CMSA) (cf. Table 2.4). The portfolio should furthermore include all proof of the diagnostic and formative assessments mentioned before.

The problem that arises with the portfolio is that it is time consuming to compile (cf. Point 5.3.1.9). Furthermore, it is not standardised and not enforced by all the academic departments. By providing a standardised online portfolio format similar to the electronic portfolio utilised by the Royal College of Radiologists (cf. Point 2.5.3.1), the candidate can update the portfolio regularly and it can be accessed by the head of the department to monitor the candidate's progress throughout the teaching programme. If such an endeavour is too expensive, the researcher is of the opinion that every academic radiology department should provide a standardised format as decided on by the examination body in hard copy or, preferably, in electronic format to every candidate; this submission should be reviewed at least biannually by the consultant body.

If the portfolio is updated and reviewed regularly it can serve to motivate the candidate continuously during the training programme to remind him/her about the progress that has been made towards the summative assessment (cf. Point 2.5.3.2). Negative sentiment towards the portfolio may arise due to the improper integration of the portfolio into the curriculum. A clear introduction may be given at the very beginning of the training process, during an informal briefing session with the candidates, to explain the purpose of compiling a portfolio (cf. Table 2.10). Such a briefing may include clear guidelines on the format and the required content of the portfolio.

Physical paperwork should be kept to the bare minimum and avoided as far as possible. A portfolio may be valuable for implementing the principles of adult learning (cf. Point 2.8.1), with the learner becoming involved in identifying learning and teaching goals that will cultivate the notion of identifying self-directed learning opportunities and ultimately becoming a lifelong learner. The portfolio can be assessed by making use of a holistic rubric (cf. Table 2.10). Finally, after successful completion of the summative assessment,

the portfolio may serve as an extended CV of the candidate when s/he applies for a post or fellowship training (cf. Point 4.3.6.1).

6.2.4.1 *The logbook*

The CR (CMSA) recommends that the logbook is regularly updated during the training period, preferably in a hard-copy format with accurate and honest recording of all procedures that were performed or observed (and noted as such) in a legible handwriting (or typed) for the purpose of auditing, if required (CR (CMSA) 2014c:4). There is no minimum in any training area regarding the number of cases to be recorded. The supervising radiology consultant should sign this record off as correct every month. If no consultant is available at the time, the record should be signed off by the head of the rotation section, the clinical head, the programme director or the departmental head prior to submission to the CR (CSMA) (CR (CMSA) 2014c:4).

The logbook may also be kept in a digital format, because information on the patient and reporting doctor is much easier to retrieve with modern PACS and RIS. A printout of these records may then be produced regularly to be signed off by the consultant (cf. Point 4.3.1.5 & CR (CMSA) 2014c:4).

Although a logbook shows the number of cases that were reported on, it does not give the assessor any indication of the quality of the radiology reports or of the candidate's level of knowledge or his/her radiological approach to pathology (cf. Points 2.5.3.1 & 4.3.1.5). It is arguable whether the candidate masters the diagnostic investigation only after performing a certain number of cases, but this argument is probably only relevant for the acquirement of practical skills (cf. Point 2.5.3.1). One can also argue that everyone learns from observation and that a candidate could improve by reporting on more cases. This argument would be valid, but only if the candidate is supervised and guided to the correct and appropriate management of the case (cf. Point 4.3.1.2). Some procedures or interventions may carry more weight than others at the level of a general radiologist and, therefore, it has to be proven that the candidate has achieved at least a certain number of essential skills (cf. Point 4.3.1.5).

The logbook is time consuming to compile but the PACS and RIS systems (as mentioned above) contribute to more effective record-keeping. Preferably, logbooks should be updated monthly and checked biannually with the rest of the portfolio (cf. Point 4.3.1.5).

Provided that the logbook is checked regularly, it can serve as a control mechanism to ensure that the candidate is getting enough exposure to all imaging modalities, procedures and interventions, and to initiate remedial action when needed (cf. Point 2.5.3.1). It can function as motivation to the candidate to see how much work has been done during the training period in preparation for the summative assessment, and can also motivate him/her to perform at the same level as his/her colleagues (cf. Point 2.5.3.1).

From the findings it is clear that the number of cases required by the examination body is too lenient and should be reviewed, especially for the reporting of general radiography (cf. Point 5.3.1.9). The latter forms the basis of most radiology investigations and therefore competency is a necessity for the reporting of general radiography. It appears that monitoring of the number of general radiography reports may be inaccurate, because many are not reported in the training circuit due to a limited number of registrars and consultants. Many cases are therefore signed off as complete to prevent the work lists on the PACS systems becoming congested (cf. Point 4.3.1.5). Some cases may be more complex and have a greater number of images and body regions to report on.

Therefore, the CR (CMSA) requests reporting the number of hours spent on general radiography, rather than the number of cases (CR (CMSA) 2014c:16). The problem that may arise is that weaker candidates may spend more time on a fewer number of cases. The required number of hours should function as a motivation to report more general radiography but it may be counterproductive for weaker candidates. Considering the present workload that registrars are confronted with in the public sector, assessing logbooks may become irrelevant due to the large number of cases that are presented (cf. Point 4.3.1.5). One of the challenges that should be addressed is the number of cases that are reported unsupervised.

6.2.4.2 *The research project*

To ensure quality in the profession a candidate should start off by receiving quality training (cf. Point 4.3.1.5). Quality training in radiology consists of three aspects (cf. Figure 6.7):

- case-based learning (learning during service delivery while registrars rotate through different imaging modalities in the radiology department (cf. Point 2.8.1.12),
- theoretical knowledge training (a structured academic programme), and
- research training (the research project).

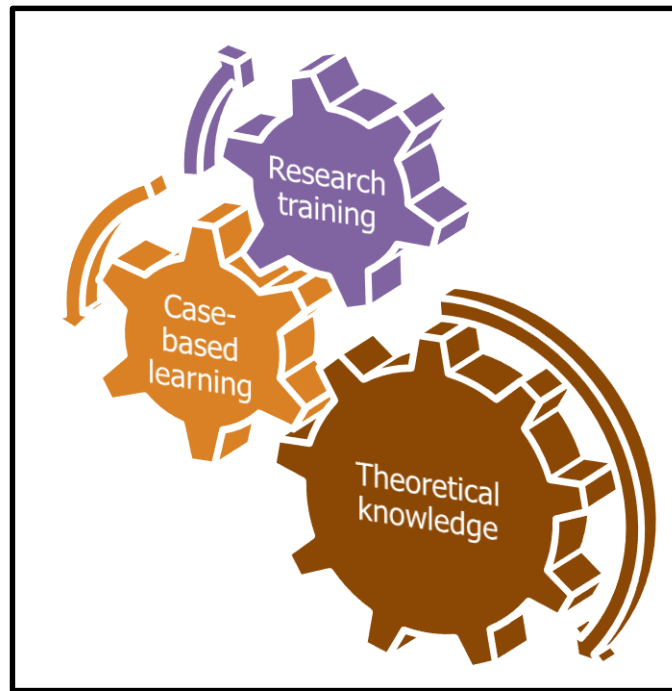


FIGURE 6.7: COMPONENTS OF QUALITY TRAINING IN RADIOLOGY
 [Compiled by the researcher: Hurter 2015]

Service delivery is required by the Department of Health, which also pays the candidate's salary. Theoretical knowledge training is the responsibility of the university and it will, ultimately, be assessed by the examination body, so that the candidate can acquire certification. This leaves research as the third leg of training.

Therefore, as part of the portfolio, the candidate needs to upload proof of an assessor-reviewed dissertation or a copy of a published research article that was completed during the training period (cf. Table 2.4). Within the context of radiology this forms part of the scholar role of the CanMEDS Framework under research literacy (cf. Table 2.1). The purpose of the research project as part of the training programme is for the candidate to learn how to conduct research and to offer an opportunity to become familiar with research terminology, methodology and principles (cf. Point 5.3.1.8).

Research furthermore teaches the candidate critical thinking skills (cf. Point 2.4), which are used to evaluate other research projects and publications critically. The ability to assess new information critically is very important for the competent radiologist to fulfil his/her roles as a lifelong learner, health advocate, manager, professional, expert, communicator and collaborator effectively and efficiently (cf. Point 4.3.2.1). The ability to apply critical thinking is constantly strengthened through various TLAs, including journal clubs and regular intra- and interdepartmental research committee meetings (cf. Point 2.8.1).

Another incentive for motivating research as part of the training programme is the fact that research tends to be neglected due to other responsibilities, mainly those related to service delivery. Research takes time and a lot of effort and therefore needs a lot of motivation to be conducted successfully and to be concluded (cf. Point 5.3.1.8). Consequently, it is highly unlikely that a junior researcher will be able to get his/her research published without the guidance of a more experienced researcher. If a researcher does not share what was discovered by the research project, what is the point of spending so much energy and time on something that remains hidden to the academic community? Therefore, good research should be published, for various reasons. It will contribute to the individual researcher's CV, but more importantly, it will contribute to the knowledge bank of humanity.

The most likely reason for making the research project part of the training programme (cf. Point 2.4.2) and a prerequisite for sitting the summative assessment in radiology was voiced by Professor Savvas Andronikou, who, at the time, was the President of the College of Radiologists of South Africa and Chairman of the South African Society of Paediatric Imaging:

The strategic step of making a research component a prerequisite for registering as a specialist with the HPCSA lays to rest the argument of qualifying for government subsidies. The universities can now provide the infrastructure to produce M.Med. research, which together with the single-exit examination, qualifies for an M.Med. degree, and therefore a subsidy. This is a greatly welcome mechanism of forcing research back into the training environment and into candidate registrars' minds (Andronikou 2012a:2).

The above-mentioned strategic step helps to address the issue of relatively few examples of research in diagnostic radiology published in South Africa – published work originates mainly from a selected, motivated group of diehard authors. Ultimately, the research project may pay off academically and monetarily. Concerns about low research output in diagnostic radiology are not limited to South Africa, but were raised in countries like Australia and New Zealand (Ming Wang *et al.* 2010:125). The crux is that research is important. Every modern medical practitioner is currently practising medicine based on past research, which proves what works and what does not work. The aim of conducting research would be to continue the "tradition" of practising evidence-based medicine in a scientific manner concluded from strategies that have been proven correct, while constantly investigating new frontiers to address new challenges that arise. The modern-day researcher has to either develop theory by hypothesising or prove theory by whatever

scientific means possible. In a nutshell, without research, it is unlikely that humanity will survive in the long run.

Therefore, research forms one of the exit-level outcomes of the CR (CMSA) (cf. Table 2.4). A candidate needs to complete a dissertation of 5 000 to 10 000 words or publish a paper in a peer-reviewed journal (cf. Table 2.4) and has to formally complete a structured research course as presented by the training university as part of the curriculum. The research project may be evaluated by a departmental evaluation committee (cf. Point 4.3.6.1), either formally or informally, to approve the viability and value of the research project and to assess the candidate's comprehension of research principles and his/her ability to commence research. It is the responsibility of the departmental research committee to monitor the progress and completion of the research project. All the processes of the research project may run concomitantly but it is important that all steps should be completed.

Assessment of the research project should be standardised nationally according to a specific pro forma (cf. Point 4.3.6.1). Such a pro forma should be presented to the deans of the faculties and possibly be evaluated by the relevant educational departments (cf. Point 4.3.6.1). Universities should not be obliged to adopt such a document, but collaboration should be encouraged nationally. It is important to identify similar outcomes to be achieved and to never forget that the main aim of the research project is to teach candidates how to do research (cf. Point 4.3.6.1). Hopefully, the academic department will be able to foster an interest in candidates to do future research.

Research adds extra work to an already overburdened system, and it may be challenging to identify research topics in radiology, considering availability of resources (cf. Point 4.3.6.1). Therefore, it is preferable to have enough competent staff that are familiar with conducting research and who are not responsible for doing the routine clinical and diagnostic work (cf. Point 4.3.6.1). Dedicated research staff will also be able to support supervisors who may lack experience in conducting research. The challenge would be to appoint and fund such posts. These appointments would be the responsibility of the university and not the Department of Health, because the research project is aimed at the M.Med. Dedicated research staff would be able to identify projects that are manageable and build on previous research topics (cf. Point 4.3.6.1).

The research project creates respect and appreciation for published work, is successful in encouraging critical thinking and stimulating better insight in the principles of research, it may even contribute by improving service delivery, but without the support of individuals dedicated to research and without dedicated research time, the candidate may experience the process as cumbersome, time consuming and not contributing to becoming a competent radiologist (cf. Point 5.3.1.8).

It was disappointing for the researcher to learn from this study that the majority of the interviewees experienced research as a burden; they were not interested in conducting research in the near future. To alleviate some of the challenges mentioned above, it is suggested that the research project is conducted during the first two years of the training programme (cf. Point 5.3.1.8).

In summary, research training in radiology entails (cf. Figure 6.8):

- identification of a research topic as early as possible in the training programme (may include the support of a dedicated research panel in the department or institution),
- supervision and guidance by an experienced researcher,
- completing a structured course on doing research as part of the radiology curriculum,
- evaluation and approval of the research project by a departmental evaluation committee, ethics committee and other relevant role players in the institution,
- presentation to and attendance of intra- and interdepartmental research committee meetings (cf. Point 2.8.1.8),
- critical review of research methods and published articles as part of a structured journal club,
- completing the research project (analysing and interpreting data),
- presenting the research as a dissertation for nationally standardised assessment or peer-reviewed publications, and
- presenting the research as a poster or presentation at a radiology conference.

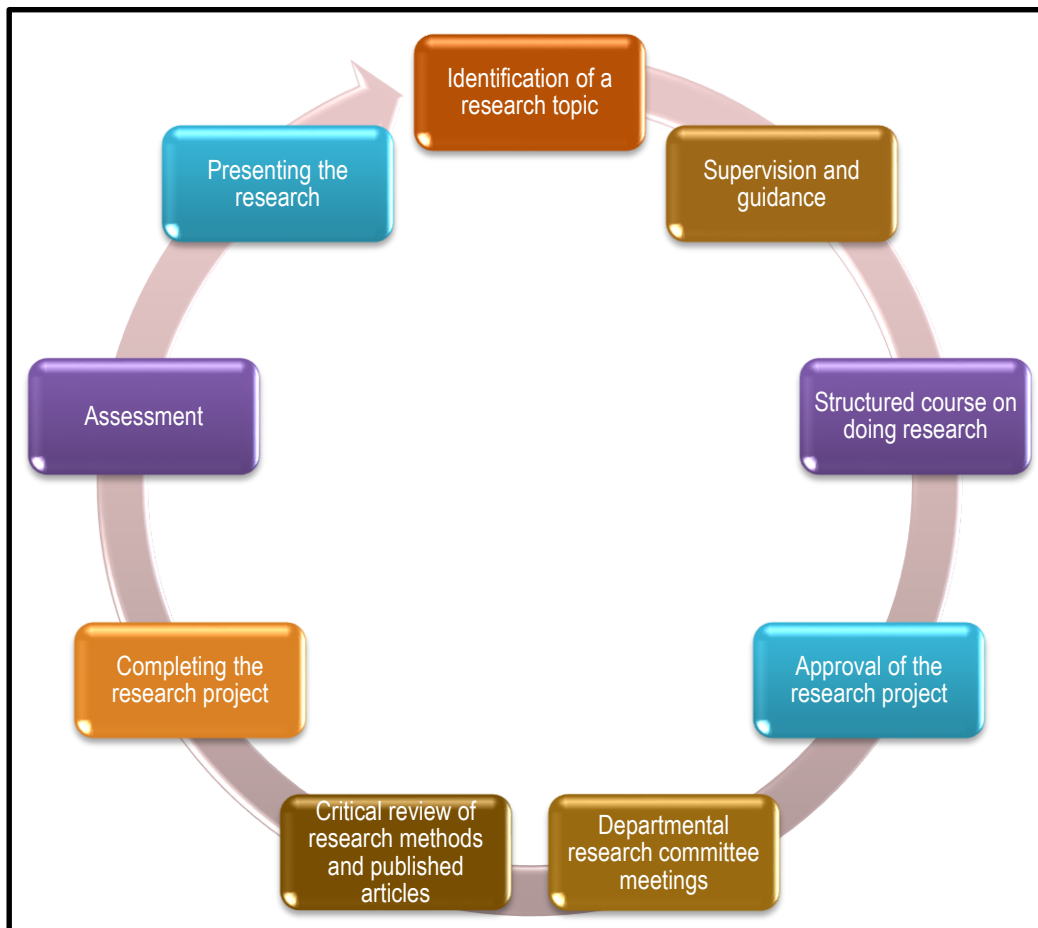


FIGURE 6.8: RESEARCH TRAINING IN RADIOLOGY
 [Compiled by the researcher: Hurter 2015]

6.2.5 The first part (written) of the radiology summative assessment

Once the candidate's portfolio is approved by the CR (CMSA), s/he is allowed to sit the CR (CMSA) Part 2 examination.

The researcher did not attend the written part of the CR CMSA Part 2 examination as this was written in the constituent academic radiological departments at pre-accredited sites (cf. Table 2.8), after which the written papers were photocopied and the original answer sheets sent (by courier) to the examiners to be marked. For this specific assessment, which is run biannually, 36 candidates were admitted to the written part. During the writing of this thesis the researcher discovered, on the updated 2015 version of the website of the CR (CMSA), that the written part of the summative assessment is currently only conducted in Johannesburg, Cape Town, Durban, Pretoria and Bloemfontein (CR (CMSA) 2015b:Online).

Access to the different examination sites (cf. Table 2.7), times and dates for the written papers are readily available on the website of the CR (CMSA), together with easy access to Google Maps for clear directions to the different examination venues.

The written part of the assessment should be conducted within a secure, quiet, well-lit, comfortable, non-threatening environment, with no interruptions once the question paper has been given to the candidates (cf. Point 4.3.5.1). The written examination constitutes three written papers of three hours each, spread over three consecutive days between 09:00 and 12:00 (CR (CMSA) 2015b:Online). According to the Blueprint for the FC Rad Diag (SA) Part I and Part II (CR (CMSA) 2014e:2), the papers cover all the subdisciplines in radiology (cf. Table 2.13). Mark allocations are weighted differently for the subdisciplines.

Candidates need to achieve an overall mark of 45% or more for the three written papers to proceed to the case reporting and oral components. If the candidate was unable to achieve this minimum mark, s/he failed the written component of the examination and the examination has to be repeated at the next available sitting (CR (CMSA) 2013:8). The CR (CMSA) does not specify a subminimum for any one of the written papers. The purpose of the written part of the summative assessment is to screen the candidates for an acceptable level of knowledge needed to pass the second part of the assessment (cf. Point 5.3.2.1). It is deemed that if a candidate fails the first part, s/he will also fail the second part.

In the researcher's opinion it is important that all answer sheets should be photocopied or digitised prior to being transported by a reliable courier service to the examination body for redistribution to the assessors.

Several instruments are utilised in the written part of the summative assessment. All written questions should have memorandums or marking sheets as assessment tools to ensure the reliability of the assessment (cf. Point 2.5). Essay-type questions are easy to set, and assess the highest levels of the cognitive domain, but have been abandoned because essay-type questions are difficult to assess, difficult to defend and reduces the reliability of the assessment (cf. Point 4.3.6.2). Shorter questions are favoured because they cover a wider spectrum of the curriculum, include more subspecialties in radiology and assess more levels of the cognitive domain by creating different clinical scenarios (cf. Point 4.3.6.2).

MCQs enable the assessors to cover a very wide spectrum of the curriculum, make it easier and very time conserving to mark and defend, but a paper comprising MCQs is very laborious to set (cf. Point 4.3.6.2). MCQs furthermore require a certain level of assessment training for setting and moderation. It is very important that MCQs are structured and formulated correctly to assess the correct level of knowledge without confusing the candidate (cf. Point 5.3.2.1). The single-best-answer type of MCQ, which allows only one correct option, is preferred by assessors, because it identifies the weaker candidates while enabling the safe candidate to pass (cf. Point 2.5.3.2). Extended-matching MCQs (cf. Point 2.5.3.2) identify stronger candidates, but this is not needed, because the purpose of the written questions is to sift the less knowledgeable instead of setting a standard for cum laude candidates.

