

Knowledge of respiratory dysfunction among nurses working in surgical wards at Universitas Academic Hospital

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Declaration of authorship

I Gaone Kediegile declare that the course work Master's Degree mini dissertation that I herewith submit in a publishable manuscript format for the Master's Degree qualification in Anaesthesia at the University of the Free state is my independent work, and that I have not previously submitted it for a qualification at another institution of higher education.

Signed



Date ..

23/11/2019

Acknowledgements and Dedication

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Dedication

I dedicate this thesis to my husband and our sons, who sacrificed the comfort of having a wife and mother in the household, supported me to pursue my postgraduate studies.

Abstract

Background: Clinical deterioration in ward patients leading to adverse events such as cardiac arrest, intensive care unit (ICU) admission and death is often preceded by respiratory dysfunction. Monitoring of ward patients is nurse-led; therefore, their knowledge and skill are crucial to identifying the deteriorating patient and to make decisions on escalating patient care. Although knowledge is a prerequisite for quality of nursing care, performing well on test is not an indicator of the quality of care. The design of a reliable knowledge test involves the structured development of the task to be carried out, and methods for each with their underlying theoretical basis which is often in psychology, psychometry and education.

Objectives: This study assesses the performance of the surgical ward nurses on a single best answer knowledge test based on respiratory dysfunction.

Method: Nurses working at an academic hospital surgical wards participated in this cross-sectional study from 20th to 26th April 2018. Data collection was done using a self-administered questionnaire with two sections: one section for demographic data and the second section consisted of nine (9) single best answer multiple-choice questions.

Results: Out of 95 ward staff, 78 were eligible to take part in the study. Of these, 50/78 (64%) agreed to take part and responded to the questionnaire and test. A desirable score of no more than two incorrect answers was set (77%), and this was achieved by 16 % of study participants. The lowest mark achieved was one correct out of 9 (11%), and the highest score was 8 out of 9 (89%), with a median mark of 5.0 and interquartile range 4.0-6.0.

Conclusion: There was a wide range of performance on the knowledge test by all grades of nurses, with only 16% scoring correctly on seven or more questions. Respiratory deterioration in surgical patients is poorly understood, and failure to diagnose it may be an important factor in the development of surgical complications leading to delayed intervention, morbidity and mortality. Although nurses are the first-line caregivers, the interventions are doctor-led, requiring a communication and action loop that involves a team and systems approach.

Keywords:

Perioperative nursing care

Physiological monitoring

Physiological deterioration

Physiological scoring models

Deteriorating patients

Nurse knowledge tests

Rapid response teams

Early warning score

Efferent afferent patient management systems

Failure to rescue

Escalation of treatment

List of abbreviations

ADOPIE Assessment, Diagnosis, Outcomes identification, Planning, Implementation and Evaluation

ASOS African Surgical Outcome Study

Bsc Bachelor of Science

EN Enrolled Nurse

EOC Escalation of Care

ERAS Enhanced Recovery After Surgery

EWS Early Warning Score

FTR Failure To Rescue

HSREC Health Science Research Ethics Committee

ICU Intensive Care Unit

MET Medical Emergency Team

NEWS National Early Warning Score

POSH Peri-Operative Surgical Home

RN Registered Nurse

RRS Rapid Response System

RRT Rapid Response Teams

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Chapter 1

Introduction

The literature on the role of ward nurses in determining outcome goes back to Nightingale, who collected ward data to show how nursing care improved patient outcomes ^[1]. Today, nurses remain as crucial as ever, in the care of patients generally and in monitoring and documenting vital signs ^[2, 3, 4, 5]. However, when assessing and monitoring patients, the data collected needs to be interpreted timeously.

Effective observation of ward patients is the first step in identifying deteriorating patient and effectively managing care. Clinical indicators of respiratory system deterioration precede adverse event such as cardiac arrest, critical care admission and in-hospital death according to the literature ^[6, 7]. As nurses are with patients most of the time, they are assumed to be first responders. Respiratory assessment and interpretation of abnormal signs are part of the undergraduate nurse training, including in South Africa ^[8, 9, 10].

Entry into professional nursing is still by various routes, such as an academic nursing degree, a nationally regulated apprenticeship diploma and by a certificate course. In South Africa, nurses enter the profession by these routes, from degree, diploma or certificate, and gain further post-basic nursing qualifications, giving the nursing practice a very mixed background ^[11, 12]. It would be expected then, that the knowledge individual nurses have would differ in depth and extent, which may affect patient care ^[13]. In many countries, like Australia, entry is by degree only. Such standard entry helps to clarify what the scope and competencies of nursing practice are ^[14]. The rationale is that, with the increasing complexity of medical cases and their management, the depth of nursing knowledge and skill required has increased and will continue to do so ^[15].

Testing nurses for knowledge and skill in bedside patient care is often used to make conclusions about the quality of nursing care ^[16, 17, 18, 19]. However, the knowledge and recognition of changes that occur in hospitalised patients, particularly very unwell patients, are considered fundamental to nursing ^[20, 21, 22]. The concept of clinical deterioration has evolved with no stable definition becoming standard which has led to different frameworks being used in literature to define the deteriorating patient ^[23, 24]. A review of the nursing literature by Lavoie et al. showed that the term 'deteriorating patient' was used in research without a definition being stated ^[24]. The current perspective is based on the predictive value of physiological monitoring and risk stratifying patients so that patients are 'rescued' early before they deteriorate ^[22]. Physiological indicators of deterioration appear several hours before clinical deterioration ^[25].

In Universitas academic hospital surgical wards admit patients during the perioperative period and act as a step down for patients who have been discharged from surgical intensive care units. These surgical wards also admit patients who would have been admitted to intensive care units peri-operatively but lacked intensive care beds. As such, the patients who are admitted at the standard surgical wards are at higher risk of having respiratory system deterioration and nurse assessment should also focus on this system. Standard surgical wards refer to an in-hospital setting where patients receive non-critical medical or surgical care. Review of the inpatient hospital vitals chart at Universitas

Hospital has revealed that only respiratory rate has been included as part of the standard vitals chart used by the nurses.

This study, therefore, aims to investigate the knowledge of respiratory complications surgical nurses may have, being from diverse training backgrounds, and working in an academic hospital.

Literature Review

Respiratory dysfunction has been described in the literature to refer to the presence of hypoxemia, tachypnoea, dyspnoea or bradypnoea ^[6]. Respiratory dysfunction precedes the occurrence of adverse events and their presence before an adverse event is associated with increased mortality ^[6,7]. In their review of the definition of 'clinical deterioration' Jones et al. defined 'adverse events' as occurring due to the medical neglect and would include iatrogenic, as opposed to 'clinical adverse event' which is 'one or more discrete complications' and related to the patient's underlying medical condition^[23]. Varied reasons are predisposing surgical ward inpatients to have respiratory system abnormalities. Postoperative pulmonary complications are common and may be due to effects of general anaesthesia, type of surgery performed or patient-related factors such as obesity, asthma or obstructive sleep apnea ^[26]. Opioid-induced respiratory depression is a preventable cause of clinical adverse events such as death and ischemic brain damage among at risk surgical patients ^[27, 28]. Some of the patient's risk factors for opioid-induced respiratory depression include obstructive sleep apnoea, obesity hypoventilation syndrome and current treatment of chronic pain using opioid analgesics ^[28]. The increase in demand for intensive care beds and unplanned intensive care admission results in sick patients who could have been admitted and managed in the intensive care unit admitted to standard surgical wards ^[29, 30]. These highly dependent patients being nursed in the standard ward are at increased risk of clinical deterioration and subsequent mortality. Nurses have a vital role in detecting, reporting of respiratory dysfunction and prevention of adverse events. Abnormalities of the respiratory system are part of early warning scores or rapid response systems activation criteria ^[3, 32]

Knowledge Test: Several studies have looked at the quality of nurse's knowledge related to patient care on the ward. Nurses have been tested to determine what knowledge they have about Glasgow Coma Scale, pain management, epidural care in obstetrics and others to index nurses' quality of patient care ^[16, 17, 18, 19]. Although knowledge is a prerequisite for quality nursing care, performing well in tests is not an indicator of quality, where different approaches are required ^[33, 34]. Knowledge tests have also been criticised for being one dimensional, in that they generally use a limited set of knowledge domains. In contrast, a practising nurse uses a wide range in the context of patient care. Studies using knowledge-tests show that most nurses score below the expected or selected threshold ^[19]. The design of reliable knowledge tests has a theoretical domain which involves the structured development of the tasks to be carried out, methods for each with their underlying theoretical basis in psychology and psychometry ^[35, 36, 37]. This domain involves defining the framework to identify the content of the area of study; then drafting of the initial test items for consideration; planning the test format, and finally determining what items for inclusion in a prototype test before piloting and undertaking a

psychometric evaluation. Several specific clinical fields have psychometrically evaluated tools, such as diabetes care, palliative or geriatric care and others.

Knowledge tests have also been used to identify knowledge gaps in the design of educational interventions^[38]. Pre and post knowledge tests evaluate the effectiveness of the educational intervention, with repeat tests used to assess retention of information and progression in professional development^[39]. A wide range of other tools have been developed for assessing competence which includes self-assessment, observation and objective structured clinical tests^[40].

Nursing Process: A definition of the nursing process as defined by the American Nurses Association incorporates six steps: assessment, diagnosis, outcomes identification, planning, implementation and evaluation [ADOPIE]^[40]. All the steps are vital and relevant to the care of perioperative surgical patients. Nevertheless, the numerous reports in the literature generally reflect that ward patient assessment by nurses is sub-optimal, and patients' signs of deterioration are detected late^[7, 21, 32]. There have been different approaches to explain this and to address it^[21, 41]. The intermittent nature of physiological ward-based monitoring and the high workload has led to suggestions to bring more continuous monitoring into the ward^[42, 43]. As technology improves, ways which this can be implemented and made affordable being discussed, the possibility is on the horizon^[43, 44]. Institutional systems already in place usually utilise nurse educators, preceptors and managers to help to maintain standards of practice and undertake regular competency assessments and appraisals, and support individual professional development^[40]. However, these are not in place across all institutions or departments within institutions. Differences in practice performance have been described between graduate and work-place trained nurses because of their differences in work-readiness at the beginning of their careers^[45]. However, this disappears with experience^[15].

Perioperative Outcome: Perioperative morbidity and mortality occurring in surgical patients may be related to underlying disease, expected complication of current illness or related to the quality of care^[23]. Perioperative outcomes research has emerged to mitigate both the short-term and long-term effects of surgery and anaesthesia^[46]. Perioperative complications such as myocardial infarction and acute renal failure can be predicted from intraoperative blood pressures or postoperative pulmonary complications^[26, 47]. The African Surgical Outcomes Study established that 'Despite a low-risk profile and few postoperative complications, patients in Africa were twice as likely to die after surgery when compared with the global average for postoperative deaths'^[48]. Their recommendation was 'improved surveillance for deteriorating physiology in patients who develop postoperative complications'. Perioperative studies have led to the development of risk profiling of patients, pre-emptive interventions such as enhanced recovery after surgery (ERAS) and 'perioperative surgical home' (POSH)^[49, 50, 51]. Both of these concepts are associated with nurses playing a direct role with patients both pre- and postoperatively as being part of a close multi-disciplinary team.

Physiological Monitoring: The use of physiological monitoring to predict the likely course of a patient outcome led to the development of Rapid Response Teams (RRT) from the mid-1990s in Australian acute hospital wards to identify seriously ill patients during the early phase of deterioration and organise interventions in order to reduce patient morbidity and mortality^[52, 53]. RRT are components of Rapid Response Systems

(RRS) and rely on ward staff identifying a patient, triggering the call, and communicating the problem, the afferent arm ^[3, 20].

The nursing personnel plays a significant role in the utilisation of the systems, therefore the nurses have to be knowledgeable about patients symptoms and possess the clinical skills to respond to a patient's clinical condition ^[23, 54, 55, 56]. Some of the reasons why ward nurses fail to call rapid response teams when patients deteriorate include subtle changes in a patient state which make the nurse unsure whether there is a real problem or not and calling the doctors elicits an unsupportive response^[55,56]. Other factors are a general lack of confidence and knowledge limitations which lead to fear of criticism ^[20, 54, 55]. Nurse intuition about a patient who is not doing well has been mentioned as a contributing factor to a nurse's decision; overriding clinical and physiological evidence when faced with a deteriorating patient ^[57, 58]. There are also institutional or organisational factors such as workload (patients per nurse), interruptions, staffing profile, work patterns and hierarchy culture ^[56]. The reasons span a wide range of issues, indicating the poor level of understanding. Douglas et al. (2014) studied the barriers to nurses performing a physical examination of patients among nurses in the USA using an instrument design methodology ^[59]. Even though nurses are trained and assessed to perform over 100 physical assessment skills, they only use about 30% routinely. In addition, significant barriers to implementing them include reliance on others; frequent interruptions and lack of time; ward culture; lack of confidence; lack of nursing role models; lack of influence on patient care; and unique characteristics of some speciality areas. All of these factors relate to organisational culture. A different approach by Nibbelink et al. (2017) using decision-making theory explored nurses' decision-making ^[41]. In theory, experienced individuals develop a store of unconscious knowledge which in practice recognises patterns and gives rise to 'intuition'. They may not be able to rationalise the 'intuition'. Inexperienced professionals, on the other hand, rely on analysing the data to arrive at a decision. In their study, Nibbelink et al. reported that while experience and increased confidence may progress together, they did not necessarily lead to best clinical decision-making, especially when identifying necessary interventions, activating team support or improving situational awareness. Among nurses, decision making was reported as a 'social experience', meaning it was developed collaboratively and the opinion of others, especially experienced others, was valued highly ^[41].