Multiple true/false questions (MTFs) are more time efficient, allowing more questions, and therefore covering a wider spectrum of the curriculum in a certain segment of the assessment (cf. Point 2.5.3.2). It is widely used, especially in the Netherlands, but MTFs tend to assess only the lower levels of the cognitive domain. Therefore, MTFs tend to alter the manner in which the candidates study, to recall facts only, instead of developing an understanding of the information at hand. Another problem with MTFs is that it may help the candidate to select the correct answer from incorrect knowledge (cf. Point 2.5.3.2).

Time management is always an issue when it comes to written questions, and is usually perceived by some of the candidates as limited (cf. Point 5.3.2.1). It is therefore important that the time needed to answer a question should be correctly identified to ensure that the assessment is fair (cf. Point 2.6). By practising question papers from previous summative assessments that are available on the examination body's website, the candidate can create a structured approach to answering the questions in the time available (cf. Point 5.3.2.1). The quality of previous clinical and radiological experience prior to specialising in radiology may also contribute to the candidate's ability to answer the questions in the time provided (cf. Point 5.3.2.1).

6.2.6 The second part (practical) of the radiology summative assessment

Once a candidate has passed the written papers, s/he is invited to attend the practical part of the assessment, which includes imaging reporting sessions and two oral sessions (CR (CMSA) 2015a:6). Usually this part of the assessment is conducted approximately two

months after the written part of the examination. The imaging reporting sessions consist of long cases and rapid reporting (short cases).

6.2.6.1 *The examination venue*

The organisation and preparation of the examination venue for the practical part of the summative assessment is the responsibility of the convenor (cf. Point 4.3.5.1). It is important that the candidates are met by a friendly, helpful, informed individual who can guide them to the registration desk and answer any relevant questions pertaining to the examination venue (cf. Point 5.3.5.3). Directions within the building should be noticeable and clear, and should direct candidates directly to the examination room. A floor manager should constantly monitor the situation and address any issues and queries (cf. Point 4.3.5.1). Any delays should be avoided, as this only contributes to stress and anxiety. The examination venue should have sufficient waiting areas and ablution facilities. These prescriptions also apply to all satellite venues that may be hosting different segments of the assessment.

The researcher will now continue to provide a narrative of the personally observed summative assessment process during the practical part of the assessment during the second semester of 2014, intertwined with any relevant comments, which serve to contextualise the summative assessment in radiology.

Note: The *narrative* sections will be presented in *italics*. Comments originating from the theoretical perspectives will continue to be referenced as (cf. Point 2.x.y.z), findings originating from the interviews with assessors and moderators as (cf. Point 4.x.y.z) and findings from the interviews with candidates who completed the summative assessment as (cf. Point 5.x.y.z). The researcher's personal perspectives or comments do not have any reference and are not formatted in *italics*.

As a prerequisite for entering the examination room, all candidates have to show proof of their identity by producing the identification card that had been sent by the CR (CMSA) after successfully applying for the Part 2 examination (CR (CMSA) 2014d:email). Three candidates who arrived at the particular examination venue did not have their identification cards available. Because identification during the assessment process is only done by making use of examination numbers and no names or surnames, these three candidates

had to show their South African identification documents and had to be verified by the attending examiners from their constituent departments as the correct candidates.

This was actually a very accommodating gesture by the assessor body, as the candidates could have been refused access to the examination room, according to the final examination timetable communiqué that was emailed to all the candidates (CR (CMSA) 2014d:email). The researcher experienced the examination venue for the long cases and rapid reporting sections of the summative assessment as adequate for conducting the assessment.

The examination was set to commence at 09:30, after a 30-minute step-by-step orientation of the digital interface system to be used during the case reports and rapid reporting. The digital interface system was set up in one room (an IT laboratory) comprising several desktop computers. Every candidate was seated in his/her own semi-private cubicle with two computers. One computer would suffice for the examination cases, and a second exact replica computer was available as a backup if the first one should fail during the examination process.

The problem that was identified at the time of the observed assessment was that there were not enough functional backup computers to cover 11 of the 33 cubicles. Should the computer in any of these 11 cubicles have failed, the candidate would have had to move to another cubicle and share the cubicle with a fellow candidate while working on the backup computer of that cubicle. This would not be the ideal situation, because every candidate should have enough personal space to feel secure, relaxed and not intimidated by anyone. The researcher hoped that no computers would fail, but, as expected in this kind of scenario, one did fail and a candidate had to move to an adjacent cubicle for one case study. Fortunately, the problem was quickly resolved and the candidate was able to move back to her own cubicle for the next case study.

For practical reasons, such as more optimal infrastructure, privacy and in an attempt to avoid influencing service delivery, the oral sessions were conducted at another academic hospital in the same city. The ventilation of the rooms where the orals were conducted was inadequate. This led to very uncomfortable room temperatures during the orals. The researcher as observer experienced a power failure during the oral assessments, which led to all the candidates having to be given extra time for the duration of the failure and the time it took to reset the digital systems.

From the findings it can be concluded that the examination room should have a comfortable ambient temperature with professionally installed, adequate lighting and comfortable seating, the desktop should be at the correct height and there should be enough personal space for every candidate (cf. Point 4.3.5.1). The room should be in a quiet, secure, non-threatening environment, away from any service delivery areas (cf. Point 4.3.5.1).

All images should be presented digitally during the long cases and rapid reporting sections of the summative assessment and therefore it is important to have enough computers available for immediate transfer in the unlikely but possible event of computer failure during the assessment (cf. Point 4.3.5.1). All images should be uploaded to all the individual computers (including the backup computers) instead of uploading to a central server – this would obviate the possibility of a server crash (cf. Point 4.3.5.1). Every computer should be connected to a UPS to provide uninterrupted, unnoticed transfer to the backup emergency power supply of the examination room that is supposed to kick in immediately in the case of a power failure (cf. Point 4.3.5.1). The emergency electricity backup supply should cover all the computers and lighting. Proper IT support provided by a well-qualified technician who is able to function independently is essential to prepare the room and to address any IT problems effectively and speedily.

From the findings it is clear that the same requirements apply to the examination venue where the long cases and reporting sections are conducted, as for the oral assessments. These requirements include an adequate number of rooms for the orals in a quiet, secure, non-threatening environment with a comfortable ambient temperature, optimal lighting, comfortable seating and proper ventilation, sufficient refreshments, including fresh water, and sufficient ablution facilities (cf. Point 4.3.5.1). It would be ideal to have high resolution radiology reporting stations available for the oral sessions, as recommended by the findings, instead of normal computer screens, but this would increase the cost of setting the assessment substantially (cf. Point 5.3.2.1).

From the researcher's perspective a backup electricity supply for lighting and computers should be guaranteed, together with a UPS installed on every computer to make the transition to backup power seamless and imperceptible. Proper ventilation of the rooms for the oral sessions is very important – it is very uncomfortable for the examiners if there is insufficient fresh air in the room.

The findings from the interviews on infrastructure and resources needed for the summative assessment, including computers, IT support, backup electricity and staffing, suggests the development of a single dedicated examination venue for the summative assessment in radiology, instead of rotating the practical part of the assessment to different geographical venues (cf. Point 4.3.5.3). Such a venture would be expensive, but it would guarantee stability in IT support, decrease anxiety among candidates, provide improved security and remove any questions that may arise about possible geographic bias, unreliable resources and pressure on a limited staff establishment. Assessors and moderators would know what to expect and this would contribute to the reliability and standardisation of the assessment.

The rapid reporting and long cases may be decentralised, together with the written part of the assessment, but doing so will probably create the need for reliable remote IT support to ensure the correct continuous presentation of the rapid reporting cases, reliability of this segment of the assessment and adherence to the guidelines of the examination body (cf. Point 4.3.5.3). If proper presentation of the rapid reporting cases can be guaranteed at the accredited examination site, decentralisation of the rapid reporting cases would be acceptable. The suggestions in this thesis would also guarantee a valid, reliable and fair assessment. The orals may be conducted at a dedicated examination venue at one geographical site.

The researcher also suggests that the long cases are decentralised to the individual examination sites (cf. Point 3.5.3). In the researcher's opinion, such a consideration would require guaranteeing the confidentiality and security of the examination material and ensuring that the IT equipment is reliable and accredited in accordance with the guidelines and standards of the examination body. Decentralising the long cases would be sensible because it would eliminate the challenges that arise from conducting the long cases in a big enough computer laboratory that requires a number of backup computers and backup electricity.

It may be easier and more affordable for every examination site to develop an accredited examination room with the necessary infrastructure and requirements, as discussed above, to conduct the long cases and rapid reporting for the limited number of candidates originating from each site. The researcher once again emphasises the importance of ensuring the confidentiality and security of examination material, properly functioning equipment and backup support in decentralisation of the rapid reporting and the long cases.

If the above-mentioned prerequisites cannot be ensured it brings the researcher back to the consideration of a single, dedicated examination venue.

During the writing of this thesis the rapid reporting segment of the summative assessment was decentralised to the constituent examination sites, as noted by the researcher during a review of a 2015 update of the document Regulations for Admission to the Fellowship of the College of Radiologists of South Africa, FC Rad Diag (SA) (cf. Point 2.3.1 & CR (CMSA) 2015c:6).

The application fee for sitting the Part 2 CR (CMSA) summative assessment is currently R7 860 per candidate (CR (CMSA) 2015d:3) (the fee applies until March 2016). For an average of 35 candidates this adds up to only R275 100 per assessment, which is unlikely to cover all expenses associated with conducting the assessment. From the findings it was noted that the biggest user of candidates who pass the assessment is the private sector, and therefore the private sector should be requested to contribute to the assessment in radiology (cf. Point 5.3.5.1). Even if a contribution could be solicited from the private sector, it may still be difficult to offer a single dedicated venue. The findings of the study also suggest that two venues should be developed, one each in Johannesburg and Cape Town (cf. Point 5.3.2.1). A third suggestion was that the summative assessment should be outsourced to a private company which should guarantee all resources and suitable infrastructure. The viability of the latter suggestion is questionable.

Expenses that are currently covered by the examination body include the travel and accommodation of the assessors and moderators, and a specific amount for daily refreshments, answer sheets and books that are provided by the examination body to the convenor and probably the IT support staff (cf. Point 4.3.5.1).

From the findings it is clear that a business plan (cf. Point 4.3.5.3) will probably have to be drawn up and should address questions such as:

- the number of candidates who will be required to sit and pass the assessment in future to address the need for radiologists in South Africa,
- the equipment that will be needed for the summative assessment,
- the impact of the assessment on service delivery, and
- staffing needs for the summative assessment.

In the researcher's opinion it is clear that it is expensive to conduct the summative assessment. The only way to further develop and maintain a successful assessment that remains affordable to the candidates is to develop the assessment into a self-sustainable business that will probably have to explore other sources of funding in addition to the examination fees that are collected from the candidates.

6.2.6.2 The long cases

During the long case reporting section of the examination the candidate is presented with seven long cases that s/he needs to report on in writing, as if in a real-world scenario. Candidates start viewing the images simultaneously on cue from the IT manager; they may scroll through the images and presented modalities but every case should be completed within 15 minutes.

The long case studies cover various modalities in radiology (cf. Table 2.14) and it is expected that a candidate should discuss every modality within the relevant case as a separate entity, identify positive and relevant negative findings, make a diagnosis and discuss the relevant management approach. This means that if three different imaging modalities are presented in a long case it entails three written reports for that particular case. Cases are presented back to back with a 15-minute break between cases 4 and 5. The cases are answered in separate answer books because every case is submitted by a different examiner. The answer books are collected after every case and cross-checked by two observers as correctly numbered and identified according to the examination number of each candidate. After the first session, the answer books are already sent off to the assessors for marking.

Every case is marked by the examiner who provided the case for the examination. The examiner uses a mark sheet or memorandum, and after marking s/he must calculate the marks according to a rubric that was provided to the examiners beforehand. The rubric is categorised into the different radiology modalities and evaluates every organ system (whatever may be relevant to the specific case). Grading is done according to a scale for every modality: "Limited Radiological Signs – 40%, All relevant Radiological Signs – 50%, Good Differential Diagnosis – 60% and Appropriate Further Management – 75%" (cf. Table 6.1). Only the rubric is processed to capture the marks (cf. Table 6.1).

TABLE 6.1: RUBRIC USED FOR THE LONG CASES IN THE FC RAD DIAG (SA) PART 2, ORAL EXAMINATION SECOND SEMESTER 2014
(From the Examiner's File of the CR (CMSA) Examination Second Semester 2014)

CANDIDATE:																				
	BLACK & WHITE				ULTRASOUND				CT				MRI				SCREENING			
LONG CASES	Limited radiological signs 40%	All relevant radiological signs 50%	Good differential diagnosis 60%	Appropriate further management (classification/staging) 75%	Limited radiological signs 40%	All relevant radiological signs 50%	Good differential diagnosis 60%	Appropriate further management (classification/staging) 75%	Limited radiological signs 40%	All relevant radiological signs 50%	Good differential diagnosis 60%	Appropriate further management (classification/staging) 75%	Limited radiological signs 40%	All relevant radiological signs 50%	Good differential diagnosis 60%	Appropriate further management (classification/staging) 75%	Limited radiological signs 40%	All relevant radiological signs 50%	Good differential diagnosis 60%	Appropriate further management (classification/staging) 75%
TRAUMA																				
CHEST (respiratory)																				
HEART AND LARGE BLOOD VESSELS																				
GIT																				
HEPATO-BILIARY																				
ENDOCRINE																				
URO-GENITAL																				
MSK																				
FEMALE IMAGING																				
CNS																				
HEAD AND NECK																				
ANGIOGRAPHY / INTERVENTION																				
PAEDIATRIC																				
FINAL MARK																				
EXAMINER'S SIGNATURE																				

All marks are captured on a spreadsheet that is prepared and continuously updated for the moderation meeting at the end of every day.

In the researcher's opinion the "real world scenario" attempted in this segment of the assessment is not truly a simulation of what happens in day-to-day practice, because most candidates are used to reporting digitally via a voice recorder or voice recognition software that do not require any reports to be written by hand. Furthermore, in real life a candidate is unlikely to be confronted with several imaging modalities at once and be required to produce a signed off report on a patient within 15 minutes. Therefore, the long cases remain an artificial situation and it should be taken in consideration that more time is needed when a structured report has to be written by hand (cf. Point 5.3.2.1). The allowed number of images should not be exceeded, especially if presenting CTs and/or MRIs, as this would render the assessment unfair and it would impair the validity and reliability of the assessment. The purpose of the long cases do include assessment of time management (cf. Point 4.3.5.1), but the long cases should focus more on observational skills, a structured approach to the imaging pathology and communication skills in order to identify a safe radiologist (cf. Point 4.3.6.2), instead of putting the candidate under too much pressure (cf. Point 2.5) to scan through a large number of images.

No copies can be made due to time constraints and the volume of answer sheets. Therefore, in the researcher's opinion, the answer books should be secured and transported in a secure container.

Assessment in postgraduate radiology is criterion-referenced assessment and not norm referenced (cf. Point 2.5.3.3) because the assessor body needs to assess the candidate against specified criteria to ultimately certify a safe radiologist. Norm-referenced assessment cannot be utilised as this would make standardisation of the assessment difficult, leading to different standards of competence from one assessment to the next.

The assessment tool is the final means of evaluating the candidate's performance on a specific segment of the summative assessment. For the assessment tool to be valid it is important that it is aligned with the assessment instrument (e.g. a rubric cannot be used to mark MCQs or short questions and a memorandum will make assessing an oral or a portfolio challenging) (cf. Point 2.5). The researcher observed that the aim of the rubric (cf. Table 6.1) as used in the long cases was to standardise the assessment of the cases that had been submitted by seven different assessors.

The researcher requests the reader to consider the following arguments:

- 1) Every assessor has a memorandum for every long case because every long case is submitted by a different assessor. Transferring this case-specific "model answer" to a generic rubric may be cumbersome. Having two **assessment tools** for one question makes the one tool redundant and therefore a single tool should be selected and submitted with the answer sheet to the moderators. Standardising the tool for the long cases makes sense because it contributes to the reliability of the summative assessment.
- 2) The rubric can either be **holistic** or **analytical**, but not both.
- 3) It is important that the **criteria** that are used for identifying competence on the rubric should be clear and not confusing to the assessor. The criteria should be aligned with the learning outcomes (cf. Point 2.5). The outcomes should employ measurable terms (e.g. "state" or "list" the findings, differential diagnosis, management options) instead of unmeasurable terms like "limited", "all", "good" or "appropriate" (cf. Point 2.4).

An example of a learning outcome would be:

The candidate should be able to describe the positive and relevant negative findings of a radio density on a chest radiograph such that a relevant differential diagnostic list can be presented.

The criteria in an analytic-type rubric may include:

1. Number of correct positive findings observed and listed
2. Number of correct relevant negative findings
3. Number of correct relevant differential diagnoses

The criteria should be rated to identify the standard (the different levels) that the candidate can achieve and is shown by a mark (cf. Point 2.5). The marks for the different criteria are totalled to calculate a percentage to either pass or fail the candidate on the case. All cases will be totalled to assess the long cases and will then be added to the summarised mark spreadsheet.

Within the context of the observed long cases, organ systems cannot serve as criteria because organ systems do not match an outcome, and in the context as demonstrated by the researcher, refers to a sub-discipline of radiology. A rubric can rather include a line for comments to identify the relevant organ system or subdiscipline that has been assessed.

- 4) One should be careful not to combine **outcomes** on a rubric within one criterion because this would lead to confusing criteria e.g. radiological signs, differential diagnosis and management.

To clarify (cf. Table 6.1):

- Level 1 Limited radiological signs 40%;
- Level 2 All relevant radiological signs 50%;
- Level 3 Good differential diagnosis 60%; and
- Level 4 Appropriate further management (classification/staging) 75%.

Questions that arise may include: What level should be chosen if the candidate identified limited radiological signs but suggested the appropriate further management or an irrelevant differential diagnosis with a good classification or staging of the pathology? Would the candidate then be safe or just lucky by guessing the correct diagnosis?

- 5) **Different imaging modalities** may be covered on the same rubric but the criteria should then be applicable to all the modalities that are presented to the candidate during the specific case and the mark achieved for every modality needs to be displayed next to it. This generates new questions: Is the candidate safe if s/he passes the CT and MRI images but fail the black and whites (general radiography)? Does the candidate need to give a differential list and suggest appropriate management on every modality? If the candidate only needs to suggest a differential list and appropriate management after assessing all the presented modalities, then the differential list and management should not be included as a criterion or a standard on every modality.

From the above-mentioned five arguments the researcher concludes that a rubric is not the ideal assessment tool for long cases because the rubric becomes too complicated and should be abandoned for this segment of the summative assessment. Alternatively, the long cases could be restructured to accommodate a rubric as assessment tool. It would be better to keep the memorandum or mark sheet as the assessment tool for every single long case.

The researcher was interested to find that, in comparison, the Royal College of Radiologists (RCR 2015c:2) presents six cases in their reporting session (long cases) that are also assessed according to a rubric, but for a total of 8 marks each (cf. Table 2.7). The RCR's rubric applies to each specific case and does not differentiate between the different imaging modalities or the different subdisciplines that may be presented. This simplifies the rubric significantly, but the criteria include "observations", "diagnosis" and "additional information", and standards such as "significant", "some", "most", "perfect", which could be contested and that, once again, suggests a pre-existing memorandum leading to the same arguments mentioned before.

In the researcher's opinion every long case should be assessed solely by marking according to a memorandum that was set by the assessor who presented the case. If a long case counts 12.5 marks (cf. Table 2.16), the researcher argues that one fact could count half a mark, which means 25 facts are required for a 12.5 mark long case. If this argument is valid, the researcher suggests that the assessor then presents a long case that calculates to 25 facts covering all the different imaging modalities that are presented in the specific case, including all the positive imaging findings, the differential diagnoses, final diagnosis and the suggested management of the patient. The examination body should provide the preferred structure (pro forma) of the memorandum as guidance before the assessor submits the long case to the convenor.