Risk Stratification(track and trigger systems): It is hypothesised that risk stratification or physiological scoring based on current data and the use of protocols, simplifies patient identification and communication of information to others ^[60, 61, 62]. This physiological monitoring system and risk stratification consist of an afferent limb which senses the triggers; a decision is then made to place a call to the rapid response team (RRT) ^[3]. This afferent arm is in three parts, each with differing problems. The first part is the nature of the parameters that are used to trigger, such as the respiratory rate or oxygen saturation. Each one of these may have artefacts produced by movement or sleep. Nurses involved in daily care get used to the alarms or other concerns triggered by these. Besides, even unstable patients often stabilise with little intervention or are unstable for short periods during their stay in the ward ^[13, 54, 63, 64, 65, 66]. The next step in the afferent pathway is decision-making, which is a cognitive process depending on knowledge, experience, systems and communication with colleagues ^[67]. The final step is communication with

the RRT or other efferent limb systems. Bedside clinicians, whether nurses or junior doctors, often face system or institutional cultural barriers to making the call to RRT ^[55].

Rapid Response Teams: The efferent-limb is the rapid response team (RRT) ^[52]. Many factors influence the effectiveness of RRTs, such as the presence of a (critical care) physician in the team, and nurse access to higher-level support ^[63]. How often the RRT is called to assess a patient, which can be related to a metric called a 'dose' or the number of RRT called per number of patient admissions, is also important ^[68]. A minimum utilisation, or minimum dose, of at least 24 calls per 1,000 admissions, is missing many patients who could be saved. Hospitals with rapid response teams in place that have improved patient outcomes report RRT dose of between 25.8-56.4 calls per 1000 admissions ^[68]. The effectiveness of the track and trigger systems (medical emergency teams and rapid response systems) generally, has been questioned either because they are not used enough, and when the response teams are called it is often triggered by indicators not on the score chart ^[32,52,53,69]. Non-compliance with RRT protocols has been investigated. Most reasons offered for non-compliance with the RRT protocols appear reasonable, (sleep deprivation, patient's report of their distress/or lack of; patients with middle-range scores are the bulk of those on the 'watch-list') so reporting these to the doctors is considered disruptive. Surgical nurses have less urgency in treatment because, if the patient needs surgery, the patient needs to go to the theatre, and if there is no surgical condition, they should go somewhere else^[58]. Figure 1 illustrates the relationship between the afferent and efferent limbs of track and trigger systems.

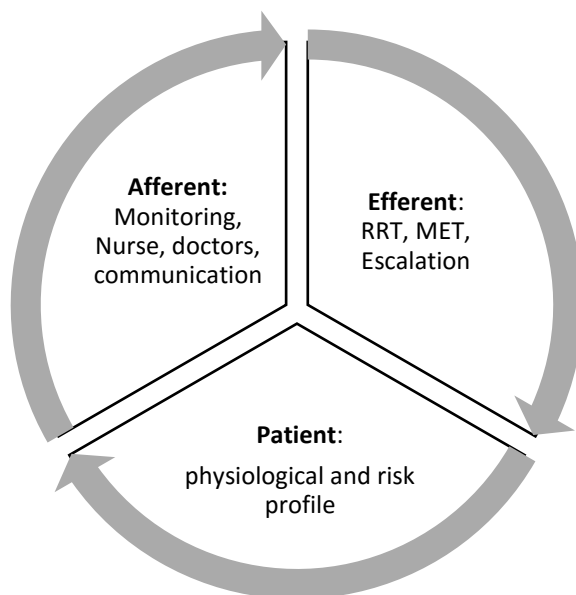


Figure 1: Diagram showing the relationship between the afferent and efferent limbs of the track and trigger systems.

Whether RRS are effective in improving patient outcome has been studied from several perspectives; observational, randomised controlled trials and population-based studies ^[53, 58, 68, 69, 70]. The general conclusion is that the level of evidence for benefit, although present is weak, meaning it is not level one in the evidence-based model of the hierarchy

of evidence. This is explained as due to the complexity of the RRS, which is situated within the complex environment of a hospital with a changing patient profile. Hospital patients today are older, with pre-existing morbidity, they are not necessarily 'sicker', but they will be found in all wards and all stages of care. So there is no single context for the RRS.

Failure to rescue: Failure to rescue (FTR) is another concept that has emerged in recent years. It refers to the number of patients who die of a complication compared to the total who develop it ^[55]. Hospitals with higher complication rates do not necessarily have higher mortalities because they may be more aggressive in 'rescuing' patients. FTR has an afferent-efferent limb analogous to early warning systems and is a track and trigger system as well. Escalation of care (EOC) is the afferent arm. It has been defined as the recognition and communication of patient deterioration leading to definitive management with the definitive management being the efferent arm. In their systematic review, all 42 papers by Johnson were from high-income countries, namely North America, Europe, Australia, and Japan. They identified delays in the escalation of care in 20 to 47% of patients between one and 56 hours. The reasons were similar to those for other track and trigger systems such as RRS, namely: failures in identifying patient deterioration, communicating such deterioration promptly and delayed response from decision-makers such as medical or senior staff ^[55]. The key, therefore, seems to depend on the quality of care, the afferent-efferent limb integrity and level of escalation of treatment.

Research Gaps

Validation of knowledge-test tools in local contexts is essential. In a study by Ebi et al. (2019) in Ethiopia on nurses' knowledge of pressure ulcers, they used a tool developed for Dutch hospitals in 2008^[71]. Such tools are often in languages other than the first language of the users in Africa, which imposes another burden of validating any translations before conducting the main study.

RRTs have been in existence for over 30 years with protocols, guidelines and standards in several countries requiring institutional compliance for accreditation. Many countries that have RRT/MET/ICU Outreach still report that a significant number of patients who need RRT intervention are not receiving it because the team is not called soon enough or at all. More research is required to explore what the barriers to change are (causes), what mechanisms and strategies can overcome them, particularly in a low resource setting ^[72]. There is little literature on the use of RRTs or efficacy of track and trigger systems like Early Warning System in Africa ^[73]. A pooled analysis by Moore et al. (2017) of data collected from other studies in several African countries was used to develop a Universal Vital Assessment for critically ill patients for Sub-Saharan Africa ^[73]. This was used to compare with EWS and the quick Sepsis-related Organ Failure Assessment (qSOFA). Wheeler et al., after testing EWS against another scoring tool, concluded that 'Local validation and impact assessment of these scores should precede their adoption in resource-limited settings' ^[74]. Recently, from the ASOS-1 data, a risk stratification tool based on prospectively collected African data has been developed, but more research can be done and is becoming possible ^[49].

Also, auditing of EWS has been used to strengthen the system of care, for example through modification of the system from regular intermittent monitoring to surveillance monitoring and improve identification of the hospital burden of critically ill patients. The system auditing is useful in advocating for more resources such as nurses, training opportunities and equipment.

They also reveal weaknesses in the system such as ineffective educational interventions, lack of institutional policies to support the system, poor implementation, variable acceptance into the local medical culture and many others, more of this need to be carried out in the resource-limited context of Africa ^[75].

The actual process by which nurses provide patient care, communicate with patients and transmit that to colleagues and, lastly, process information into decisions is a developing area. The result is that much of the understanding of failure to identify deteriorating patients by nurses is not complete ^[76]. The literature reports that there is a gap between what is taught (knowledge and skills) and what is practised and that this gap requires further research.

Research Question

Are nurses working at Universitas academic hospital adult surgical wards knowledgeable about clinical indicators of respiratory system dysfunction?

Aims

This study aims to evaluate the ability of surgical ward nurses to recognise abnormalities of the respiratory system when given a clinical scenario that describes such an abnormality.

Hypothesis

Nurses working in adult surgical wards at Universitas Academic Hospital have adequate knowledge about clinical indicators of respiratory system dysfunction.

Objectives

This study assesses the performance of the surgical ward nurses on the single best answer knowledge test based on respiratory dysfunction.

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Knowledge of respiratory dysfunction among nurses working in surgical wards at an academic hospital

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Abstract

Background: Clinical deterioration in ward patients leading to adverse events such as cardiac arrest, intensive care unit (ICU) admission and death is often preceded by respiratory dysfunction. Monitoring of ward patients is nurse-led; therefore, their knowledge and skill are crucial to identifying the deteriorating patient and to make decisions on escalating patient care.

Objectives: This study assesses the performance of the surgical ward nurses on a single best answer knowledge test based on respiratory dysfunction.

Method: Nurses working at an academic hospital surgical wards participated in this cross-sectional study from 20th to 26th April 2018. Data collection was done using a self-administered questionnaire with two sections: one section for demographic data and the second section consisted of nine (9) single best answer multiple-choice questions.

Results: Out of 95 ward staff, 78 were eligible to take part in the study. Of these, 50/78 (64%) agreed to take part and responded to the questionnaire and test. A desirable score of no more than two incorrect answers was set (77%), and this was achieved by 16 % of study participants. The lowest mark achieved was one correct out of 9 (11%), and the highest score was 8 out of 9 (89%), with a median mark of 5.0 and interquartile range 4.0-6.0.

Conclusion: There was a wide range of performance on the knowledge test by all grades of nurses, with only 16% scoring correctly on seven or more questions. Respiratory deterioration in surgical patients is poorly understood, and failure to diagnose it may be an important factor in the development of surgical complications leading to delayed intervention, morbidity and mortality. Although nurses are the first-line caregivers, the interventions are doctor-led, requiring a communication and action loop that involves a team and systems approach.

Knowledge of respiratory dysfunction among nurses working in surgical wards at an academic hospital

Background:

Clinical deterioration in ward patients leading to adverse events such as cardiac arrest, critical care admission and death is often preceded or accompanied by respiratory dysfunction^[1,2,3,4,5]. Effective observation of ward patients is the first step in early identification and intervention in the deteriorating patient and effectively managing care^[5, 6,7, 8]. The monitoring of patients on the ward is nurse-led, and the knowledge and skill of the nurse are crucial for the identification of the deteriorating patient and in the decision-making to escalate care of the patients which may prevent adverse events^[2, 5, 7, 9, 10, 11].

Respiratory dysfunction manifests itself as hypoxemia, dyspnoea, tachypnoea, bradypnoea, and respiratory acidosis^[3]. The ability to identify respiratory dysfunction accurately and correctly is essential if adverse events related to respiratory dysfunction are to be prevented. Nurses working in surgical wards deal with a range of causes of respiratory dysfunction such as patient factors, Opioid complications and postoperative complication making it essential for them to have good respiratory assessment skills^[12, 13, 14,15,]. Respiratory assessment and interpretation of abnormal signs is part of the undergraduate nurse training in South Africa^[16, 17, 18,]. We could not find literature published in the South African context that evaluated the baseline knowledge of respiratory dysfunction among surgical ward nurses. This study aims to assess the ability of surgical ward nurses to recognize abnormalities of the respiratory system when given a clinical scenario that describes such an abnormality.

Literature Review

The study of perioperative patient monitoring touches on a large number of areas in both nursing and medicine. These can be divided into factors relating to the patient, patient-nurse interaction, nursing process and institution. This study begins with the surgical nurse and extends into the related concerns.

Knowledge tests: There is a large body of literature on tests of knowledge and sometimes skills, applied to nurses in clinical settings^[19, 20, 21, 22]. The hypothesis is that a demonstration of required knowledge translates into good nursing care. However, such tests usually demonstrate less than expected knowledge or skill. However, the field of knowledge testing includes psychometric evaluation of the tests, self-assessment of the subjects, standardized tests and may include educational interventions^[23, 24]. The results of such knowledge tests may say more about the group tested or about the institutional environment than about the individual nurse.

Nurse qualifications: Several countries have national training frameworks for nurse training which have been evaluated to establish what competencies nurses are expected to have^[25, 26,27,28]. Degree programs lay a broad knowledge foundation which may be deficient initially in practical experience but develop with experience. Shorter diploma, work-based courses are rich in experience but have a weaker theoretical foundation. These factors have implications when thinking about knowledge testing and possible interventions. They may not correlate to the bed-side practice of the nurse or experience of the patient.

Nurse decision making: At the bed-side, in addition to the caring role, nurses monitor and document patient status. There is close nurse-patient interaction and clinical decision

making by the nurse. The close interaction gives the nurse an opportunity to sense or have an intuition about the general state of the patient, while the measurement of parameters provides evidence [7, 8, 9, 11, 29, 30, 31]. The literature documents that this is a challenging area where decision making is influenced by colleagues more than by evidence collected from measurement and prior events, such as spontaneous recovery from bradycardia, may influence the decision not to call for help [7,9,10,30]. The patient may influence the nurse's decision by reporting that they are 'fine' and do not want to make a fuss. The area of nurse decision-making is well studied, but this relies on nurses who are trained as 'carers', to be 'diagnosticians' because they are essentially left without close medical cover and have to 'call'. The use of protocols to guide decision-making improves the process, but again, literature shows, protocols are not followed, or patient measurements are not documented [32, 33, 34,35]. When staff are short and workload high, much of the nursing work is not recorded, and at-risk patients are overlooked. Workload and staff shortage are some of the institutional and environmental factors that act as a barrier or facilitator toward organisational changes [30, 36,37].

Track and trigger systems: Studies of the afferent limb of the Rapid Response Systems (RRS) examine the institutional factors, but because the nurse is the 'sensor' in the system, the focus tends to drift back to the nurse [32,38, 39]. Protocols have been developed so that they have triggers for activating the system [32, 38]. The vital signs may be one parameter, such as respiratory system, or several such as respiratory, cardiovascular and neurological. Despite this, activation remains unsatisfactory [30, 31, 36]. Metrics used to measure rapid response team (RRT dose) utilization such as calls per 1,000 admissions, have been developed in order to have targets to aim for [40]. One of the factors inhibiting activation of the afferent limb is communication between the nurse and the medical team [7, 11,30,32]. Calling the emergency team can be humiliating if they deem the patient is not in danger. On the other hand, the ward medical team are 'busy' and do not want unnecessary calls from the ward [30].