The candidates who are preparing for the summative assessment should receive feedback on the preferred examination technique for the long cases. If more information is required by the assessor, e.g. the complications of the suggested management or intervention (short or long term), or any classification or staging of the imaging pathology, it should be communicated to the assessors, consultants and candidates at the training departments – this will ensure transparency in the assessment and fair assessment of the long cases. The number of images that are presented should furthermore be aligned with the time provided to complete the case, as well as the number of facts to be written down by the candidate.

From the above-mentioned suggestions the researcher deduces that if a memorandum, according to a prescribed pro forma, serves as the only assessment tool for the long cases, a distinction-level candidate should be able to achieve more than 75% for a specific long case, which would be fairer than the maximum of 75% that is presented on the rubric used for the long cases (cf. Table. 6.1) in the assessment observed by the researcher.

6.2.6.3 The rapid reporting (short cases)

The seventh case study is followed by a rapid reporting session, in which 30 cases are presented with the aid of a PowerPoint presentation. Every short case, comprising one image, is presented for 45 seconds and the slide advances automatically. The candidate is expected to write down only the correct diagnoses. The end of the second case study session signals the end of the radiology case studies for the examination.

According to the Blueprint for the FC Rad Diag (SA) Part 2, Case Studies, every long case study carries a weight of one eighth of the total mark of the case study section of the summative assessment (cf. Table 2.15). The rapid reporting cases as a whole represents one eighth of the total for this section.

The researcher noted during the discussions at the moderation meeting at the end of the examinations that the rapid reporting session was a valid indicator of success in the summative assessment, however, it is interesting that the rapid reporting only calculates to 1/8th of 25% (that is, 3%) of the final mark. The Regulations for admission to the Fellowship of the College of Radiologists of South Africa (CR (CMSA) 2013:8) state that a candidate is required to achieve a 50% subminimum for the rapid reporting subcomponent of the reporting section to pass the examination.

During the writing of this thesis the researcher found an undated notice of the CR (CMSA) that was submitted after completion of the observed second semester summative assessment in 2014, which forms part of the researcher's narrative. This notice states: "The Rapid Reporting will have 60 images to be reported in 60 minutes" (CR (CMSA) 2015c:1). Furthermore, the researcher found that the updated format of the Regulations for admission to the Fellowship of the College of Radiologists of South Africa, FC Rad Diag(SA) (cf. Point 2.3.1 & CR (CMSA) 2015a:6) states that the rapid reporting subminimum has changed from a 50% subminimum required to pass in the 2014 second semester summative assessment, to a 70% subminimum to pass in the 2015 first semester summative assessment.

The compilation of cases that are presented to the candidates during the rapid reporting includes straightforward, day-to-day radiological cases and a number of normal cases (cf. Point 4.3.6.2). It was deduced from the findings that the main aim of the rapid reporting is to assess the candidate's observation skills and baseline radiological knowledge. It is

argued by the examination body that an inability to observe the radiological signs and relevant positive findings on the presented images renders the candidate incapable of presenting the single most likely correct diagnosis and causes him/her to fail this section of the assessment – the candidate is thus deemed to be unsafe and is therefore not a competent radiologist (cf. Point 4.3.6.2). For the sake of protecting the public, the candidate has to fail the summative assessment.

If the argument holds true, one would expect the candidate to perform poorly in the other segments of the assessment too, and a candidate will not fail due to anxiety or a technical problem that s/he may have experienced in this segment of the assessment. The researcher can accept the argument presented, though from a more positive perspective. If the candidate experiences difficulties in one or more of the other segments of the assessment and ends up as a borderline fail, a good mark in the rapid reporting (suggesting a safer candidate) is likely to help him/her to pass during closer perusal at the post-examination meeting. Every failed candidate is discussed in depth at the meeting and all the answer sheets of the second part of the assessment may be reviewed.

As mentioned previously (cf. Point 6.2.6.1), the rapid reporting may also be decentralised to the individual examination sites, and conducted together with the written part of the summative assessment. It may be argued that if a candidate is unable to pass the rapid reporting that is meant to identify a safe radiologist, s/he will probably fail the second part of the summative assessment. By conducting the rapid reporting during the first part of the summative assessment, which serves as a sifting mechanism prior to the second part of the assessment, a number of candidates who would have failed the rapid reporting anyway, will be spared the expense of travelling to the examination venue for the second part of the assessment. Furthermore, it will save the examination body the time and expense involved in conducting the extended second part of the assessment for a greater number of candidates, of whom a number will fail in the end.

The above-mentioned arguments oblige the researcher to ask why, if the rapid reporting functions as a "gate keeper", are candidates required to sit for the written papers at all? The rapid reporting could be presented at the very beginning of the assessment, forwarded to the convenor and marked within a relatively short time. Failing candidates can be notified immediately and do not need to sit for the written part of the assessment.

6.2.6.4 The orals

After the radiological cases, there is a break before the first oral examination session commences in the afternoon; these sessions are scheduled from 13:30 to 15:45. All candidates for a specific session must arrive at the venue at least one hour prior to the session.

Five session blocks are conducted over three consecutive days, starting on a Monday afternoon. Each session is divided in four oral examination sessions running simultaneously in four different rooms to accommodate all the candidates (cf. Table 2.12). Two examiners and one moderator are allocated to each room. All rooms are equipped with a traditional viewing box for hard-copy black-and-white films, a separate high-illumination desk lamp, as well as a large high-resolution computer monitor for viewing cases and, last but not least, enough fresh water for a dry throat.

Up to the point that the candidate enters the room for the oral assessment, the assessors do not know which candidate s/he will get for the oral, nor do they know the level of knowledge of any candidate, as no marks (written papers and radiology cases) have been discussed or made available. All candidates are identified by their examination numbers and are therefore interviewed in numerical order. The only rule that applies is that no candidate may be interviewed by an examiner from the same radiology department as the candidate. The convenor needs to organise the candidates and appoint the assessors to the rooms in such a way that this rule is not broken.

Assessors rotate between the rooms after every session block. Observers rotate between the four rooms between session blocks. The moderators rotate between oral sessions as per personal preference. Every candidate is interviewed, in total, by four examiners during two oral examination sessions that are conducted in two different rooms. Every examiner has the opportunity to interview a candidate for 15 minutes. During the 15 minutes different cases are presented to the candidate, usually starting with a straightforward, easy case to relax the candidate, and then gradually building to more challenging cases. A discussion may follow on every case to probe the candidate for deeper knowledge and insight. Several images may be presented per case, covering different imaging modalities, organ systems and subdisciplines by usually starting with a general radiograph and progressing to more specialised imaging, such as fluoroscopy, and ending with a CT or MRI, if relevant.

In the ideal situation, with a good, competent candidate, all of the candidate's comments on a specific case should be given within one minute. If the candidate's response was incomplete, further probing by the examiner usually follows. Ideally, every candidate should reach at least 7 cases per examiner within the projected 15 minutes, with a total average of 12 to 14 cases observed by the researcher per oral session between the two examiners. During the researcher's personal observations he noted that the fewest cases presented in a session was eight cases in 30 minutes, and the maximum was 19 in 30 minutes. Although one may deduce that fewer cases suggests a weaker candidate, this is not necessarily the case, as the final marks for the room average do not indicate this. (The researcher recently learned that the cases to be shown at the orals will be standardised, and that no probing by the assessors on any case will be permitted.)

The mark awarded for the specific oral session is calculated according to a rubric (cf. Table 6.2) provided to the examiners beforehand. The rubric is categorised into all the different radiological modalities (CT, MRI, ultrasound, etc.). Not all modalities are necessarily covered by the cases presented to the candidate and, therefore, the candidate is only graded on those that were presented and marked on the rubric. Grading is done according to a scale for every modality: "Lacks Basic Knowledge – 40%, Basic Knowledge – 50%, Advanced Knowledge – 60% and Exceptional Knowledge – 75%". The correct diagnosis is written into the space next to every case number on the rubric beforehand. The problem is that every case is assessed on multiple levels. If it should happen that the candidate needs to look at more than one imaging modality, it requires that the assessor actually needs to give a mark for every modality and then calculate this to a mark on every case. The marks then need to be added and averaged to a final mark and then the marks of the two assessors need to be averaged to a final room average to count as one oral session.

All the calculations required make the whole process very cumbersome and difficult to complete in the time allocated before the next candidate enters the room. To prevent bias both examiners assessing the candidate per oral session are supposed to grade the candidate independently on every case that is presented. Because the examiner is busy presenting cases and listening intently to the candidate's responses, s/he cannot grade the candidate during the conversation. This leads to grading at the end of the oral by the presenting examiner on his/her own cases, leading to reliance on the other examiner and the observer, who is sometimes asked to assist with the grading once the oral has been completed. The primary assessor, therefore, is often in a position where s/he does not make a truly independent judgment.

TABLE 6.2: RUBRIC USED FOR THE ORAL CASES IN THE FC RAD DIAG (SA) PART 2, ORAL EXAMINATION SECOND SEMESTER 2014
(From the Examiner's File of the CR (CMSA) Examination Second Semester 2014)

CANDIDATE:																				
	BLACK & WHITE				ULTRASOUND				CT				MRI				SCREENING			
ORAL CASE	Lacks Basic Knowledge 40%	Basic Knowledge 50%	Advanced Knowledge 60%	Exceptional Knowledge 75%	Lacks Basic Knowledge 40%	Basic Knowledge 50%	Advanced Knowledge 60%	Exceptional Knowledge 75%	Lacks Basic Knowledge 40%	Basic Knowledge 50%	Advanced Knowledge 60%	Exceptional Knowledge 75%	Lacks Basic Knowledge 40%	Basic Knowledge 50%	Advanced Knowledge 60%	Exceptional Knowledge 75%	Lacks Basic Knowledge 40%	Basic Knowledge 50%	Advanced Knowledge 60%	Exceptional Knowledge 75%
1																				
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				
13																				
FINAL MARK																				
EXAMINER'S SIGNATURE																				

The observers are also required to grade the candidate, although their marks are not recorded. After the allocated 30 minutes (once the candidate has left the room) a 5-minute discussion follows to calculate, with the aid of the rubrics, the room average mark. The input of the observer may be asked and the moderator may also comment, although the final mark is decided jointly by the two examiners only. The room average and individual examiner marks are recorded on the examination spreadsheet for review later, during the moderation meeting. Time for discussing borderline candidates is very limited, taking into account that only 5 minutes are available for moderation (if needed), deciding on a room average and writing and collecting the rubrics. Furthermore, each assessor has to reorganise before the next candidate enters the room.

Because the rubrics were modality specific and not case specific, this caused delays in organising the line of thinking during grading, as every examiner tries to recall the candidate's performance according to the presented case and not necessarily the type of images that were shown during the discussion. Furthermore, the majority of images that were shown were traditional general black-and-white radiographs, which only leads to the presentation of more specialised imaging if the candidate offers a proper diagnosis or differential diagnosis on the first radiograph presented for that particular case.

Being constrained by a tight time schedule (which is understandable), the researcher as an observer experienced the oral sessions as inevitably developing into another case study session, with the only difference between the case study sessions and the oral sessions being that the latter is presented by an individual instead of a computer program and the grading is done differently, with no specific number of cases being presented. There was very little time for an in-depth discussion to assess the candidates' deeper knowledge and critical thinking on most of the presented radiological cases.

Some assessors may be of the opinion that they would like to observe the candidate's performance first-hand in an oral (cf. Point 4.3.6.2). The purpose of the oral assessment, as found in this research, is to assess the candidate's observational, communication, professional and interpersonal skills, and to determine if the candidate exhibits logical clinical and radiological reasoning processes characterised by a clear, structured approach to the presented imaging, leading to the candidate, finally, listing relevant differential diagnoses together with a relevant management approach (cf. Point 4.3.6.2). The oral is the final assessment instrument to assess if the candidate is safe. The oral also gives the assessor the opportunity to probe further for in-depth knowledge of radiology and, most

importantly, to assess if the candidate has any clinical insight in the scenario that is presented. The oral communication skills should be comprehensible to patients, clinical colleagues and academic staff. Therefore, the oral should assess the candidate's ability to express the imaging findings in appropriate radiological language (cf. Point 4.3.1.4).

Preferably, only digital images should be submitted (cf. Point 4.3.3.5), making a viewing box for hard copies redundant.

During his review of the literature the researcher came across authors (cf. Point 2.5.3.2) who pointed out some of the limitations of the oral as an assessment instrument. Bias, especially related to race and gender, is probably the most important limitation. The above-mentioned mechanism of anonymity that is used in the radiology summative assessment is supposed to counteract any bias that may arise, whether it is detrimental or to the benefit of the candidate. Regardless of the interventions discussed, from the data it appears that some candidates who failed at least once are still of the opinion that bias may exist due to personality clashes and the possibility that assessors do not adhere strictly to the rules and guidelines of the examination body (cf. Point 5.3.2.1). Geographic bias was also mentioned – in favour of candidates from the training department where the assessment is hosted. According to the assessors and moderators involved in this study, none of these perceptions can be validated, because of the mechanisms in place to ensure the anonymity of candidates, nor did any assessor report personally experiencing any bias towards any candidates (cf. Point 4.3.5.4).

When it comes to a candidate's response to a presented case, the researcher is of the opinion that a typical first response on seeing a case should include identification of the radiology investigation, immediate mention of positive findings on the presented image and, if relevant, any negative findings, a diagnosis, a differential diagnosis, and any associated syndrome, followed by suggestions for further management of the patient, starting with other radiological imaging or interventions and, finally, management outside the radiology department (cf. Figure 6.9).

A rubric is a valid tool for assessing an oral (cf. Point 2.5.3). It contributes to the reliability of the orals and can be reviewed when needed, especially in the case of legal queries (cf. Point 4.3.6.3). The rubric that is presented as an example (cf. Table 6.2) is a holistic type of rubric because of the terms "lacks", "basic", "advanced" and "exceptional" describing the level of knowledge that the candidate needs to present, where "knowledge" is actually the

criterion. A holistic rubric is usually used in summative assessment and is a valid assessment tool for an oral, as confirmed by the theoretical perspectives (cf. Point 2.5.3). From the data it was furthermore clear that the assessors and moderators preferred a holistic rubric (cf. Point 4.3.6.3).

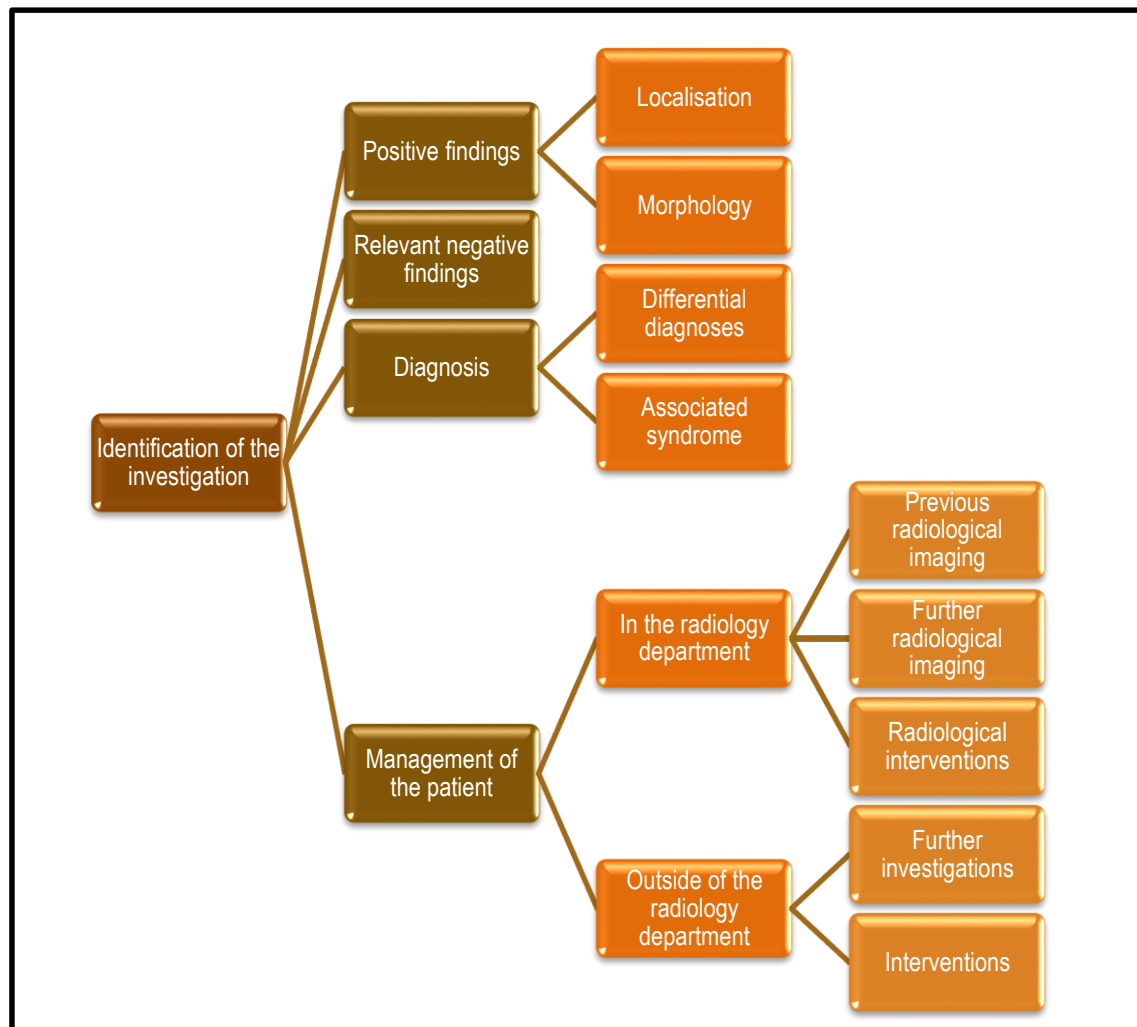


FIGURE 6.9: SUGGESTED FIRST RESPONSE ON AN ORAL CASE
[Compiled by the researcher: Hurter 2015]

The fact that the rubric (cf. Table 6.2) is categorised into different imaging modalities is redundant if only one criterion, "knowledge", is graded. The question that arises is whether the candidate should be deemed safe if s/he fails one modality but passes another modality. The rubric would be much less confusing if the level of knowledge is holistically decided per case with a holistic rubric and awarded a mark on this basis. Mertler (2001:3) (cf. Point 2.5.3.3) points out this fact by emphasising that a disadvantage of an analytical rubric is that it is time consuming because the assessor needs to read through it more than once to make a judgment.

Another question to consider is that, according to the data that was gathered for this study, the purpose of the oral (as mentioned in the second paragraph of this discussion on orals) is to assess different skill sets and reflexive competence (cf. Point 4.3.6.2).

Why is "knowledge" then the only criterion on the rubric? The researcher suggests that "knowledge" should be identified together with the named skill sets as expected outcomes, formulating the outcomes into criteria, and specifying the standards to be achieved accordingly (cf. Point 2.5.3.3). Every case will be then numbered at the top of the rubric, instead of listing the modalities, which become redundant.

Applying the suggestion will create a situation where, instead of presenting as many cases as possible to the candidate, every candidate is shown the same number of standardised cases that were moderated prior to the oral sessions to assess specific skill sets and deeper levels of knowledge. It is suggested from the theoretical perspectives (cf. Point 2.5.3.2) that the orals should be a structured rather than an unstructured assessment to improve the reliability and validity of this segment of the assessment. Furthermore, it was gathered from the data that all subdisciplines should be presented in the orals to cover the curriculum as far as possible (cf. Point 5.3.5.1).