The concept of patient deterioration has evolved [1,2]. Current methods of physiological monitoring are based on the concept that clinical deterioration follows hours or days after physiological change and early correction averts morbidity and mortality. Research into early and improved detection of physiological change is increasing, particularly as there are now software systems that are stable in the face of artefacts from, for example, a patient's movement which made continuous monitoring difficult to interpret [31,38,41]. Also, the debate between intermittent, continuous and surveillance monitoring tries to understand which information is more useful in terms of patient outcomes [31, 41, 42]. Intermittent monitoring is often prescribed by the medical team, diagnosis or ward protocol. The discrete data points make it easy to understand and interpret. Continuous monitoring often provide an avalanche of data which may be challenging to explain, especially for the nursing team. Surveillance monitoring means the patient data is sent to the clinician wherever they may be and the team can make decisions remotely, this brings the medical team closer to the nursing team in the afferent limb.

Surgical Outcomes: The purpose of the whole exercise is to improve surgical outcomes. Surgical outcomes are becoming a focus of research, even in Africa [43,44, 45,46]. Complications should be prevented by anticipating them with safe and quality care, but when they do occur, they should be detected early, treated aggressively and mortality averted. An important metric, 'failure to rescue' (FTR), has been developed, and refers to the number of patients who die of a complication compared to the total who develop it.

Failure to rescue indicates how robust the afferent and efferent systems (RRS) in the organisation or culture is ^[30,39].

Method

Study design:

A prospective descriptive observational study from the 20th to 26th April 2018 was conducted. Ethical approval was obtained from the Health Science Research Ethics Committee of University of the Free State (HSREC182/2017-UFS-HSD2017/1550) and the Free State Department of Health (26/03/2018). Oral informed consent was obtained from the study participants after written, and verbal information was provided.

Study population:

Participants were enrolled nurses (EN), registered nurses (RN) and degree nurses (BSc) working in adult surgical wards. Enrolled Nurse and Registered Nurse are in-service trained nurses registered as such with the South African Nursing Council. The total number of nurses eligible for inclusion in the study was 95. There was no calculation of sample size. Nurses in critical care units, paediatric surgical wards and trainee nurses were excluded. Convenience sampling was used to enrol participants into the study. During the study, nurses worked in two shifts in 24 hours from 07.00-19.00 and 1900-0700 hours followed by seven days off duty. The study participants were enrolled from both shifts over one week of the study. Nurses who were on a shift at the time of conducting the study were given an information document to read, and if they did agree to take part in the study, they were given a questionnaire form to complete. Once completed, questionnaire forms were immediately placed in a box provided by the researcher.

Measurement:

Data was collected using a self-administered questionnaire with two sections; one for demographic information and the second with nine best answer multiple-choice questions each based on a clinical scenario as shown in table 1. This section was used to measure baseline knowledge of respiratory system abnormalities by the nurses. A Consultant Anesthesiologist and two (one RN and one EN) experienced nurses undertook a review of the questionnaire for both content and face validity, before submission for ethical committee review. A score of seven (7) out of nine was deemed the desirable level. A questioned left unanswered was marked wrong.

Table 1: Example of questions used in the knowledge test

Scenario	Answer options
5 A 23 year old patient had an exploratory laparotomy today in theatre. He received 8 mg intravenous morphine 2 hours ago. You find he has a respiratory rate of 9 breaths per minute and saturating at 90% on room air. Name the possible respiratory abnormality based on respiratory rate?	a) Hypoventilation b) Respiratory distress c) Apnoea d) Bradypnoea
Mantwa is a 25 year old patient going for the evacuation of the uterus for retained products of conception. Two hours ago, she was transfused two units of blood. She is	a) Hyperoxia b) Hypoxaemia c) Hypercarbia

7	restless, has a fever and blood-stained sputum. Her saturation in room air is 89%. What is her respiratory abnormality based on saturation reading?	d) Hypocarbia
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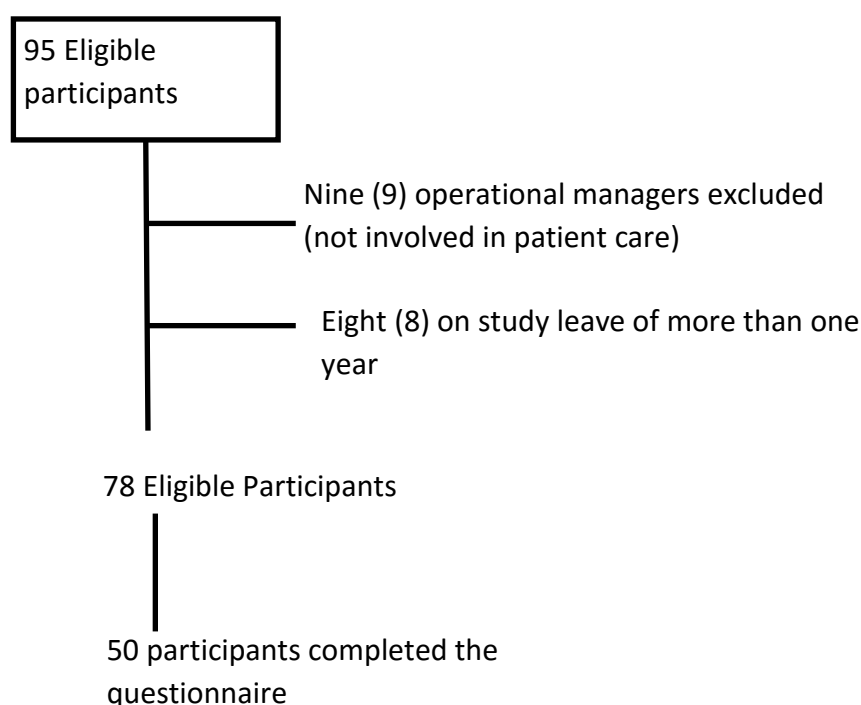
Statistical analysis

Data analysis was done by the department of Biostatistics, University of the Free State. Categorical variables were reported as frequencies and percentages. Numerical variables were summarized into median, interquartile ranges, lowest and highest marks attained.

Result

Of the 95 eligible ward staff, nine (9) were not involved in patient care, and eight (8) were away on courses for up to a year hence excluded from the study. Written, and in some cases, additional oral information (in response to questions and enquiries) was given to 50 of the 78 eligible staff of whom completed the questionnaire: a shown in figure 1.

Fig 1: Flow diagram showing recruitment of study participants.



Of the 50/78(64%) who completed the questionnaire, 30/50 (60%) were RN, 14/50(28%) were degree nurses with 45/50(90%) having five years or more years of experience (Table 2). Besides basic nursing training, 19/50(38%) had additional qualifications such as critical care, midwifery and surgical nursing, with 31/50(62%) having none. Figure 2 shows the total marks attained by participants according to their highest level of qualifications in nursing. Most study participants (80%) correctly identified respiratory abnormalities that resembled hyperventilation and tachypnoea. The lowest mark per question was for bradypnoea and airway obstruction with only 36% of correct responses

(Table 3). The median mark was 5.0 and interquartile range of 4.0-6.0. The lowest mark attained was 1/9 (11.1%) and the highest mark was 8/9(88.8%) as shown in figure 3.