Therefore, it may be relevant that, during moderation of the oral cases, a blueprint is reviewed to ensure that all candidates are presented with random images, though with the same spectrum of cases covering all the subdisciplines at similar levels of the cognitive domain. Interestingly, the Royal Australian and New Zealand College of Radiologists moved from two general oral examinations to seven organ and system-based oral examinations at the beginning of the century (Hibbert *et al.* 2012:97) to cover all the organ systems (cf. Point 2.5.2.3).

Another remark on the rubric used for the oral session is that only four levels are set as standards to be achieved. Achieving the lowest level means a candidate fails the assessment. Conversely, a candidate passes if s/he achieves the second level (cf. Table 6.2). The standards therefore appear to be weighted in favour of passing the candidate. This leads the researcher to the conclusion that if a candidate, in the end, fails the oral segment of the summative assessment, his/her knowledge is really deficient and this lack should reflect in all the other segments of the assessment. If this conclusion is valid, no candidate would be able to fail because of bias. If a candidate performed well in all the other segments and performed poorly in the orals, as assessed by four assessors from four

different geographical locations and completely unfamiliar with the anonymous candidate, this result is more likely due to anxiety, where lack of confidence may have been misinterpreted as lack of knowledge.

The standards only specify specific percentages, leading the researcher to the assumption that the candidate cannot be marked less than 40% on the room average; the candidate therefore only needs to get 60% in the other oral room to pass the oral segment of the assessment. The other assessment segments will then have to identify an unsafe candidate. Again, this weights the oral assessment in favour of the candidate. The researcher therefore concludes that, if the candidate fails the orals, s/he is unsafe and should therefore fail the summative assessment, with one exception.

If a candidate performs well in all the segments of the assessment and passes one oral room easily, but fails badly in the other oral room, the researcher cannot but come to the conclusion that bias was at play, although it is theoretically improbable and unlikely. If all the instruments are valid, one would not expect to find any major discrepancies between the different instruments. There is only one way to exclude this possibility and that is to record all the oral assessments on video for review later by an impartial assessor and moderator, if needed, keeping in mind that such an intervention will take time. The reader should keep in mind that the rubric presented assesses only knowledge and that a candidate could perform poorly in the oral because of other reasons that are not identified by the rubric.

The researcher mentioned anxiety as a possible cause of poor performance in the oral sessions. Some candidates experience a great deal of anxiety during the oral assessment (cf. Points 5.3.1.4 & 5.3.2.1). From the findings the researcher concluded that a competent candidate should be able to cope with the stress associated with the oral. Candidates are also exposed to tutorials sessions and case-based mock examinations, to desensitise them towards the oral and to teach them examination techniques involved the oral assessment (cf. Point 2.5.3.2). Regardless of such pre-examination exposure it can still happen that a candidate performs badly in the oral due to stress and anxiety, which will probably be detrimental to the outcome of the assessment. Assessors and moderators in general try to calm and relax the candidate but if an anxious candidate performs badly in one case, it tends to get worse in the following cases. The oral then becomes not only an instrument for assessing knowledge, communication and observational skills, but also for assessing stress management (cf. Point 4.3.6.2).

The researcher noted that the oral assessment is time consuming. This notion was confirmed by the theoretical perspectives (cf. Point 2.5.3.2) and may become more relevant in future summative assessments. Currently the examination body is able to cope with the number of candidates who sit the second part of the summative assessment, but if the number should increase to address the shortage of radiologists nationally, it may become challenging to continue with the orals within the current time set aside for this segment of the summative assessment (cf. Point 4.3.5.3). It is unlikely that it would be practical to allocate more time to the orals in the South African context. The American Board of Radiology abandoned their orals in 2008 due to time constraints and imaging-display limitations that rendered the orals very artificial (Alderson & Becker 2008:708) (cf. Point 2.5.2.3).

6.2.6.5 *The post-examination meeting*

Aligned with the theoretical perspectives (cf. Point 2.6), an examination committee meeting is convened at the end of each assessment day to give the moderators and the convenor feedback on the day's events and to discuss any assessment related problems or suggestions. Moderation of the candidates who completed the examination up to that stage is also concluded. Borderline candidates who require more detailed attention and discussion are identified and this discussion is postponed until the final examiners' meeting after all oral examinations have been completed and all the marks have been processed. The moderators are actively involved in all discussions and all the examiners' opinions are listened to conscientiously (cf. Point 4.3.4.1).

On the last day, after the final oral examination sessions and after all the marks have been submitted, an examiners' meeting (joint moderation meeting) takes place, where a spreadsheet with all the candidates' examination numbers along with all their marks are presented. Every candidate is reviewed individually by the committee to be passed or failed. Every failed candidate is identified and discussed in depth regarding current workplace, work experience, training and learning development, previous failed attempts and remedial steps that can be taken to assist further training of this candidate. At this point the rules of the CR (CMSA) are close at hand, because no mistakes can be made that may end up as legal challenges.

Interestingly, during the examiners' meeting, it came to light that the majority of candidates who passed the examination were working in training departments when they sat for the

assessment. The majority of candidates who failed had left the training departments in accordance with the individual departmental rules, after repeatedly failing the Part 2 examination. Of the original 36 candidates who were submitted to the written part of the examination, 20 finally passed. Of the 16 who failed, only two candidates failed for the first time. As a final comment in ending the narrative it appears that, once a candidate leaves the training facility, it becomes less likely that the candidate will pass future attempts. A review of the failing group during the post-examination meeting showed that the majority of the failing candidates had experienced an increased number of failed attempts.

The mandate of the examination committee given by the CR (CMSA) reads as follows:

This committee is constituted by formal promulgation of a duly constituted meeting of the Council of the College of Radiologists. It derives this mandate from this promulgation and requires that the committee remain subject to the authority of the Council. This mandate will cease when a duly constituted meeting of the Council so decides (CR (CMSA) 2008:Online).

The role of the examination committee is to advise the CR (CMSA) of all the obligatory processes involved in conducting the examinations of the College of Radiologists. The committee is expected to focus on the conduct of the examinations, and its other responsibilities encompass a number of the findings of this study, including:

development and maintenance of appropriate policy and procedures, the formulation of minimum standards for the evaluation of candidates, the establishment and maintenance of an examiners roll, the arrangement of primers/short courses/updates that aim to assist current and potential examiners in the execution of examinations, the formulation of a debrief after each examination focusing on the successes and challenges experienced with the conduct of the examination and the overall performance of candidates and the formulation of a brief annual report that can be incorporated into the annual report of the College for Transactions (CR (CMSA) 2008:Online).

In light of the above, the most important role of the examiners' meeting is to decide if a candidate will pass or fail the CR (CMSA) Part 2 examination and, by passing the assessment, receive the stamp of approval of the CR (CMSA) that the candidate is competent and safe to practise radiology in South Africa as an independent radiologist. If

a candidate passes, everyone is delighted, but if a candidate fails it creates questions that need to be answered, not only to the candidate but also to the CR (CMSA).

The written papers contribute 25% to the final total mark, the reporting contributes 25%, the first oral session 25% and the second oral session also 25%. According to the *Regulations for Admission to the Fellowship of the College of Radiologists of South Africa* (CR (CMSA) 2013:8), a candidate is required to pass with a:

45% subminimum for the written component to allow entry to the Reporting and Oral components, a 50% subminimum for the Reporting session, a 50% subminimum for over half of the long cases (i.e. five of a total of eight cases are given 50% or more; or six of a total of ten long cases are given 50% or more), a 50% subminimum for the Rapid Reporting subcomponent of the Reporting section, a 50% subminimum for the two oral examinations combined, a 40% subminimum for at least one of the oral examinations (examiner pair) and a overall total mark of 50% or more. There is no limit to the number of attempts allowed for Part II but this must be achieved within six years of obtaining Part I, or the candidate will be required to repeat Part I. [The rapid reporting subminimum has changed from a 50% subminimum required to pass in the 2014 second semester summative assessment, to a 70% subminimum to pass in the 2015 first semester summative assessment (cf. Point 6.2.6.3).]

If the candidate fails to meet any one of these requirements, it means that the candidate will be failed. In the end, if a candidate fails, this is reported to the CR (CMSA) as such with suggestions for actions that should be considered to assist the candidate with future attempts, if any further attempts at the summative assessment can be considered. If six years have passed since the candidate obtained Part 1, s/he will have to either leave radiology or reapply for a numbered training post to redo the whole of the training programme at an accredited academic radiology department. Feedback is therefore only given to the unsuccessful candidates, and except for the examination results, no other feedback is given to the successful candidates, unless this happens without the knowledge of the researcher (cf. Point 5.3.2.3).

6.2.6.6 Feedback

In the theoretical perspectives feedback at multiple occasions and levels was identified as the most powerful single factor contributing to success. Feedback is "the most powerful

single moderator that enhances achievement" (Hattie 1999:Online) (cf. Point 2.7). Feedback was also mentioned numerous times by the interviewees who took part in this study (cf. Points 4.3.3.4 & 5.3.2.3).

Feedback can be given:

- by the assessors to the examination body;
- by the candidates to the examination body;
- by the examination body to candidates who passed;
- by the examination body to candidates who failed;
- by the examination body to candidates who are preparing for the summative assessment; and
- by the examination body to assessors and moderators.

Assessors may give feedback **to the examination body** during the post-examination meeting. If the time is limited an assessor may voluntarily communicate any pertinent feedback via email to the examination body. Formal feedback two weeks after the assessment, by completion of a single-page questionnaire, could also be considered, although it would be less ideal and unlikely to be completed by all the assessors (cf. Point 4.3.3.4).

Candidates may give feedback **to the examination body** about any suggestions or issues they experienced during the summative assessment. This can be done voluntarily and anonymously if the individual has concerns about possible victimisation. Such feedback should be done in writing. If the candidate has any concerns about the fairness of his/her assessment, the appeals mechanism should be followed. The candidate may review all answer sheets at the nearest office of the CMSA (cf. Point 5.3.2.3).

Currently, the only feedback the **examination body** gives **candidates** who **passed** is a summary of the marks that were achieved during the assessment. Although some candidates may appreciate more detailed feedback, this would be difficult to achieve due to logistical impracticalities, cost factors and time constraints during the post-examination meeting. Candidates may still request access to the answer sheets via the appeals mechanism; this has financial implications, and would probably be senseless (cf. Point 5.3.2.3).

It is possible for the **examination body** to give detailed feedback to the **candidates** who **failed** because every single failing candidate is discussed in detail and all segments of the assessment are reviewed during the post-examination meeting, as previously mentioned. The representative from the candidate's parent department is also involved in the discussion. No candidate fails the assessment without a proper review. The feedback arising from the discussion, together with identified areas of weakness and suggestions for future remedial action, should be given to the representative of the department or formally forwarded to the HOD of the parent department via the examination body. The HOD should then give formal individual feedback to the candidate. The HOD should, together with the candidate, decide on a structured remedial plan to address weaknesses and to prepare the candidate for attempts at the summative assessment (cf. Point 5.3.2.3).

Feedback from the **examination body** to the **candidates** who are **preparing** for the summative assessment encompass many different topics. Some of the topics include learning outcomes, suggested literature resources, previous written question papers, transparency of the assessment processes, examples of assessment instruments (e.g. long cases, rapid reporting cases, oral cases) and examples of memoranda or rubrics that are used in the summative assessment. All this information can be made available via the examination body's website, obviously including all the guidelines, rules and registration processes applicable to sitting the summative assessment, and the appeals mechanisms (cf. Point 5.3.2.3).

Such feedback will contribute to decreasing anxiety and stress for many candidates. Feedback pertaining to the candidates in general, relating to, for instance, gaps in knowledge or generic shortcomings that are noted in the post-examination meeting, should be forwarded to all the HODs, who should inform the candidates who are in the process of preparing for the summative assessment. If any problems were identified that are only relevant to a specific training department, such feedback should be given to the relevant HOD, to address appropriately (cf. Point 4.3.3.4).

Feedback from the **examination body** to **assessors** and **moderators** should include online access to any relevant guidelines, including rules and regulations pertaining to assessors and moderators of the radiology summative assessment (cf. Point 2.5.5). Such documentation should also include specific guidelines to convenors of the radiology summative assessment, with information on detailed requirements and procedures to be followed when conducting the assessment. Guidance should be given about assessor and

moderator training as well as development of future junior assessors who may become involved in the summative assessment (cf. Point 4.3.7.1).

6.2.6.7 *Summative perspectives of the researcher on observing a summative assessment*

The researcher found the opportunity to observe a summative assessment of the CR (CMSA) Part 2 Examinations Second Semester 2014 to be very insightful. The assessment was very well organised and conducted. Service delivery was never compromised, however, keeping to time schedules was always a challenge. Something unexpected can and will always occur, which shows that every step of the process has to be thought through chronologically beforehand during timeous and proper planning to identify possible risks and difficulties that may arise (cf. Point 2.5.5). Such an event is always a very stressful experience for the candidates and therefore a calm environment is of the utmost importance (cf. Point 5.3.5.3). Assessors should always act in a restrained manner and present a calming, supportive attitude, which was definitely a hallmark of this examination event.

The researcher was highly impressed with the camaraderie of the examiners involved, bearing in mind that they came from different radiology departments all over South Africa. The positive attitudes, dynamic ideas and critical thinking were so motivating that the researcher hopes that he may have the opportunity to experience such an event again in the future. Finally, it was clear that every candidate who was assessed was treated and evaluated fairly. The case of every candidate who failed was reviewed properly and discussed in depth regarding future remedial actions to be taken to assist him/her with future training. The researcher is of the opinion that the structure of some rubrics and the composition of the oral session should be reviewed. It became clear that assessment and moderation is closely intertwined to form a structure so delicate and specialised that it should be closely guarded to ensure credibility and quality in our profession.

6.3 FACTORS PLAYING A ROLE IN THE PREPARATION OF CANDIDATES FOR THE SUMMATIVE ASSESSMENT

A number of factors that play a role in the preparation of candidates for the summative assessment were identified in the research findings (cf. Figure 6.10).

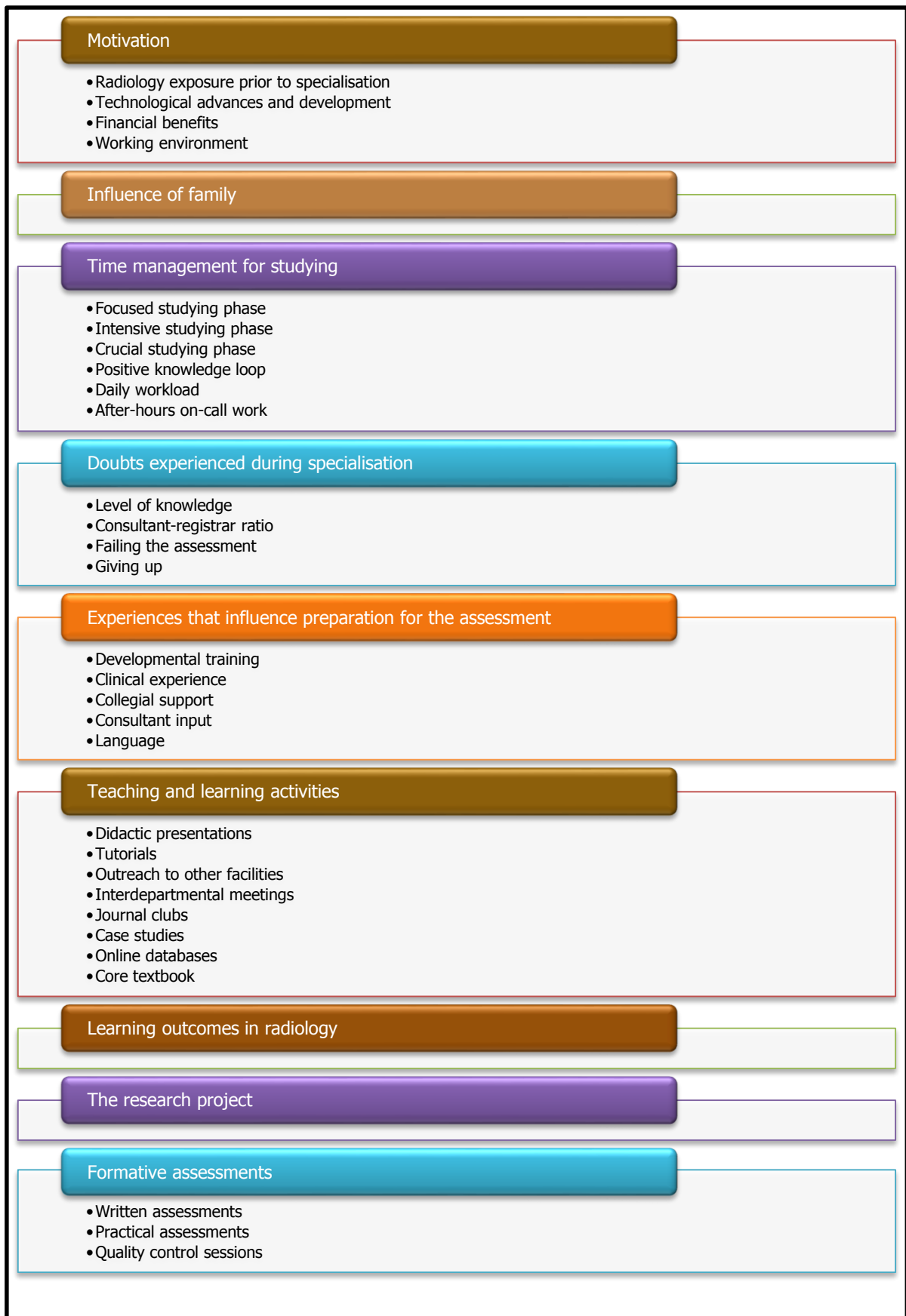


FIGURE 6.10: FACTORS PLAYING A ROLE IN THE PREPARATION OF CANDIDATES FOR THE SUMMATIVE ASSESSMENT
 [Compiled by the researcher: Hurter 2015]

6.3.1 Motivation

It is unlikely that the candidate will pass the summative assessment if s/he is not motivated.

From the theoretical perspectives (cf. Point 2.8.1) it is clear that:

- motivation is fundamental to learning, performing and communicating,
- an individual's motivation increases if the situation is interesting or challenging,
- registrars become more motivated when they achieve their outcomes, and
- constructive feedback contributes to motivation.

Several factors that contribute to motivation were identified from the data and should be considered during the diagnostic assessments when a candidate is selected for a registrar post, but also during periodic interaction with the candidate during the training period, especially when the candidate is confronted with demoralising challenges.

Radiology exposure prior to specialisation (cf. Point 5.3.1.1) contributes to motivation to pass the summative assessment. Contributing factors to be identified in the diagnostic assessment include:

- interest in science and technology,
- rotating through the radiology department as a medical student,
- working in a department that regularly comes in contact with the radiology department, and
- previous observation of a radiologist at work.

Technological advances and development (cf. Point 5.3.1.1) in radiology presents new challenges and interests that motivate the candidate to complete specialisation. The candidate can also super-specialise, if interested in doing so.

Financial benefits (cf. Point 5.3.1.1) is not a major motivational factor for candidates in general, but radiologists should be able to take care of their families, which does make this a motivational factor in completing the summative assessment.

The **working environment** (cf. Point 5.3.1.1) in radiology is a major motivational factor. In this environment the candidate is exposed to a well-controlled environment with better working hours and a more physically secure setting, which is especially important for female candidates. The candidate is exposed to a variety of patients and can offer quality care,

leading to job satisfaction. Responsibilities and risks are shared between colleagues within a flexible system. All these factors contribute to better quality of life and more family time than in most other disciplines.

6.3.2 Influence of family

Having relatives in the medical field is a contributing factor in **completing radiology** specialisation and passing the summative assessment at the first attempt. The fact that candidates tend to neglect their families (especially if there are children), during specialisation due to work and study demands, motivates them to complete the summative assessment. Families also function as a support system to motivate the candidate psychologically, provide food, and present relaxing recreational activities when needed (cf. Point 5.3.1.2).

6.3.3 Time management for studying

Three time periods (cf. Point 5.3.1.3) for dedicated studying prior to sitting the summative assessment were identified:

- the focused studying phase from 24 to 18 months prior to the assessment,
- the intensive structured phase from 12 to 8 months prior to the assessment, and
- the crucial studying phase in the last 6 months.

Focused studying was understood by the researcher to refer to commencing studying for the summative assessment, having completed the research project and not focusing on interests other than radiology. Intensive literature studying prior to the summative assessment was defined as the least time needed for studying – in this time the candidate no longer takes part in social events. Crucial studying was understood as consolidating radiology knowledge, concentrating on published journal articles and consolidating examination techniques.

The candidate's level of knowledge is an important factor contributing to effective time management regarding studying and performance at work. The researcher terms this phenomenon the **positive knowledge loop** (cf. Point 5.3.1.3 & Figure 6.11), whereby knowledge that is gained early in the training period leads to periodic exponential increase in knowledge during the later phases of the training period, generating more time to gain even more knowledge. Therefore, it is important that the candidate masters a wide basic

knowledge of radiology early in the training period if s/he is to benefit from this positive knowledge loop. This can be achieved by studying a core general radiology text as soon as possible. Furthermore, the candidate should attempt the summative assessment late in the training period to increase the chances of success.

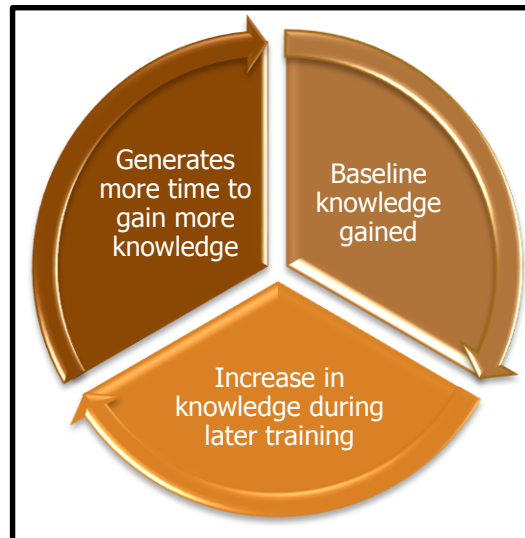


FIGURE 6.11: THE POSITIVE KNOWLEDGE LOOP
[Compiled by the researcher: Hurter 2015]

The **daily workload** and **after-hours on-call work** (cf. Point 5.3.1.3) contribute to exhausting candidates and therefore negatively impacts on study time, which can only be done after hours. Because candidates in any specialisation experience a tight schedule and a demanding daily work environment it is imperative that the candidate should have a structured study plan if s/he is to cope with the demands of specialisation. Even with a structured study plan candidates should not be overburdened by demands for service delivery and, therefore, it remains the responsibility of the training department to provide enough staffing and training resources. Demanding after-hours on-call work can lead to substantial loss of study time over a five-year period and workload should therefore be constantly monitored by the training department.

6.3.4 Doubts experienced during specialisation

As adult learners, some candidates experience doubt during the training period, and they may become demoralised, which will have an impact on their preparation for the summative assessment. This may happen due to a lack of radiology exposure prior to specialisation, their realisation of the workload associated with radiology practice and their lack of radiology knowledge at the beginning of the training period. Contributing to this may also be a realisation that they have a deficient **level of knowledge**, which may be identified

during formative assessments, especially when the summative assessment is looming (cf. Point 5.3.1.4).

Another factor that may have a negative impact on preparation for the summative assessment is the limited number of consultants in some training departments. A **consultant-registrar ratio** (cf. Point 5.3.1.4) of at least one consultant for every four registrars is currently prescribed by the HPCSA (UFS 2011:1). It has been established from the data that, due to the current workload and lack of consultants, it often happens that candidates need to work unsupervised. The ideal ratio for enough teaching opportunities is one consultant for every two registrars. Having fewer consultants puts strain on the senior registrars, who receive less exposure to higher-level competencies and increased exposure to medico-legal risks.

Failing the assessment has a major negative psychological impact on the candidate. The candidate's confidence will be challenged, and if not addressed appropriately it will lead to poor performance in the upcoming summative assessment. It is sometimes argued that experience is gained from failing the assessment, but this may only be relevant if proper feedback is given to the candidate. The question that arises is, why does a candidate need to fail an assessment to gain experience if the assessment is completely transparent? Failing the summative assessment may be experienced as humiliating and could lead to anxiety in upcoming assessments (cf. Point 5.3.1.4).

It happens very seldom that a candidate considers **giving up** radiology specialisation. The only reasons to be considered would be waiting an extended period of time to get into a radiology post, considering where one would be able to find work after completing radiology, family responsibilities or repeatedly failing the summative assessment (cf. Point 5.3.1.4).

6.3.5 Experiences that may influence preparation for the assessment

Radiology experience conceptualised by the researcher as **developmental training** (cf. Point 5.3.1.5) is a major contributing factor to success in the summative assessment. Developmental training is the concept of working in a peripheral radiology department that is affiliated with an academic radiology department under direct supervision of a qualified radiologist for a period of at least one year. Within this period the candidate can successfully complete the primary examination, CR (CMSA) Part 1 (cf. Point 2.5.1.1), while

mastering basic radiology knowledge and skills that will contribute to the "positive knowledge loop".

Developmental training contributes to settling the candidate in radiology and may assist him/her in doing early research or publishing a case study.

Clinical experience is less important than previous radiology experience and theoretical knowledge, though it is still an important contributory factor in preparing and passing the summative assessment. The quality of clinical experience is more important than the number of years, and is thus influenced by the level of exposure and the level of the institution where experience was gained. Clinical experience is needed to ask the right clinical questions and make the correct clinical decisions in radiology (cf. Point 5.3.1.5).

Collegial support (cf. Point 5.3.1.5) contributes to preparing for the summative assessment through teamwork, where more senior registrars guide junior colleagues to learn new skills, offer psychological support and give advice on preparing for the summative assessment.

The relevance of **consultant input** (cf. Point 5.3.1.5) is gravely underestimated in some academic radiology departments. A consultant plays a very important role as a mentor during the training period of every candidate. Consultants' remarks can therefore be constructive or destructive. The input of consultants who are involved in the summative assessment is even more relevant for guiding examination technique and identifying readiness for the assessment. Therefore, the HOD or members of the consultant body should interview the candidates regularly to address training issues, challenges, underperformance, work ethics, future career goals and academic progress.

English is the **language** (cf. Point 5.3.1.5) used in teaching activities, academic meetings, academic literature and conferences, and was identified as the language of choice. Theoretically, it should therefore not be a challenge in the summative assessment, but keeping in mind that it is not the first language for most of the candidates it may cause challenges for some.

6.3.6 Teaching and learning activities that influenced passing the summative assessment

Didactic presentations (cf. Point 5.3.1.6) can be time consuming to prepare and can present challenges, especially when there is a limited registrar body, and can cause stress, especially close to the summative assessment. Topics should be relevant and presented according to a four-year organ-system-based, structured academic programme aimed at preparing for the summative assessment. Such presentations may suffice as summaries that can be reviewed prior to the assessment. Presentations can be extended by visiting consultants, or webinars.

Tutorials (cf. Point 5.3.1.6) are a major contributory factor to success in the summative assessment because it helps with the teaching of fundamental principles of radiology, identifies gaps in knowledge, gives immediate feedback to candidates, provides guidance on examination technique and motivates continued performance and learning.

Outreach to other health facilities (cf. Point 5.3.1.6) may contribute to building confidence and independent reasoning, but does not contribute to knowledge or other skill sets, except for management skills. Outreach should not be considered if consultant supervision is not available at the host department. Outreach leads to several logistical challenges and mainly contributes to the candidate's stress and frustration.

Interdepartmental meetings (cf. Point 5.3.1.6) contribute to passing the summative assessment. Candidates are exposed to the questioning and reasoning of clinical consultants and are often confronted with unfamiliar scenarios, which challenge them to show proof of reflexive competence and therefore readiness for the summative assessment. The aim of these meetings is to be constructive – there is no room for destructive comments. It also contributes to teaching the candidate clinically relevant insight.

Journal clubs (cf. Point 5.3.1.6) contribute to preparing for the summative assessment, as long as it is structured and identifies topics that are relevant. Summarised articles can be reviewed prior to the assessment. Journal clubs, furthermore, contribute to teaching critical thinking skills and teaching research methodology approaches and can be utilised to investigate modern trends in radiology.

Case studies (cf. Point 5.3.1.6) are a contributory factor to preparing for the summative assessment because the focus is predominantly on common topics rather than on rare cases. Candidates are encouraged to share knowledge during the discussion of such cases and it gives the presenting candidate the opportunity to do in-depth preparation for the case that, in its turn, will contribute to the positive knowledge loop. Furthermore, studying case studies helps candidates to learn a structured approach to a specific topic, with immediate feedback from the consultant guiding them in their preparation for the summative assessment.

Online databases (cf. Point 5.3.1.6) have evolved considerably over the last five years and fill a gap in daily radiology practice, to such an extent that working without it is almost unimaginable – the analogue to tourism without access to aeroplanes. Books have become redundant, time consuming to access, impractical to carry around and not updated with the most recent information. Unless specific notes or diagrams are reviewed or personal notes are updated, most quick reviews are done via online databases. Easy, immediate access to online radiology literature anytime, anywhere is imperative if working in radiology to keep up with the current knowledge explosion. Databases offer systematic peer-reviewed approaches to all radiological pathology, summarised in a nutshell. Examples include RADPrimer, Radiopaedia, STATdx and Radiology Assistant.

The candidate should select a general radiology **core textbook** (cf. Point 5.3.1.6) early in the training period to study as a way of starting the positive knowledge loop, and should add information to this text during the training period to save time at the end of the programme. This core text, together with added notes, will form the basis of the candidate's theoretical knowledge and will be reviewed during the crucial phase (third phase) of preparation prior to the summative assessment, to consolidate all the knowledge gathered.

6.3.7 Learning outcomes in radiology

The learning outcomes that are currently available on the examination body's website have no affect on the preparation of registrars for the summative assessment. Reasons for this are that registrars are either not aware of the outcomes, or those who are aware, ignore the outcomes because they are too generic and of no practical value. This does not mean that the outcomes are not wanted. Learning outcomes are pertinent to all candidates and

academic departments, especially in resource-limited settings, to set a national standard and contribute to planning a curriculum (cf. Point 5.3.1.7).

Learning outcomes need to be identified at the unit level, modular level and exit level for the curriculum and are essential for the implementation of OBE. Every written outcome should contain a description of **what** the candidate should achieve, **how** s/he will be able to achieve it and **how well** (to what standard) it should be achieved (cf. Point 2.4).

Example:

1. Module-level outcome (gastro-intestinal tract)

The candidate will be able to assess imaging pathology of the gastro-intestinal tract by reviewing the prescribed texts, attending the academic presentations and presenting a case study to show a structured diagnostic approach and a clinically relevant list of at least four to five differential diagnoses when confronted with a case during the formative assessment.

2. Unit-level outcome (liver)

The candidate will review the imaging pathology of the liver by reviewing the prescribed texts and attending or presenting a PowerPoint presentation on imaging pathology of the liver, enabling him/her to present a clinically relevant list of four to five differential diagnoses when assessing any radiological imaging of the liver at the level of a general radiologist.

Exit-level outcomes would be the responsibility of the examination body, while module and unit-level outcomes should be prepared by the training department in relation to their resources, but should be aligned with the exit-level outcomes. The OBE inventory as suggested by Harden (2007a:667) may be used to assess how well OBE has been implemented in a specific institution (cf. Table 2.3).

6.3.8 The impact of the research project

The research project has been discussed (cf. Point 6.2.4.2), but the researcher wants to re-emphasise that it should be completed within the first two years of the training period, before the candidate commences with the focused phase (first stage) of preparing for the summative assessment. This should be done to provide enough time for studying, because the project is time consuming (cf. Point 5.3.1.8).

6.3.9 Formative assessment contributing to passing the assessment

Formative assessments (cf. Point 5.3.1.9) are vital during preparation for the summative assessment. It serves as a measurement of the candidate's progress throughout the training period and motivates the candidate to study frequently. It helps the candidate to achieve the learning outcomes and creates opportunities for constructive feedback when gaps in knowledge have been identified, giving enough time for remedial action prior to the summative assessment. Formative assessment falls outside of the scope of this thesis and has been investigated by Janse van Rensburg (2015:1). Many different types of formative assessments exist but they can be classified roughly as written assessments, practical assessments and quality control sessions.

Written assessments (cf. Point 5.3.1.9) include long cases and rapid reporting with the aim of simulating the summative assessment, to prepare the candidate and identify readiness for the summative assessment. It should ideally be conducted quarterly.

Practical assessments (cf. Point 5.3.1.9) are important for assessing a variety of skill sets, including observation skills, practical skills, interpersonal skills and communication skills.

Quality control sessions (cf. Point 5.3.1.9) are important to ensure the correctness of registrar reports, provide feedback to registrars, and for teaching. It is highly valued by registrars and offers the consultant body an ideal opportunity to assess the candidates individually for motivation, performance and progress. Quality control sessions should include teaching of skills and radiology report nomenclature.

6.4 CRITERIA FOR PRESENTING A CANDIDATE FOR THE SUMMATIVE ASSESSMENT

The researcher summarises (cf. Figure 6.12) and discusses (cf. Points 6.4.1-6.4.8) the eight criteria that should be fulfilled prior to presenting a candidate for the summative assessment.



FIGURE 6.12: CRITERIA FOR PRESENTING A CANDIDATE FOR THE SUMMATIVE ASSESSMENT
 [Compiled by the researcher: Hurter 2015]

6.4.1 Complete the diagnostic assessment

The first criterion for presenting a candidate for the summative assessment is not determined during the final preparation prior to the assessment, but should be identified at the very beginning of the training period. Although one may argue that it is irrelevant, because the candidate is only at the beginning of a five-year training period, it is a very important criterion (cf. Point 2.5.1.1).

The selection of the correct candidates for the training programme will play an important role in the success of the candidate throughout the training period. It is therefore of great importance that the department applies clear criteria for the selection of every individual (cf. Point 4.3.1.7). From the interviews and the theoretical perspectives it is clear that proof of continued performance is a good predictor of success in the summative assessment. One may argue that people can change and therefore previous poor performance is not an predictor of future failure. This argument is fair but it has been proven by Boyse *et al.* (2002:437) that undergraduate marks strongly predict success in the written exit-level examination (cf. Point 2.5.1.1).

More importantly, the researcher identified from the interviews (cf. Points 5.3.1.1 & 5.3.1.5) that previous clinical and radiology experience contributed in a major way to the success of the candidates in the summative assessment. Furthermore, it became clear from the interviews that the quality of previous experience (cf. Point 4.3.1.7) is more important and

reliable than the quantity of previous experience. As part of the diagnostic assessment a candidate may need to pass the CR (CMSA) Part 1 (primary examination) prior to admission into the radiology training programme, although this is not a prerequisite of all South African academic radiology departments (cf. Point 2.5.1.1).

6.4.2 Complete the formative assessments

Formative assessment improves the performance of radiology students during the training period and ultimately contributes to their success in the summative assessment (cf. Point 2.5.1.2). The key to assessment is that it should contribute to the learning process (Shepard 2000:5). Formative assessment should be conducted on a regular basis if it is to be valuable, and must entail continuous feedback to the candidate with the aim of identifying weaknesses and promoting further development. It has been found that, by implementing formative assessment, student behaviour is changed (cf. Point 2.5.1.2) such that candidates are encouraged to study more often (cf. Point 5.3.1.9).

The reliability of formative assessment for identifying readiness of a candidate for the summative assessment has been proven by the data. Formative assessments are reliable for predicting the success of the candidate at the summative assessment (cf. Point 4.3.1.5). Formative assessments may be conducted in different formats that are relevant to the radiology context. Quarterly written assessments are relevant and valuable to prove the objectivity of the consultants when giving feedback to the candidate, especially when unsatisfactory performance has to be addressed (cf. Point 4.3.1.5). Formative quarterly assessments may include long cases, rapid reporting and orals, and may be presented as a mock assessment to simulate the summative assessment. The aim of the quarterly formative assessments is to assess the candidate's level of knowledge, the candidate's confidence, communication skills and examination technique (cf. Point 4.3.1.5).

Continuous or regular modality-based practical evaluations are also important for assessing the candidate's practical skills, and are done informally. It is important to allocate time for the practical assessment to ensure that it is not neglected, because practical competence is an important criterion for identifying someone as a competent radiologist (cf. Point 4.3.2.1). Furthermore, it has been proven that candidates who do well in the modality-based rotations also tend to do well in the summative assessment (cf. Point 2.8.1.12). Regular review, at least biannually, of an updated logbook, especially in a large training circuit, is needed to confirm that the candidate is exposed to a sufficient number of cases

presenting at different imaging modalities and presenting with a wide range of pathologies. Although logbooks are time consuming to prepare (cf. Point 5.3.1.9) and do not address the quality of the work that has been done, it can be argued that we all learn from repetition and a logbook is therefore an indicator of the acquisition of practical skills (cf. Point 4.3.2.1). Logbooks furthermore guide the candidate to achieve personally set goals (cf. Point 2.5.3.1). Logbooks need to be standardised to be reliable as proof of performance within the radiology setting.

The annual progress report includes a summary of the formative assessments that had been conducted through the year and should demonstrate the candidate's progress over the training period. Compiling an annual progress report on every candidate may be challenging in a big training circuit (cf. Point 4.3.1.5). The purpose of the annual progress report is to identify continued performance over the training period (cf. Point 4.3.1.5) and consistent, correct diagnoses as an indicator of the candidate's readiness for the summative assessment. The annual progress report furthermore creates an opportunity for bidirectional feedback between the consultant body and the candidate, which may include information about challenges that arise during the training period (cf. Point 4.3.1.5).

Prior to the summative assessment the consultant body should discuss, at a joint forum, the candidates who are planning to sit the summative assessment, so that the consultants can generate a general impression of the candidates' performance, quality of reporting, level of knowledge, dependability, safety towards patients, staff and self, and readiness for the summative assessment. Continuous interaction with the candidates throughout the training period is therefore important to generate a reliable opinion (cf. Point 4.3.1.5). The consultants' general impression is important for assessing the CanMEDS roles that cannot be assessed during the summative assessment. Challenges of constructing the consultants' general opinion lie, once again, in having a big training circuit and preventing bias. Ultimately, the consultant body should be able to give constructive feedback to the candidates (cf. Point 4.3.1.5).

Finally, after reviewing the annual progress report and generating a consultant general opinion the HOD needs to give a final opinion and decide on the readiness of the candidate for the summative assessment. The ideal scenario (cf. Figure 6.7) has been discussed (cf. Point 4.3.1.5), but it often happens that a candidate is presented for the summative assessment in spite of the lack of time and resources available at the training facility. Candidates often sit the summative assessment regardless of being advised by their HODs

to postpone. From the interviews it was clear that the HOD's opinion regarding whether a candidate is ready for assessment has not been wrong in the last five years (cf. Point 4.3.1.5).

6.4.3 Complete the research project

The research project was discussed under Point 6.2.4.2.

6.4.4 Demonstrate sufficient knowledge

The candidate needs to demonstrate a basic knowledge of general radiology, including all the subspecialties, s/he should be able to demonstrate an interpretation and a understanding of radiological imaging and be able to integrate this knowledge to make a correct diagnosis (cf. Point 4.3.1.1).

6.4.5 Demonstrate clinical, observation, practical and interpersonal skills

The candidate needs to demonstrate clinical insight and clinical examination skills and give a relevant differential diagnosis. At least one year quality clinical experience after obtaining a graduate qualification is deemed necessary to acquire the required level of clinical skills (cf. Point 4.3.1.2). The candidate should demonstrate good observation skills by observing the findings on radiological imaging and identifying abnormalities within a limited time frame. The candidate needs to demonstrate that all the practical skills needed for practising as a competent radiologist have been acquired, by successfully completing the practical formative assessments, as discussed above (cf. Point 6.4.2). The candidate, furthermore, needs to demonstrate interpersonal skills, which are assessed during the training period and remediated when applicable prior to presenting the candidate for the summative assessment.