Table 2 Biographical data of study participants

Q1Highest level of qualification	No of respondents (%)
Certificate	6(12)
Degree	14(28)
Diploma	30(60)
Q2Number of years of experience	No of respondents (%)
<1	5(10)
1-5	12(24)
6-10	8(16)
>10	25(50)
Q3Appointment level	No of respondents (%)
Enrolled nurse	8(16)
Registered nurse	7(14)
Professional nurse	35(70)
Q4Additional qualification	No of respondents (%)
Critical care trained	1(2)
Midwife trained	11(22)
Surgical nurse trained	6(12)
Midwife + surgical nurse trained	1(2)
None	31(62)

Fig 2: Score for each participant by their qualification

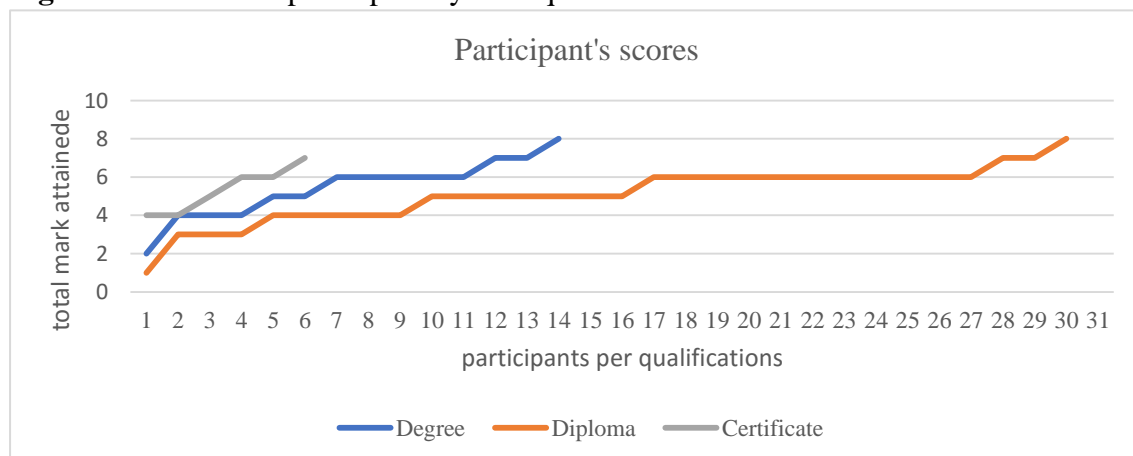
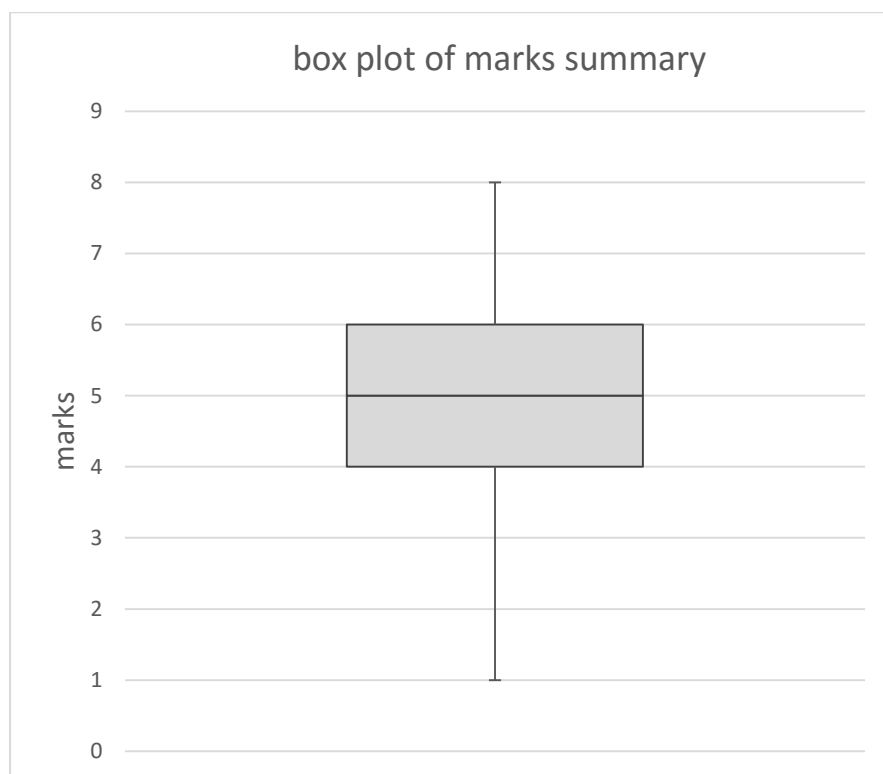


Table 3: Overall performance on each respiratory system abnormality in the test

Respiratory system abnormality	Number of respondents out of 50 (%)	Percentage of correct responses
Bradypnoea	50 (100%)	36
Hyperventilation	49 (98%)	80
Hypoxaemia	50 (100%)	56
Airway obstruction	50 (100%)	36
Tachypnoea	50 (100%)	80
Hypoventilation	50 (100%)	42
Respiratory distress	50 (100%)	74
Apnoea	50 (100%)	44
Bronchospasm	50 (100%)	72

Fig 3: Box plot summarizing the overall performance of study participants on the knowledge test



Discussion

Only 16 % of study participants were able to reach 77%, the score considered desirable. No published research specifically looking at knowledge of respiratory dysfunction among nurses working at surgical wards from the South African context could be found for comparison.

Respiratory dysfunction carries a significant risk of adverse events which impact patient safety. The ASOS-1 study showed that inadequate postoperative monitoring lead to increased mortality^[45]. In low and medium-income countries, with insufficient staff numbers and not enough resources to invest in monitoring equipment, one needs teamwork and maintenance of good clinical skills by medical staff to decrease mortality.

As the demand for intensive care unit services increases^[43,44] critical and high dependency patients are being nursed in general wards where their baseline clinical condition will not meet the profile of a typical stable surgical ward patient^[46,47]. This diverse patient profile nursed in general nursing wards may require that nurses be equipped with core assessment skills, including in respiratory system assessment and monitoring^[6]. The scope of practice of both enrolled nurses (the nursing act of 1978) and professional nurses is to provide comprehensive care and ensure the safe implementation of care (according to the nursing act of 2005). Assessment of patients is one of the several factors that contribute to the recognition of patient deterioration, and is one of the

fundamental roles of the nurses as they constantly monitor and document hospitalised patient's findings.

Our study did not look at surgical ward nurses test performance in relation to increase in years of nursing experience. The low number of participants who passed the set competency mark can be addressed through cycles of training and supervision using real patients, simulation and exercises. Enrolled nurses report to the registered nurses who provide supervisory roles as required by the Nursing Act of 2005. Clinical support, mentorship from nursing colleagues and continuous professional development is essential in nursing care in order to respond timely to clinical deterioration and to strengthen nurse confidence to seek assistance ^[7, 11, 37].