6.4.6 Demonstrate communication and collaboration skills

The candidate should communicate clearly and correctly, orally and in writing, relevant information to patients, their families and colleagues, to create a summative perspective of the diagnostic findings and therapeutic considerations, challenges that may arise and the management of the patient (cf. Point 2.3.2).

The candidate needs to demonstrate his/her ability to communicate with clinicians via different modalities within a timely fashion, depending on the requirements of the scenario. The candidate needs to demonstrate inductive as well as deductive communication skills (cf. Point 4.3.1.4) and should be able to accommodate factors influencing proper communication, such as personality differences and language differences. The candidate needs to demonstrate quality control mechanisms that ensure proper communication, such as speaking clearly, using proper radiology terminology and writing a good radiology report (cf. Point 4.3.1.4).

The candidate should be able to work as a member of a team by making the correct diagnosis and contributing to the management of the patient. To assess the candidate's ability to collaborate there should be a clear line of communication between the radiology staff and the head of the department. Collaborator skills are also assessed during interdepartmental meetings (cf. Point 4.3.1.4).

6.4.7 Demonstrate good aptitude and attitude

The candidate needs to perform in all the imaging modalities and needs to demonstrate a certain level of personal drive for performing during the training period and ultimately passing the summative assessment, while constantly upholding good work ethics.

6.4.8 Demonstrate a systematic approach to radiological imaging

The candidate needs to demonstrate his/her way of reasoning. To be identified as ready to sit the summative assessment the candidate should demonstrate logical thinking, a structured approach to radiological imaging and pathology as well as integration of knowledge, interpretation of radiological imaging and clinical insight, as previously mentioned, as assessed during daily interaction with the candidate and during the formative assessments (cf. Point 4.3.1.6).

6.5 CRITERIA TO BE CONSIDERED WHEN DECIDING THAT A CANDIDATE IS READY FOR RADIOLOGY PRACTICE

From the data 10 criteria emerged for identifying a competent radiologist who is ready for radiology practice (cf. Figure 6.13):

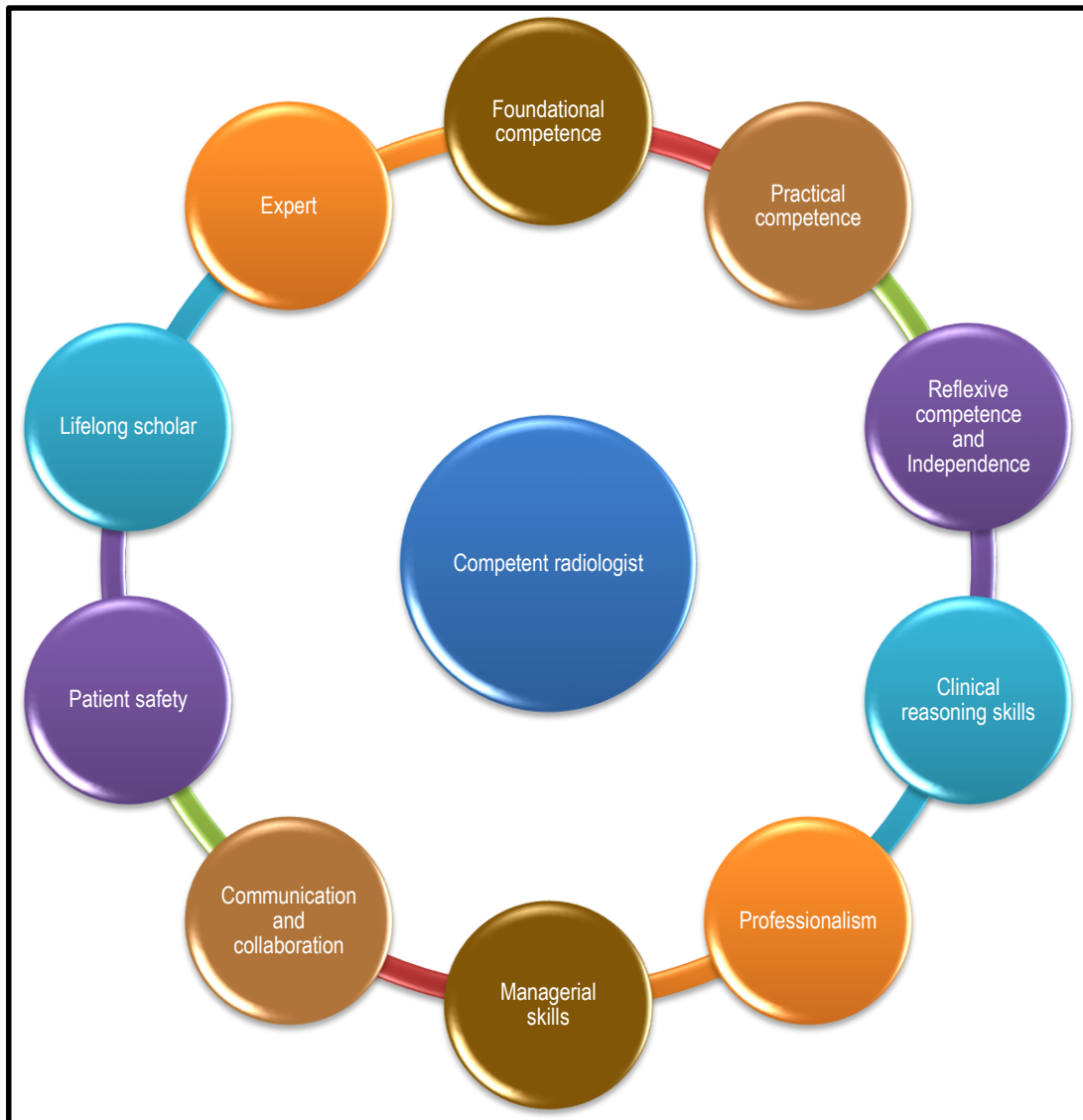


FIGURE 6.13: CRITERIA FOR IDENTIFYING A COMPETENT RADIOLOGIST
 [Compiled by the researcher: Hurter 2015]

6.5.1 Demonstrate foundational competence

A competent radiologist needs to demonstrate a broad (cf. Point 5.3.3.1), basic, general theoretical radiology knowledge at the level of international standards (cf. Point 5.3.3.1), which can only be acquired by working for at least five years within a safe environment under the guidance of competent radiologists (cf. Point 4.3.2.1). Theoretical knowledge on its own is not enough and therefore the competent radiologist needs to demonstrate practical skills as well (cf. Point 5.3.3.1).

6.5.2 Demonstrate practical competence

Practical competence is demonstrated by choosing an appropriate imaging modality, demonstrating good observation skills, a structured approach to radiological imaging pathology, not missing findings (cf. Point 5.3.3.2) and giving a short list of differential diagnoses (cf. Point 4.3.2.1). Furthermore, the competent radiologist needs to demonstrate practical skills by performing any relevant practical or interventional procedures that may be required of a general radiologist, effectively and efficiently (cf. Points 4.3.2.1 & 5.3.3.2).

6.5.3 Demonstrate reflexive competence and the ability to work independently

The competent radiologist should be able to demonstrate reflexive competence (cf. Point 5.3.3.2). Reflexive competence takes time to develop after passing the summative assessment – it takes on average one year to reach reflexive competence while practising radiology. Reflexive competence has been achieved when the radiologist demonstrates that s/he is working independently (cf. Point 5.3.3.2), and makes independent decisions without relying on the opinion of a consultant (cf. Point 4.3.2.1). Furthermore, the competent radiologist should demonstrate confidence (cf. Point 5.3.3.2) and leadership (cf. Point 4.3.2.1) by demonstrating that s/he understands what is needed to make a correct diagnosis, and must be able to transfer that comprehension to another individual (cf. Point 4.3.2.1). The competent radiologist must be able to make correct decisions and should be able to explain and defend reasons for making a specific decision (cf. Point 4.3.2.1).

6.5.4 Demonstrate clinically relevant reasoning skills

The competent radiologist should demonstrate clinical insight and the ability to apply critical thinking and logical reasoning when liaising with a clinical colleague to gather more clinical information (cf. Point 4.3.2.1).

6.5.5 Demonstrate professionalism

The competent radiologist should realise his/her responsibilities and be approachable, even when working under pressure (cf. Point 5.3.3.3) and interacting with all stakeholders and team members. The competent radiologist should always represent the radiology

community at large (cf. Point 4.3.2.1) and maintain good interpersonal skills. The radiologist should always act in the best interests of the patient (cf. Point 5.3.3.3).

6.5.6 Demonstrate managerial skills

The competent radiologist must be able to demonstrate leadership when choosing members of the radiology team and must demonstrate proper time management when planning and conducting patient lists at the different radiological imaging modalities (cf. Point 4.3.2.1). The radiologist needs to manage resources appropriately, especially in a resource-limited system (cf. Points 4.3.2.1 & 5.3.3.3). The radiologist needs to monitor radiation exposure according to the prescribed national guidelines and exercise extra awareness when monitoring radiation exposure to children. The competent radiologist needs to demonstrate basic business, managerial and accounting skills (cf. Point 4.3.2.1).

6.5.7 Demonstrate communication and collaboration skills

The competent radiologist should be able to work in a team and demonstrate good interpersonal skills (cf. Points 4.3.2.3 & 5.3.3.3). The radiologist should communicate relevant findings effectively with patients, clinicians and colleagues (cf. Point 5.3.3.3).

6.5.8 Ensure patient safety

Ensuring patient safety is the paramount denominator for demonstrating competence as a radiologist (cf. Points 2.3.1, 2.4, 2.5.3.1, 2.5.5, 4.3.2.1, 5.3.3.2, Tables 2.1, 2.4 & 2.5). A radiologist should be critically self aware and should acknowledge any limitations in his/her knowledge base, skill set and performance (cf. Points 4.3.2.1 & 5.3.3.2). The radiologist should constantly avoid becoming overconfident or acting in an arrogant fashion (cf. Points 4.3.2.1 & 5.3.3.2). The radiologist should be a health advocate (cf. Table 2.1 & Point 5.3.3.3) by constantly considering other possible diagnoses or other options for managing the patient. The radiologist should limit radiation exposure (cf. Point 5.3.3.2) to the patient, staff and him/herself by preventing unnecessary radiological imaging and/or interventions (cf. Point 4.3.2.1). The radiologist should constantly exercise quality improvement skills when conducting investigations and reporting on imaging modalities (cf. Point 5.3.3.2). Safety involves the correct response to diagnostic findings and patient management, proper communication with the patient, the patient's family and colleagues, as well as

demonstrating good interpersonal skills without missing the correct diagnosis (cf. Points 4.3.2.1 & 5.3.3.2).

6.5.9 Become a lifelong scholar

The competent radiologist should realise any deficiencies in his/her knowledge base and always be motivated to learn. The radiologist should never stop learning (cf. Point 5.3.3.3) and should acquire new knowledge by consulting colleagues (cf. Points 4.3.2.1 & 5.3.3.3), consulting the literature and searching the internet whenever s/he does not know the answer (cf. Points 4.3.2.1 & 5.3.3.3).

6.5.10 Become an expert

It takes time to become an expert in radiology. As an expert the competent radiologist's opinion should be trusted (cf. Points 4.3.2.1 & 5.3.3.3) and s/he should contribute to patient care by communicating relevant findings properly to the clinician, differentiating between urgent and non-urgent communication and by guiding the clinician as a member of the team (cf. Point 4.3.2.1).

6.6 SUMMARY OF RECOMENDATIONS TO BE CONSIDERED IN FUTURE RADIOLOGY SUMMATIVE ASSESSMENTS

The current system of assigning the summative assessment to a convenor is sensible (cf. Point 2.5.5). Questions together with detailed memoranda showing the mark allocations should be submitted timeously to the convenor in a digital format to allow enough time for moderation (cf. Points 2.5.5 & 4.3.5.1).

The written part of the assessment can be conducted at the constituent examination sites (cf. Table 2.8). It is possible to conduct the rapid reporting and the long cases in the constituent centres as long as every site has an accredited examination facility with computers and backup mechanisms according to standardised guidelines set by the examination body (cf. Point 6.2.6.1) to ensure reliability and standardisation of the assessment. The rapid reporting part of the assessment should be conducted at the very beginning of the assessment as a screening assessment prior to allowing the candidates to sit the written part of the assessment. The rapid reporting may be conducted on the first day or a week prior to the written part of the summative assessment, to enable marking of

the answer scripts and screening the candidates (cf. Point 6.2.6.1). The written papers should consist of context-rich short questions and single-best-answer MCQs (cf. Point 4.3.6.2) that aim to assess a wide spectrum of the curriculum at higher levels of the cognitive domain (cf. Point 2.5.3.2). The written answer sheets should be photocopied and transported in a secure manner.

The convenor should be supported by a co-convenor and sufficient administrative support staff to ensure confidentiality and smooth running of the assessment while service delivery is not impaired (cf. Point 4.3.5.1). It is important to assign a floor manager who acts as a centre point in the system during the practical part of the assessment to ensure that all the individual components of the assessment, including transportation and communication needs, proceed smoothly (cf. Point 4.3.5.1). The convenor should ensure that all the participants in the assessment adhere strictly to the time schedule (cf. Point 4.3.5.1).

The examination venue and assessment environment for both the written and practical parts of the assessment should adhere to the prescribed prerequisites, as discussed (cf. Point 6.2.6.1). The possibility of assigning the radiology summative assessment to a single examination venue (or two) holds a number of benefits, as discussed (cf. Point 4.3.5.3), and should include a customised infrastructural setup for a radiology summative assessment. This will result in less stress for the candidates, fewer concerns about the possibility of geographical bias, improved IT support, better human resources and organisation, better standardisation of the assessment and better security.

The long cases should be submitted in a digital format together with detailed memoranda showing the mark allocations to be moderated (cf. Point 4.3.6.2). The memorandum should be the only assessment tool for the long cases. To save time and prevent confusion, the memorandum should not be transferred to a rubric. Assessors should adhere strictly to the guidelines of the examination body regarding the number of images to be submitted, to give candidates enough time to complete the assessment.

The rapid reporting cases should also be submitted timeously in a digital format for moderation. Rapid reporting cases should include daily, straightforward general radiology cases that should aim to identify a safe radiologist (cf. Point 4.3.6.2). Assessors should be encouraged to make notes on the answer sheets for future reference (cf. Point 4.3.3.3).

The oral part of the assessment should be reviewed to cover all subdisciplines of the radiology curriculum (cf. Point 5.3.5.1). All the cases for the oral assessment should be submitted timeously in a digital format for moderation prior to the assessment (cf. Point 4.3.4.4). The orals should be standardised by presenting the same number of cases at the same level of difficulty to every candidate (cf. Point 5.3.2.1). Holistic rubrics should be used as the assessment tool (cf. Point 4.3.6.3) and should be correctly structured as a criterion-rating scale to cover specific criteria that are identified from the learning outcomes (cf. Point 2.5.3.3). The orals should be videotaped for future reference, if needed (cf. Point 4.3.3.4).

Giving feedback is an integral part of assessment (cf. Point 2.7). During the post-examination meeting feedback should be noted in different categories (cf. Point 4.3.3.4), namely, to candidates who failed the assessment, candidates who passed the assessment and candidates who are still preparing for the summative assessment. Detailed feedback should be forwarded in writing to the head of the parent department of a failing candidate so that the HOD can give individual feedback to the failing candidate (cf. Points 4.3.3.4 & 5.3.2.3).

From the theoretical perspectives it is clear that policies should be provided to support the training of assessors for future assessments (cf. Point 2.5). Assessors and moderators should be encouraged to attend assessment training workshops which may be hosted by the examination body or local university education departments (cf. Point 4.3.7). All academic consultants should be offered the opportunity to observe a radiology summative assessment event, and those consultants who show a special interest in assessment should be supported by the relevant parent departments to become involved in the summative assessment (cf. Point 4.3.7.1). CPD points, especially ethical points, should be offered to assessors and moderators of the radiology summative assessment as motivation to take part in the assessment (cf. Point 4.3.7.2).

Although a national curriculum may be valuable for standardising the training in the constituent academic departments, it may be unnecessary to attempt such a project in the South African context due to the magnitude of the endeavour and the fact that radiology knowledge is evolving so fast (cf. Point 4.3.8.1). It would be more realistic to adopt an international radiology curriculum that is accessible online and that is updated regularly (cf. Point 5.3.4.1). The examination body may put forth national learning outcomes that should be achieved by the different academic departments, but it should be left to the departments

to decide on the way outcomes would be achieved within their individual settings, keeping in mind their availability of human and infrastructural resources (cf. Point 4.3.8.1).

Keeping in mind the challenges that are currently experienced nationally in training new radiologists, which are the result of limited resources, the researcher concluded from the findings that academic departments should create partnerships with their counterparts as well as with the private sector to share intellectual, human and infrastructural resources (cf. Point 5.3.4.2). Furthermore, it is suggested that the radiology fraternity assesses the needs for training future radiologists as well as the needs for future radiology summative assessments, and engage with the Department of Health to plan accordingly and to address the need for appointing more radiology consultants in academic radiology departments (cf. Point 4.3.5.3).

A business plan may be developed for the radiology summative assessment and the assessment should be run as a business (cf. Point 4.3.5.3). The examination body should be responsible for all expenses (cf. Point 4.3.5.1). Examination fees collected from the candidates will not be enough to cover all expenses and the private sector, as "end user" of the majority of candidates who qualify, should be encouraged to contribute financially to the radiology summative assessment (cf. Point 4.3.5.1). The aim of all these suggestions is to ensure quality in the radiology profession.

6.7 CONCLUSION

In this chapter, Chapter 6, the researcher contextualised and conceptualised the summative assessment in radiology, presented factors playing a role in the preparation of candidates for the summative assessment, identified criteria for presenting a candidate for the summative assessment, identified criteria to be considered when deciding that a candidate is ready (competent) for radiology practice and presented a summary of recommendations to be considered in future radiology summative assessments, with the aim of ensuring quality in the profession.

In the next chapter, Chapter 7, entitled ***Conclusion, recommendations and limitations of the study***, an overview of the study, together with conclusions and recommendations based on the study as well as limitations of the study, will be discussed.

CHAPTER 7

CONCLUSIONS, RECOMMENDATIONS AND LIMITATIONS OF THE STUDY

7.1 INTRODUCTION

In this research project, an in-depth study was done by the researcher to construct a directive for summative assessment of student learning in postgraduate radiology, to ensure quality in the profession and to propose guidelines for assessors and moderators, as well as students preparing for the summative assessment.

The cornerstone of conducting a successful summative assessment is the concept of constructive alignment: Assessment must be aligned with the learning outcomes, and the feedback given to the relevant role players must align the curriculum for conducting assessments in the future. Considering the current knowledge explosion in radiology training it is important to decide what a competent general radiologist needs to know, by identifying learning outcomes that the candidate should achieve during the training period. Therefore, it becomes relevant to know how we should go about assessing the achievement of these outcomes. Relatively inexperienced assessors are constantly joining the assessor body and therefore assessors and moderators must be trained to ensure the validity and reliability of the assessment. Criteria and guidelines for assessors and moderators should serve as a directive to assess candidates in postgraduate radiology to ensure quality in the profession.

In Chapter 6 the researcher discussed recommendations based on the findings of the study. In this chapter the researcher will provide an overview of the study and review the research questions while explaining to the reader how the research questions were addressed. The researcher will then present factual and conceptual conclusions and the limitations of the study, before explaining the contribution the study makes to address the gap identified in the knowledge. The researcher will conclude the chapter with concluding remarks.

7.2 OVERVIEW OF THE STUDY

The researcher identified that there is a lack of clear directive documentation for assessors and moderators of the radiology summative assessment and conducted the study to fill this gap in knowledge. The findings of the study served as the basis for a number of

recommendations for the way radiology summative assessment should be conducted, and provided guidelines to assessors and moderators of the assessment, as well as candidates preparing for the assessment.

The researcher presented the problem statement and an outline of the research questions in Chapter 1 (cf. Point 1.3). The research questions that formed the foundation of this study are reviewed (cf. Points 7.2.1-7.2.5) together with the findings relating to each question, to create a directive for summative assessment in postgraduate radiology.

The researcher conducted a trustworthy study according to the principles that were described in Chapter 3 (cf. Point 3.4.3) and meticulously applied these principles to ensure the credibility, dependability, transferability and confirmability of the study.

7.2.1 Research question 1

The research question was stated as:

Can the lack of directive documentation for summative assessment of postgraduate training in radiology be conceptualised and contextualised?

The following objective was pursued:

Conceptualising and contextualising the lack of directive documentation for summative assessment in radiology by gathering theoretical perspectives through this research.

As a prelude to this study the researcher completed a training module in Health Professions Education on assessment and moderation to become immersed in the concepts and rhetoric of health professions education with the aim of gaining a better understanding of assessment and moderation in general, but more specifically to prepare him for gathering in-depth theoretical perspectives on radiology training and assessment.

By gathering theoretical perspectives the researcher was able to conceptualise and contextualise radiology summative assessment within the South African context, namely, the assessment conducted by the CR (CMSA) (cf. Point 2.3.1), but also summative

assessments within the wider international context, namely, the RCR, ABR and RANZCR (cf. Point 2.5.2.3) summative assessments.

The researcher presented the concept of constructive alignment (cf. Point 2.2), by which OBE and the assessment process should be aligned to identify a competent radiologist and to ensure quality in the profession. The researcher continued to gather theoretical perspectives on identifying a competent candidate by conducting an in-depth investigation into the principles of the CR (CMSA) (cf. Point 2.3.1), the CanMEDS Physician Competency Framework (cf. Point 2.3.2) and the AfriMEDS Framework (cf. Point 2.3.3).

The researcher presented theoretical perspectives on learning outcomes and OBE (cf. Point 2.4), including critical cross-field outcomes (cf. Point 2.4.1) in the South African context and exit-level outcomes in radiology (cf. Point 2.4.2). The researcher reviewed the principles and concepts underpinning assessment in postgraduate radiology, including diagnostic (cf. Point 2.5.1.1), formative (cf. Point 2.5.1.2) and summative assessments (cf. Point 2.5.2.3). The researcher led the reader through the theoretical perspectives on and considerations of assessment methods, instruments and tools that may be relevant within the radiology context (cf. Point 2.5.3).

The researcher investigated the role of the assessor (cf. Point 2.5.4) in assessment to identify concepts that should be considered in postgraduate radiology assessment. He also investigated theoretical perspectives on providing guidelines and training to assessors of summative assessment within the radiology context. The researcher continued to gather perspectives on moderation (cf. Point 2.6) and the role of feedback (cf. Point 2.7) in the assessment process. The researcher completed his exploration of the concept of constructive alignment by gathering theoretical perspectives on the structure of a successful curriculum by identifying teaching and learning activities that are relevant in the radiology context.

The researcher compared the theoretical perspectives (cf. Chapter 2) with his own experiences of a radiology summative assessment during the second semester of 2014 (cf. Point 6.2) to contribute further to the contextualisation and conceptualisation of directive documentation for summative assessment in postgraduate radiology. Chapter 2 serves as a theoretical framework for the study.

The accomplishment of this objective addressed research question 1.

7.2.2 Research question 2

The research question was stated as:

What are the factors that play a role in summative assessment of postgraduate students in radiology?

The following objective was pursued:

Identifying the factors that play a role in the summative assessment of postgraduate students in radiology.

The researcher conducted a qualitative study according to the methodology presented in Chapter 3 (cf. Point 3.3) by interviewing assessors and moderators involved with summative assessment in postgraduate radiology (cf. Point 3.3.2) as well as candidates who were within one year after completing the radiology summative assessment regardless of failing or passing the assessment (cf. Point 3.3.3). By comparing the theoretical perspectives in Chapter 2 with the findings of the interviews with assessors and moderators that were presented in Chapter 4 (cf. Point 4.3.5) and the findings of the interviews with the candidates that were presented in Chapter 5 (cf. Points 5.3.2 & 5.3.5) the researcher was able to identify the factors that play a role in the summative assessment of postgraduate students in radiology. All the factors that were identified from the findings and triangulated with the theoretical perspectives are conceptualised in Figure 7.1.

Factors related to organising and convening the summative assessment (cf. Point 4.3.5.1), motivation of the assessors and moderators (cf. Point 4.3.5.2), the training of assessors and moderators (cf. Point 4.3.7), preventing the possibility of bias (cf. Point 4.3.5.4), ensuring fairness of the assessment (cf. Points 2.6 & 5.3.2.1), the assessment instruments and tools to be used in the radiology summative assessment (cf. Points 2.5.3, 4.3.6 & 5.3.2.1), giving feedback to the different role players participating in the assessment (cf. Points 2.7, 4.3.3.4 & 6.2.6.6) and future considerations (cf. Point 4.3.5.3) in radiology summative assessment, were discussed in Chapter 6 (cf. Points 6.2 & 6.6).

The accomplishment of this objective addressed research question 2.

7.2.3 Research question 3

The research question was stated as:

What are the factors that play a role in the preparation of candidates for summative assessment in radiology?

The following objective was pursued:

Identifying the factors that play a role in the preparation for summative assessment in radiology.

The researcher identified the factors that play a role in the preparation of candidates for summative assessment from responses to interviews with candidates who were within one year of completing the radiology summative assessment. The interviews were conducted according to the methodology described in Chapter 3 (cf. Point 3.3.3).

The factors were discussed in Chapter 6 (cf. Point 6.3 & Figure 6.10), namely, factors that played a role in motivating the candidate to attempt and complete specialising in radiology (cf. Point 6.3.1), the influence of family on the candidate's success in the radiology summative assessment (cf. Point 6.3.2), time management for studying during the preparation for the summative assessment (cf. Point 6.3.3), doubts that were experienced by the candidate during specialisation (cf. Point 6.3.4), experiences that influenced the candidate's preparation for the assessment (cf. Point 6.3.5), TLAs that influenced the candidate's ability to pass the summative assessment (cf. Point 6.3.6), how learning outcomes in radiology contributed to preparation for the summative assessment (cf. Point 6.3.7), the impact of the research project on the candidate's preparation for the summative assessment (cf. Point 6.3.8), and how the formative assessments contribute to passing the assessment (cf. Point 6.3.9).

It is important that candidates who are preparing for the summative assessment take note of these factors as it may serve to contribute to their success in the summative assessment in the future.

The accomplishment of this objective addressed research question 3.

7.2.4 Research question 4

The research question was stated as:

- (a) What criteria will be essential in compiling directive documentation for summative assessment in postgraduate training in radiology; and***
(b) What guidelines can be developed for assessors and moderators?

The following objective was pursued:

Determining (a) criteria regarded essential for compiling directive documentation for summative assessment in postgraduate training in radiology, and (b) guidelines for assessors and moderators.

The researcher determined the criteria for presenting a candidate for the summative assessment in radiology from the findings of the interviews that were conducted with the assessors and moderators of the radiology summative assessment, according to the methodology explained in Chapter 3 (cf. Point 3.3.2). The researcher presented the findings of the interviews in Chapter 4 (cf. Point 4.3.1) and discussed the criteria in Chapter 6 (cf. Point 6.4 & Figure 6.12). The criteria may be useful to assessors of the radiology summative assessment and consultants who are guiding candidates in their preparation for the summative assessment, to identify the readiness of the candidate to be presented for the assessment and, ultimately, being successful.

If the candidate does not fulfil the criteria identified, s/he should be strongly advised not to sit the summative assessment and to postpone until the criteria have been met. The criteria may be developed further as outcomes that should be achieved prior to sitting the summative assessment.

The researcher furthermore determined the criteria that may be considered by assessors when deciding that a candidate is ready for radiology practice. The criteria were determined from the findings of the interviews with both groups, as described in Chapter 3 (cf. Points 3.3.2.1 & 3.3.3.1), presented and discussed in Chapter 4 and 5 (cf. Points 4.3.2 & 5.3.3) and conceptualised in Chapter 6 (cf. Point 6.5 & Figure 6.13). The criteria may be useful in identifying a competent radiologist who will be able to practice radiology independently.

The researcher determined guidelines for assessors and moderators of the radiology summative assessment by reviewing the theoretical perspectives on assessment (cf. Points 2.5.4 & 2.5.5) and moderation (cf. Point 2.6), to provide a foundation for addressing this research question and by reporting and discussing the findings of the interviews with assessors and moderators of the radiology summative assessment in Chapter 4 (cf. Points 4.3.3 & 4.3.4). The researcher ultimately discussed and conceptualised the guidelines for assessors (cf. Point 6.2.2 & Figure 6.4) as well as the guidelines for moderators (cf. Point 6.2.3 & Figure 6.5) in Chapter 6.

The accomplishment of this objective addressed research question 4.

7.2.5 Research question 5

The research question was stated as:

Can the criteria and guidelines in 4(a) and (b) be converted into a directive for summative assessment of student learning in postgraduate radiology?

The following objective was pursued:

Constructing a directive for summative assessment of student learning in postgraduate radiology, including guidelines for assessors, moderators and other role players, and making recommendations regarding principles and purposes of assessment to ensure quality in assessment instruments, methods and tools employed in summative assessments in postgraduate radiology.

By combining the criteria (cf. Figures 6.12 & 6.13) and guidelines (cf. Figures 6.4 & 6.5) that were identified from research question 4 (cf. Point 7.2.4) the researcher was able to construct directive documentation to guide assessors and moderators of the radiology summative assessment to identify competency in candidates who are sitting the assessment, to ensure quality in the profession (cf. Figure 7.1).

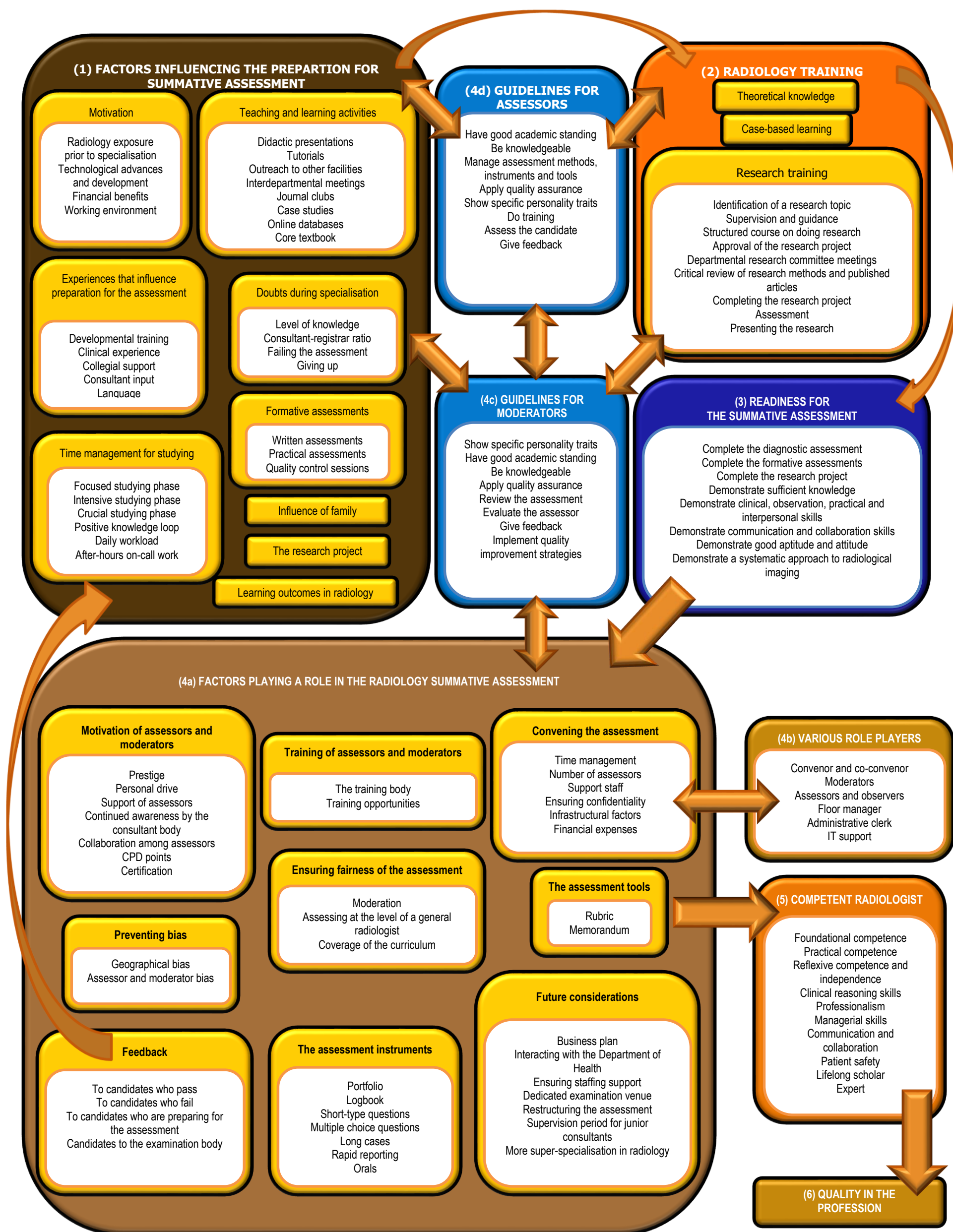


FIGURE 7.1: SUMMATIVE ASSESSMENT OF POSTGRADUATE RADIOLOGY TO ENSURE QUALITY IN THE PROFESSION
 [Compiled by the researcher: Hurter 2015]

Figure 7.1 demonstrates the **(1) Factors influencing the preparation for summative assessment**. Assessors and moderators should be knowledgeable about these factors that may serve to guide candidates during the radiology training period to prepare successfully for the summative assessment. When the three levels of **(2) Radiology training** have been completed, the candidate's **(3) Readiness for the summative assessment** should be proven according to the criteria identified, and the candidate may then be presented for summative assessment. All the **(4a) Factors playing a role in the radiology summative assessment** should be considered to ensure a reliable assessment. The **(4b) Various role players** involved at different levels of the summative assessment are listed. The directive documentation for the summative assessment includes the **(4c) Guidelines for moderators** and the **(4d) Guidelines for assessors**. Again, the assessors and moderators are involved in academic training departments and contribute to the factors influencing the preparation for summative assessment as well as radiology training. Feedback from the summative assessment influences preparation for summative assessment and, ultimately, radiology training. The summative assessment will certify a **(5) Competent radiologist** who is identified according to the criteria named, and thereby ensures **(6) Quality in the profession**.

The guidelines that are presented for assessors and moderators of the radiology summative assessment will also serve as a directive to improve the reliability of the assessment by ensuring the quality of the assessment instruments and tools, and assisting assessors and moderators to standardise the assessment.

The accomplishment of this objective addressed research question 5.

7.3 CONCLUSION

Summative assessment in radiology is the final step for any registrar specialising in radiology; success in the assessment means the student is certified as a **safe radiologist** who is **competent to practice** radiology **independently** without further supervision or guidance from a consultant. A safe radiologist has to continue as a **lifelong scholar** to maintain his/her competency, which includes **knowledge, skills and aptitude**, to manage any scenario even when confronted with unfamiliar radiological pathology. The competent radiologist should know when and whom to consult for **guidance** without ever becoming arrogant or so confident that the radiologist fails to realise his/her own shortcomings.

Therefore, the competent radiologist has to **demonstrate** a number of **competencies**, which involve much more than the radiology knowledge that has been acquired during his/her training period. The competent radiologist needs to demonstrate foundational competence, practical competence and reflexive competence, and has to **fulfil** several **roles** that include being a manager, being professional, being a good communicator and a collaborator, becoming an expert and, most important of all, being safe towards his/her patients, him/herself and his/her colleagues and staff.

All of these competencies and roles have to be specified through the **identification** of **learning outcomes** for the training period; the outcomes must be **achieved** prior to the summative assessment. The **role of the assessor body** is to confirm that all these outcomes have been achieved, and that the candidate can be certified as safe. The **gap in knowledge** that was identified by the researcher and that ultimately led to this study was the **lack of directive documentation** that is needed to guide assessors and moderators to **repeatedly certify safe radiologists** who have achieved the required level of competency.

Considering the number of summative assessments that are completed annually by different assessors it is important to provide directive documentation to **ensure consistency** and standardisation of the assessments, thereby **ensuring** the **reliability** of consecutive assessments. In the absence of reliable assessments, the **quality** of candidates who pass the summative assessment may become questionable.

The researcher decided on using a **qualitative research** approach to gather as much information as possible from a relatively small target population that would still be representative of the radiology community in South Africa. By choosing a qualitative approach all the data were valued as true and important regardless of the number of participants in the study. **Semi-structured interviews** were conducted with two groups, namely, assessors and moderators as providers of the summative assessment, and candidates who completed the summative assessment as users, to **triangulate** the findings with theoretical perspectives that were gathered by the researcher and presented in Chapter 2. The theoretical perspectives that were linked to the findings of the interviews created a **conceptual framework**, forming the basis for this study.

The findings of the interviews with assessors, moderators and candidates who completed the summative assessment were presented meticulously and discussed in Chapters 4 and 5.

The researcher then interpreted the findings and integrated the evidence to present **recommendations** and considerations for conducting a radiology summative assessment. The factors playing a role in the radiology summative assessment were presented, together with **criteria** and **guidelines** that, together, form a **directive** for summative assessment in postgraduate radiology.

By following the process of collecting theoretical perspectives, gathering data from the interviews, presenting the findings and drawing conclusions before presenting recommendations, the researcher realised that education and assessment is a speciality field on its own and the researcher is of the opinion that conducting summative **assessment** in radiology should be done in a **transparent**, educational and **scientific** manner.

The researcher is furthermore of the opinion that **assessment** should become a **daily routine** in the training environment of radiology registrars and should not be limited to certification at the end of the training period. **Summative assessment** is faced with a number of **limitations** that cannot be overcome due to the nature of the different levels of competency required to become a safe radiologist (cf. Point 6.5 & Figure 6.13). Limitations of summative assessment include the assessment of interpersonal skills, management skills, communication skills, practical skills and work ethics. **Assessment** should therefore be a **continuous process** that becomes an integral **part of training**, instead of it being a consequence of training. Continuous **feedback** and consultant supervision therefore goes synchronise with successful training and assessment.

A number of **teaching and learning activities** that are relevant for the radiology context and that can be utilised during the training period to achieve the required learning outcomes were identified from the theoretical perspectives given in Chapter 2 and the findings of the interviews in Chapter 5. Every academic radiology department has access to a variety of technological resources and staffing **resources**, but by choosing TLAs that are relevant to a particular scenario, each department will be able to present **competent candidates** for the summative assessment.

7.4 LIMITATIONS OF THE STUDY

The researcher was faced with a major challenge at the beginning of the study, namely, to contact the candidates who sat for the summative assessment that he observed and that

was conducted during the second semester of 2014. The researcher did not have access to any contact details of the candidates who completed the summative assessment and he was unable to get any contact details via the examination body. A bulk email that was sent via the examination body to all the candidates only produced one response. The researcher had to trace the candidates via the training departments, which led to significant delays in the collection of the data, because by then the majority of candidates had left the departments. Every candidate who was traced and contacted by the researcher was immediately willing to participate in the study. The aim was to communicate with all the candidates who sat the summative assessment, however, the researcher continued to trace candidates until the data became saturated, which led to the researcher ultimately interviewing ten candidates.

Due to the geographical distribution and often limited availability of the interviewees the researcher was unable to conduct all the interviews with the candidates in person. This, however, did not have an effect on the outcome of this study. The interviews that were conducted with the assessor and moderator target group were all conducted in person due to the availability of the assessors and moderators at the relevant academic radiology departments or private radiology practices.