Numerous factors contribute to failure to rescue deteriorating patients in surgical wards, including delayed escalation of care and communication between team members, especially between different professionals making up the care team ^[7, 30, 32, 36, 37]. Rapid Response Teams aim to reduce "failure to rescue" deteriorating inpatients and manage unstable ward patients to prevent serious adverse events ^[39]. Traditionally help is requested when patients have already developed a cardiac arrest or respiratory arrest. The teams may be comprised of intensive care nurses, critical care medicine registrar and others. Their effectiveness depends on accurate monitoring of patient's vital signs and ability to escalate care of the identified deteriorating patients ^[40]. Tools to predict adverse outcomes have been developed, and their use has been aimed at early recognition of clinical deterioration and to communicate it with little ambiguity. Early warning score systems and the ASOS surgical risk calculator are some of the examples.

Early warning scores (EWS) are track and trigger system tools for informing the rapid response team with an intent to escalate patient management ^[32,38]. They may use a single parameter or multiple parameters which are then aggregated into a single number. Different early warning scores are used in practice. An example is the National Early Warning Score (NEWS), which is comprised of seven parameters (respiratory rate, oxygen saturation, systolic blood pressure, pulse rate) and a weighted score on oxygen supplementation ^[49]. The national early warning score has set trigger levels for clinician's assessment, the urgency of clinical response and the clinical competency of the responder. The set criteria in Early Warning Score eliminates the ambiguity in communicating patient deterioration, resulting in structured and organized response to patient care.

The ASOS surgical risk calculator is another example of a tool formulated to identify patients at risk of a serious post-operative adverse event and mortality ^[50]. Formulated in response to the findings of the ASOS study, it is aimed at identifying patients at risk of serious postoperative complications and death in a resource-constrained environment. The ASOS surgical risk calculator score is based on three different indicators: population (age), risk profile (ASA status) and surgical factors (timing of surgery, surgery severity, indication for surgery, surgery type). A score of 10 or more indicates a patient at risk and vigilance and resources can be directed towards them.

Conclusion

Respiratory deterioration is an important factor in surgical complications leading to increased morbidity and mortality. Nurses are the principal caregivers and monitors of patients on the ward, and their basic knowledge of indicators of respiratory failure was

tested using nine scenarios and single best answer questions as a surrogate for the ability to identify a patient at risk. There was a wide range of performance by all grades of nurses, with only 16% scoring correctly on seven questions. Nurses do not work alone on the ward and are part of a team including doctors, physiotherapists and others, who were not part of the study. The institution does not use tools such as early warning scores or risk scoring to identify patients at risk and therefore invest in increased observation and monitoring.

The study identifies a definite gap in the ward care of surgical patients that can be addressed through quality improvement interventions, improved team communication and regular cycles of training in basic knowledge and skills.

Strength of the study

The study included nurses who are involved in patient care daily. All grades of nurses on the wards were included, which reflects daily patient care. The senior nurses serve as both supervisors to the junior nurses and are also involved in the assessment of patients, decisions on the need for escalating treatment and inter professional communication. The response rate of the study participants was 64%, which is good for an institutional response. Though the results could not be generalized, a definite gap was identified in ward care of surgical patients that can be addressed through the use of monitoring tools, training in inter professional communication and introduction of quality improvement exercises.

Anonymous data collection: waiver for informed consent strengthened the anonymous data collection. Participants were further informed that their completed questionnaire would be placed into a sealed box by themselves. This could have resulted in voluntary participation as no nurse who was approached refused to take part in the study

Weakness of the study

Selective study population – the study focused only on nurses working in surgical wards without considering the interactions with other professionals such as the doctors. This is the first study in our institution, and possibly the country to look specifically at the knowledge of respiratory dysfunction among surgical ward nurses. The study did not include observing the nurses while they carried out respiratory assessments on patients therefore, the study couldn't be extrapolated to skill and management capabilities of the nurses on the ward.

Further research

The effect of regular training in the assessment of clinical parameters, using both paper-based clinical scenarios and simulations would be of interest to track how quickly knowledge and skills degrade or are sustained after qualifying. There is a body of literature on how long clinical skills like cardiorespiratory resuscitation, emergency obstetric care and others are retained after initial acquisition.

Research is needed to understand how nurses communicate patient's deterioration where there is no early warning scores and track and trigger systems. This is important because, for example, doctors may not spend much time on the wards post ward-rounds, making their availability and therefore, communication limited.

Recommendations

Health care institution: At the time of the study, there was no track and response system such as Early Warning Scoring. Continued professional development that focusing on

the identification of deteriorating patients and their rescue before developing an adverse event is essential. The hospital may consider introducing early warning scores, as part of in-hospital patient documentation and as part of the assessment for deteriorating patients.

Quality improvement: Quality improvement activities that focus on clinical surgical outcomes and perioperative care would help to focus attention.

Conflict of interest:

The authors have no conflict of interest to declare.

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Appendices

Appendix A: Letter of approval from Research Ethics Committee



Health Sciences Research Ethics Committee

12-Apr-2018

Dear Miss Gaone Kediegile

Ethics Clearance: Knowledge of respiratory dysfunction among nurses working in surgical wards at Universities academic hospital

Principal Investigator: Miss Gaone Kediegile

Department: Anaesthesiology (Bloemfontein Campus)

APPLICATION APPROVED

Please ensure that you read the whole document

With reference to your application for ethical clearance with the Faculty of Health Sciences, I am pleased to inform you on behalf of the Health Sciences Research Ethics Committee that you have been granted ethical clearance for your project.

Your ethical clearance number, to be used in all correspondence is: **UFS-HSD2017/1550**

The ethical clearance number is valid for research conducted for one year from issuance. Should you require more time to complete this research, please apply for an extension.

We request that any changes that may take place during the course of your research project be submitted to the HSREC for approval to ensure we are kept up to date with your progress and any ethical implications that may arise. This includes any serious adverse events and/or termination of the study.

A progress report should be submitted within one year of approval, and annually for long term studies. A final report should be submitted at the completion of the study.

The HSREC functions in compliance with, but not limited to, the following documents and guidelines: The SA National Health Act No. 61 of 2003; Ethics in Health Research: Principles, Structures and Processes (2015); SA GCP(2006); Declaration of Helsinki; The Belmont Report; The US Office of Human Research Protections 45 CFR 461 (for non-exempt research with human participants conducted or supported by the US Department of Health and Human Services- (HHS), 21 CFR 50, 21 CFR 56; CIOMS; ICH-GCP-E6 Sections 1-4; The International Conference on Harmonization and Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH Tripartite), Guidelines of the SA Medicines Control Council as well as Laws and Regulations with regard to the Control of Medicines, Constitution of the HSREC of the Faculty of Health Sciences.

For any questions or concerns, please feel free to contact HSREC Administration: 051-4017794/5 or email EthicsFHS@ufs.ac.za.

Thank you for submitting this proposal for ethical clearance and we wish you every success with your research.