Radiology summative assessment is a dynamic process and therefore there may be continuous new, additional developments or changes. The researcher updated changes that he became aware of during more recent summative assessments that took place while he was writing this thesis.

The focus was on summative assessment in radiology within the South African context. Further research in the future could be conducted in radiology summative assessments in a wider international context. Future research in radiology summative assessment within the African context may also be valuable, because of the potential of collaboration with colleagues in the rest of Africa.

The researcher did not elaborate on formative assessments in radiology within the South African context in great depth, although it was inevitably reported on in the study as part of the findings, as formative assessment is one of the contributory factors during preparation for the summative assessment (cf. Point 6.3.9). Studies that were recently published on the topic of formative assessment in radiology have been acknowledged (cf. Point 6.3.9) and need to be studied in the context of follow-up research.

7.5 CONTRIBUTION AND SIGNIFICANCE OF THE RESEARCH

The study contributes to the field of radiology, in particular, summative assessment to ensure quality in the profession. The researcher was able to provide guidelines for assessors and moderators of the summative assessment in radiology within the South African context. From this study the researcher was able to conceptualise and contextualise summative assessment in radiology to present a summary of recommendations for conducting a radiology summative assessment, including future considerations for the further development of the radiology summative assessment to ensure the practicable sustainability of the assessment.

The researcher identified guidelines for assessors and moderators, to fill the gap in directive documentation for guiding assessors and moderators of the radiology summative assessment; these guidelines can be used by the examination body and academic radiology departments.

Furthermore, the researcher identified the factors that assessors should keep in mind when assisting candidates to prepare for the summative assessment. These factors serve as guidelines to assist the candidates who are preparing for the summative assessment.

The researcher identified and presented criteria for identifying readiness of a candidate to be presented for the summative assessment, and presented criteria to identify a competent radiologist who is ready to practice radiology independently.

To ensure that this study contributes to radiology summative assessment the researcher plans to present the findings and recommendations that were identified by the research to peer-reviewed radiology or other educational journals for publication, and to present papers at radiology and/or medical education conferences.

The research can be considered by academic radiology departments and the examination body in South Africa as a directive to present criteria and guidelines to assessors and moderators of the radiology summative assessment.

The researcher will be involved with radiology assessment in the future and will continue to encourage his colleagues to participate in radiology assessments, while constantly guiding radiology registrars towards the summative assessment.

7.6 RECOMMENDATIONS

Conducting summative assessment in radiology is expensive and future debate should be encouraged to consider the development of a dedicated examination venue at one geographical location to improve the reliability and the transparency of the assessment.

Currently the practical part (Part 2) of the radiology summative assessment is rotated through a number of geographical locations so that the relevant academic radiology departments offer their infrastructure for the assessment. From the findings of the interviews it became clear that a dedicated examination venue for conducting the radiology summative assessments should be considered. Benefits of hosting the radiology summative assessment at a single geographical site include the development of adequate infrastructure that is conducive to the radiology assessment, preventing the possibility of geographical bias and, furthermore, contributing to the reliability of the assessment by creating a secure, friendly environment for the assessor body and candidates while offering reliable IT support and backup power.

Guidelines for assessors and moderators, as well as for candidates preparing for the summative assessment, should be communicated to all the academic radiology departments, and the documentation should be accessible online. Consultants in the academic departments should be encouraged to become involved in the summative assessment to create a bigger assessor body, which can guide candidates who are preparing for the summative assessment by providing continuous feedback to ensure transparency in the assessment process.

Learning outcomes should be reviewed and updated constantly to drive the assessment. The assessments should be aligned with new developments in medical education, which are relevant to radiology summative assessment as well as the curricula of the respective academic departments. Furthermore, the examination body and academic departments should consider involving more private radiologists in the training and assessment of radiology candidates, by creating partnerships, especially where resources are limited in the public sector.

Research forms an integral part of radiology training and should be developed and strengthened further in the consultant body that is responsible for guiding registrars who are conducting research projects. The requirements for the research project should be

standardised, but it should be kept in mind that the main purpose of the research project is to teach the candidates the principles of research and critical thinking.

The development of a national outcome-based curriculum that could be implemented by all the academic radiology departments would be the ideal scenario, but it may be challenging to develop a national curriculum. Challenges that could be encountered include the magnitude of such a venture and the reality that knowledge in the field of radiology is expanding at such a pace that the learning outcomes will need to be reviewed frequently, again requiring regular review of the curriculum. From the findings of the interviews the researcher identified the possibility of adopting an international online curriculum that is updated constantly. An international curriculum that is available online will offer all candidates and consultants access to a uniform curriculum that will remain at a high standard.

Summative assessment in radiology certifies a competent radiologist. The question that now arises is whether further continued assessment should be considered to prove continued competence in radiology even after completion of the summative assessment to retain certification as an independent radiologist with a view to ensuring sustainability of quality in the profession. Further research may be needed to answer this question.

7.7 CONCLUDING REMARKS

Assessors and moderators of the radiology summative assessment are guided by experience that is gathered during a number of assessments over a period of several years. The radiology fraternity is currently faced with the need to address the challenges arising from the fact that a limited number of consultants and assessors are available in the public sector. Due to the lack of clear directive documentation on guiding less experienced assessors who are joining the assessor body, the reliability and standardisation of the assessment may be a challenge.

By providing directive documentation for the radiology summative assessment, the quality of assessment instruments and tools, the assessment process and the profession will be ensured.

HODs will be presented with guidelines on when to present a candidate for the summative assessment; convenors of the assessment will be presented with guidelines on how to

conduct the assessment, and assessors and moderators will be presented with criteria on identifying competent radiologists. The training of assessors and moderators in assessment and moderation will furthermore contribute to the reliability of the assessment.

Finding truth

Wisdom isn't cheap. Going up the mountain takes time and a lot of effort. From your perspective, when you reach the summit you will only find that it was just the hill at the foot of the mountain leading to a plateau. You will never get to the summit because you are mortal. Along the way you've got two choices: dropping rocks and dust on those below or guiding them along an easier, simpler path. You will gain only one thing: the higher you get, the further you will see. How far you want to see is for you to decide.

Delmé Hurter (Hurter 2015:Unpublished)

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APPENDICES A
(LISTING APPENDICES A1 to A4)

- APPENDIX A1: LETTER OF INVITATION TO ASSESSORS AND MODERATORS TO PARTICIPATE IN A SEMI-STRUCTURED INTERVIEW**
- APPENDIX A2: CONSENT TO PARTICIPATE IN A SEMI-STRUCTURED INTERVIEW**
- APPENDIX A3: DEMOGRAPHIC INFORMATION QUESTIONNAIRE**
- APPENDIX A4: INTERVIEW GUIDE FOR SEMI-STRUCTURED INTERVIEWS OF ASSESSORS AND MODERATORS**

APPENDIX A1



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15 May 2015

LETTER OF INVITATION TO ASSESSORS AND MODERATORS TO PARTICIPATE IN A SEMI-STRUCTURED INTERVIEW

Dear Professor/Doctor

This is a letter to invite you to participate in a Ph.D. (HPE) study entitled:

SUMMATIVE ASSESSMENT OF POSTGRADUATE RADIOLOGY TO ENSURE QUALITY IN THE PROFESSION

The **purpose** of the semi-structured interview is to investigate the factors that play a role in the assessment of postgraduate students in radiology, determining the criteria for directive documentation for summative assessment in radiology, determining guidelines for assessors and moderators and identifying principles and purposes of assessment to ensure quality in assessment instruments, methods and tools for the radiology summative assessment. The semi-structured interview will take approximately 60-90 minutes to complete.

I would like to **request you to take part** in the semi-structured interview. Please take note that by taking part in the semi-structured interview you are voluntarily agreeing to participate in the research study. Your personal details will remain confidential and your data will be treated confidentially at all times. You may withdraw from this study at any given moment during the completion of the semi-structured interview. Should you be willing to participate, you will not be held responsible for any decisions or conclusions made from the study. Kindly take note that the results of the study may be published. You will not receive any remuneration and there will be no costs payable by the participant.

Please fill in the accompanying consent form and return it to me electronically or by fax or hand it to me personally.

Thank you for your consideration of this initiative. I am looking forward to hearing from you and hope to meet you personally in future.

Yours faithfully

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CONSENT TO PARTICIPATE IN A SEMI-STRUCTURED INTERVIEW

TO: Semi-Structured Interview Participants (Assessors and Moderators)

Consent Form

Regarding participation in the Ph.D. (HPE) study entitled:

SUMMATIVE ASSESSMENT OF POSTGRADUATE RADIOLOGY TO ENSURE QUALITY IN THE PROFESSION

I (title, surname and full names) _____

- I have been fully informed about the research study and my participation in the study.
- I agree that the semi-structured interview may be voice recorded and I understand that these recordings will be kept safe.
- I freely agree to participate in this project and acknowledge that should I wish to withdraw my participation due to unforeseen circumstances or personal choice, I would be required to sign a Revocation of Consent Form which will be given to me by the researcher. I understand that this will not disadvantage me in any way.
- I understand that my identity and personal details will remain confidential.
- I further acknowledge that I am aware that the results from this study will be made available to the Faculty Board of the Faculty of Health Sciences, UFS. The findings will also be presented at appropriate congresses and forums and for publication purposes.
- I understand that I will be given a copy of the Consent Form to keep.
- I am aware that I can contact the researcher and/or promoters of the study at any time, should I have a concern.

Signature: _____

Date: _____

Please email or fax this form to:

Dr D Hurter
Lecturer
Department of Clinical Imaging Sciences
Kimberley Hospital Complex, Block B, Room 280
Tel. +27 (0)53 802 2224
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Ecufs number: 121/2014



Departement Kliniese Beeldingswetenskappe/
Department Clinical Imaging Sciences
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E-Pos/Email:dhurter@ncpg.gov.za

DEMOGRAPHIC INFORMATION QUESTIONNAIRE

TO: Semi-Structured Interview Participants (Assessors and Moderators)

Demographic Information

Thank you for participating in the Ph.D. (HPE) study entitled:

SUMMATIVE ASSESSMENT OF POSTGRADUATE RADIOLOGY TO ENSURE QUALITY IN THE PROFESSION

1. Full Names: _____
2. Surname: _____
3. E-mail address: _____
4. Landline Telephone Number: _____
5. Cell phone Number: _____
6. Age: _____
7. Gender: _____
8. Ethnicity: _____
9. Years post Radiology Training: _____
10. Registrar / Consultant ratio at training Department: _____
11. Tertiary Qualifications: _____
12. Where and when did you qualify? _____
13. Did you work in the public or private sector prior to specialisation? _____
14. How long did you work in each sector? _____
15. Current work place: _____
16. How long have you been at your current work place? _____
17. Current access to an Academic Radiology Department: _____
18. How much experience do you have in assessment and moderation in terms of?

i) number of years

ii) number of assessments

iii) number of moderations

iv) international exposure

v) M.Med. assessments

vi) M.Med. moderations

vii) South African College Part 2 assessments

viii) South African College Part 2 moderations

19. What time and date would you prefer to take part in the interview? _____

20. Home Language: _____

21. Training Language: _____

22. Examination Language: _____

23. Special needs / Physical Mobility (if relevant): _____

Signature: _____

Date: _____

Please email or fax this form to:

Dr D Hurter
Lecturer
Department of Clinical Imaging Sciences
Kimberley Hospital Complex, Block B, Room 280
Tel. +27 (0)53 802 2224 email: dhurter@ncpg.gov.za

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INTERVIEW GUIDE FOR SEMI-STRUCTURED INTERVIEWS OF ASSESSORS AND MODERATORS

TO: Assessors and Moderators

Regarding participation in the Ph.D. (HPE) study entitled:

SUMMATIVE ASSESSMENT OF POSTGRADUATE RADIOLOGY TO ENSURE QUALITY IN THE PROFESSION

The **purpose** of the semi-structured interview is to investigate the factors that play a role in summative assessment in radiology. These include the factors playing a role in publishing a research article or writing a dissertation for acceptance to take part in the exit examination currently run by the South African College of Radiologists. The factors also include those playing a role in the preparation for the exit examination itself with possible recommendations for future examinations as well as investigating the role of feedback mechanisms. The semi-structured interview will take approximately 60-90 minutes to complete.

Semi-structured interview guide

Competency

1. When, in your opinion, is a candidate ready for the final examination?

2. When is a candidate ready for radiology practice?

Roles and responsibilities

3. What are the roles and qualities of an assessor in the radiology summative assessment?

4. What are the roles and qualities of a moderator in the radiology summative assessment?

Assessment practices

5. What are the factors playing a role in the radiology summative assessment?

6. What assessment methods, instruments and tools do you think should be used in the radiology summative assessment?

Training

7. What is your opinion on assessment training for assessors and moderators?

Future recommendations

8. What is your opinion about a uniform, national outcome-based curriculum in radiology?

Thank you for participating in this interview.

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APPENDICES B
(LISTING APPENDICES B1 to B4)

- APPENDIX B1: LETTER OF INVITATION TO CANDIDATES WHO ARE WITHIN ONE YEAR POST SUMMATIVE ASSESSMENT (EXIT EXAMINATION) TO PARTICIPATE IN A SEMI-STRUCTURED INTERVIEW**
- APPENDIX B2: CONSENT TO PARTICIPATE IN A SEMI-STRUCTURED INTERVIEW**
- APPENDIX B3: DEMOGRAPHIC INFORMATION QUESTIONNAIRE**
- APPENDIX B4: INTERVIEW GUIDE FOR SEMI-STRUCTURED INTERVIEWS OF CANDIDATES WHO ARE WITHIN ONE YEAR POST SUMMATIVE ASSESSMENT**



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15 May 2015

LETTER OF INVITATION TO CANDIDATES WHO ARE WITHIN ONE YEAR POST SUMMATIVE ASSESSMENT (EXIT EXAMINATION) TO PARTICIPATE IN A SEMI-STRUCTURED INTERVIEW

Dear Doctor

This is a letter to invite you to participate in a Ph.D. (HPE) study entitled:

SUMMATIVE ASSESSMENT OF POSTGRADUATE RADIOLOGY TO ENSURE QUALITY IN THE PROFESSION

The **purpose** of the semi-structured interview is to investigate the factors that play a role in the preparation for summative assessment (exit examination) in Radiology. These factors include those playing a role in publishing a research article or writing a dissertation for acceptance to take part in the exit examination. The factors also include those playing a role in the preparation for the exit examination itself with possible recommendations for future examinations as well as investigating the role of feedback mechanisms. The semi-structured interview will take approximately 60-90 minutes to complete.

I would like to **request you to take part** in the semi-structured interview. Please take note that by taking part in the semi-structured interview you are voluntarily agreeing to participate in the research study.

Your personal details will remain **confidential** and your data will be treated confidentially **at all times**. You may withdraw from this study at any given moment during the completion of the semi-structured interview. Should you be willing to participate, you will not be held responsible for any decisions or conclusions made from the study. Kindly take note that the results of the study may be published. You will not receive any remuneration and there will be no costs payable by the participant.

Please fill in the accompanying consent form and return it to me electronically or by fax.

Thank you for your consideration of this initiative. I am looking forward to hearing from you.

Yours faithfully

Dr D Hurter
Lecturer
Department of Clinical Imaging Sciences
Kimberley Hospital Complex, Block B, Room 280
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CONSENT TO PARTICIPATE IN A SEMI-STRUCTURED INTERVIEW

TO: Semi-Structured Interview Participants (Candidates)

Consent Form

Regarding participation in the Ph.D. (HPE) study entitled:

SUMMATIVE ASSESSMENT OF POSTGRADUATE RADIOLOGY TO ENSURE QUALITY IN THE PROFESSION

I (title, surname and full names) _____

- I have been fully informed about the research study and my participation in the study.
- I agree that the semi-structured interview may be voice recorded and I understand that these recordings will be kept safe.
- I freely agree to participate in this project and acknowledge that should I wish to withdraw my participation due to unforeseen circumstances or personal choice, I would be required to sign a Revocation of Consent Form which will be given to me by the researcher. I understand that this will not disadvantage me in any way.
- I understand that my identity and personal details will remain confidential.
- I further acknowledge that I am aware that the results from this study will be made available to the Faculty Board of the Faculty of Health Sciences, UFS. The findings will also be presented at appropriate congresses and forums and for publication purposes.
- I understand that I will be given a copy of the Consent Form to keep.
- I am aware that I can contact the researcher and/or promoters of the study at any time, should I have a concern.

Signature: _____

Date: _____

Please email or fax this form to:

Dr D Hurter
Lecturer
Department of Clinical Imaging Sciences
Kimberley Hospital Complex, Block B, Room 280
Tel. +27 (0)53 802 2224 email: dhurter@ncpg.gov.za

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DEMOGRAPHIC INFORMATION QUESTIONNAIRE

TO: Semi-Structured Interview Participants (Candidates)

Demographic Information

Thank you for participating in the Ph.D. (HPE) study entitled:

SUMMATIVE ASSESSMENT OF POSTGRADUATE RADIOLOGY TO ENSURE QUALITY IN THE PROFESSION

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6. Age: _____
7. Gender: _____
8. Ethnicity: _____
9. Years post Radiology Training (if relevant): _____
10. Registrar / Consultant ratio at training Department: _____
11. Tertiary Qualifications: _____
12. Where and when did you qualify? _____
13. Did you work in the public or private sector prior to specialisation? _____
14. How long did you work in each sector? _____
15. Current work place: _____
16. How long have you been at your current work place? _____
17. Current access to an Academic Radiology Department: _____
18. What time and date would you prefer to take part in the interview? _____
19. Do you prefer to be interviewed by Skype / Landline Telephone / Both / Other? _____

20. Home Language: _____

21. Training Language: _____

22. Examination Language: _____

23. Special needs / Physical Mobility (if relevant): _____

Signature: _____

Date: _____

Please email or fax this form to:

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INTERVIEW GUIDE FOR SEMI-STRUCTURED INTERVIEWS OF CANDIDATES WHO ARE WITHIN ONE YEAR POST SUMMATIVE ASSESSMENT

TO: Candidates

Regarding participation in the Ph.D. (HPE) study entitled:

SUMMATIVE ASSESSMENT OF POSTGRADUATE RADIOLOGY TO ENSURE QUALITY IN THE PROFESSION

The **purpose** of the semi-structured interview is to investigate the factors that play a role in summative assessment in radiology. These include the factors playing a role in publishing a research article or writing a dissertation for acceptance to take part in the exit examination currently run by the South African College of Radiologists. The factors also include those playing a role in the preparation for the exit examination itself with possible recommendations for future examinations as well as investigating the role of feedback mechanisms. The semi-structured interview will take approximately 60-90 minutes to complete.

Semi-structured interview guide

- 1) What are the factors that influenced you in preparation for the summative assessment?

- 2) What are your thoughts and opinions on the examination process?

3) How would you define a competent general radiologist?

4) What is your opinion on a uniform, national outcome-based curriculum?

5) Are there any other factors that should be considered in the summative radiology assessment?

Thank you for participating in this interview.

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Kimberley Hospital Complex, Block B, Room 280
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APPENDIX C



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REVOCATION OF CONSENT TO PARTICIPATE IN A SEMI-STRUCTURED INTERVIEW

TO: Semi-Structured Interview Participants

Revocation of Consent Form

(For use only for participants who initially signed consent to take part in the project but now wish to withdraw from the project)

Regarding participation in the Ph.D. (HPE) study entitled:

SUMMATIVE ASSESSMENT OF POSTGRADUATE RADIOLOGY TO ENSURE QUALITY IN THE PROFESSION

I (title, surname and full names) _____,
hereby wish to WITHDRAW my consent to participate in the above research project.

I understand that such withdrawal WILL NOT jeopardise my relationship with the researcher or with the Division of Health Sciences Education and Faculty of Health Sciences, UFS.

Signature: _____

Date: _____

Please email or fax this form to:

Dr D Hurter
Lecturer
Department of Clinical Imaging Sciences
Kimberley Hospital Complex, Block B, Room 280
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