Yours Sincerely

Dr. SM Le Grange

Chair : Health Sciences Research Ethics Committee

Health Sciences Research Ethics Committee

Office of the Dean: Health Sciences

T: +27 (0)51 401 7795/7794 | E: ethicsfhs@ufs.ac.za

IRB 00006240; REC 230408-011; IORG0005187; FWA00012784

Block D, Dean's Division, Room D104 | P.O. Box/Postbus 339 (Internal Post Box G40) | Bloemfontein 9300 | South Africa



Information document

KNOWLEDGE OF RESPIRATORY DYSFUNCTION AMONG NURSES IN SURGICAL WARDS UNIVERSITAS HOSPITAL

My name is Gaone Kediegile. I am an anaesthetic registrar at the University of the Free State doing 4th year of Mmed in Anaesthesia programme. It is a requirement as part of the training to complete a research module and as such undertaking the above mentioned study which will be involving the in service enrolled and registered nurses of all cadres working at adult surgical wards at Universitas hospital excluding critical care units and pediatrics surgical wards.

This study is to understand the knowledge of respiratory dysfunction among registered nurses working at surgical wards at Universitas academic hospital. The study will be carried out for the duration of a week. No remuneration will be offered towards participation in the study and the participation is voluntary. You are informed that you may voluntarily withdraw from participation at any time.

You are being asked to be part of the study which will enroll only willing participants. Convenience sampling is the method used to recruit study participant. I am the principal investigator and will be responsible for collecting data.

Please carefully read the summary below regarding the research

A) Voluntary participation

Your participation in this research is completely voluntary. Should you wish to participate a ten point questionnaire will be given to you to answer .Should you not wish to participate the decision will not in any way affect your employment or service delivery.

Description of the process

- The study will take place in April 2018 and expected to be completed within a week from commencement.
- Permission has been requested to conduct this research among nurses from the Free State Department of Health, (Dr Motau) and Nursing Manager; Universitas Academic Hospital (Matron Modisapoli).
- Data will be obtained from the study participant at the hospital either after reporting for duty or before knocking off from duty. The questionnaire will be completed immediately and placed in a box provided by the researcher.

B) Anonymity

The information collected during the research is anonymous. No identifiable information will be collected during the research process. The questionnaire document will not collect any personal data that may lead to recognition of study participants. As this study will not be comparing wards against each other the demographic information will just be used for statistical purposes only and measures will be taken to ensure there is no link between the information collected and the individual study participant. The results of this research may be published, presented at meetings and conferences.

C) Duration

The questionnaire is once off and answering the questionnaire will be estimated to take around 10-15 minutes.

The study will contribute to local medical literature and also give an idea of how we should recommend the improvement of nurse knowledge depending on the results of the study. From the researcher's perspective the study will be used for the MMed dissertation.

You have been informed about the study by Gaone Kediegile, my contact details are listed below and you can contact me at any time for more information regarding the study. You may contact the secretariat of the Health Science Research Ethics Committee of the UFS at telephone number 0514052812 if you have questions about your right as a study participant

The results will be availed to the participants upon request.

Contact details of the principal researcher for further information or reporting of study related adverse events

Gaone Kediegile-0818974870. gkediegile@yahoo.co.uk

Contact details of secretarial chair: Health Sciences Research Ethics Committee of the UFS-for reporting of complaints /problems

Telephone number (051)401 7795

Appendix C: Permission from Free State Department of Health



health

Department of
Health
FREE STATE PROVINCE

26 March 2018

Mrs. G Kediegile
Dept. of Anaesthesiology
UFS

Dear Mrs. G Kediegile

Subject: Knowledge of respiratory dysfunction among nurses working in surgical wards at Universities academic hospital

- Please ensure that you read the whole document, Permission is hereby granted for the above – mentioned research on the following conditions:
- Participation in the study must be voluntary.
- A written consent by each participant must be obtained.
- Serious Adverse events to be reported to the Free State department of health and/ or termination of the study
- Ascertain that your data collection exercise neither interferes with the day to day running of the Universitas Hospital nor the performance of duties by the respondents or health care workers.
- Confidentiality of information will be ensured and please do not obtain information regarding the identity of the participants.
- **Research results and a complete report should be made available to the Free State Department of Health on completion of the study (a hard copy plus a soft copy).**
- Progress report must be presented not later than one year after approval of the project to the Ethics Committee of the University of Free State and to Free State Department of Health.
- Any amendments, extension or other modifications to the protocol or investigators must be submitted to the Ethics Committee of the University of Free State and to Free State Department of Health.
- **Conditions stated in your Ethical Approval letter should be adhered to and a final copy of the Ethics Clearance Certificate should be submitted to sebeclats@fshealth.gov.za before you commence with the study**
- No financial liability will be placed on the Free State Department of Health
- Please discuss your study with the institution manager/CEOs on commencement for logistical arrangements
- Department of Health to be fully indemnified from any harm that participants and staff experiences in the study
- Researchers will be required to enter in to a formal agreement with the Free State department of health regulating and formalizing the research relationship (document will follow)
- You are encouraged to present your study findings/results at the Free State Provincial health research day
- Future research will only be granted permission if correct procedures are followed see <http://nhrd.hst.org.za>

Trust you find the above in order.

Kind Regards

Dr D Motau

HEAD: HEALTH

Date: 29/03/18

Head : Health
PO Box 227, Bloemfontein, 9300
4th Floor, Executive Suite, Bophelo House, cnr Maitland and, Harvey Road, Bloemfontein
Tel: (051) 408 1646 Fax: (051) 408 1556 e-mail: khusem@fshealth.gov.za / chikobvup@fshealth.gov.za

www.fs.gov.za

Appendix D: Permission from nursing manager Universitas Academic Hospital

LETTER REQUESTING PERMISSION TO CONDUCT RESEARCH STUDY

To: Nursing Manager
Universitas Academic Hospital
P O Box 20660
Bloemfontein

RE: REQUEST FOR A PERMISSION TO CONDUCT A STUDY AT UNIVERSITAS HOSPITAL

Researcher's contact details: Gaone Kediegile
0818974870/0780339543
Department of Anaesthesia – MMed Registrar

Brief description of the study

I would like to request a permission to carry out a prospective qualitative study among nurses working in general surgical wards excluding surgical intensive care units and pediatric ward and pediatric intensive care unit.

The study is to assess knowledge among nurses of respiratory dysfunction and recognition. There will be a questionnaire with patient's scenario (not real patient) and the respondent will be expected to mark the most appropriate answer to pertaining to the scenario. The data collection will not have any identifiable data and confidentiality will be ensured. No compensation will be offered to the respondents and the questionnaire has about 15 questions of which to answer will take approximately 15 minutes. Sampling will be on convenience sampling at number of respondents will depend on available respondents. The result of the study will be used as part of my MMed research module and may be shared with others via publishing or presentation at conferences or meeting.

The following wards will be involved in the study – nurses working in this ward

- Ward - Orthopedic ward 3B
- ENT ward 8B
- Plastic, Urology 5B
- Cardiothoracic ward 4B
- Neurosurgery ward 6B
- Vascular surgery 7A
- General surgery 7B
- Ophthalmology ward 26
Gynaecology ward

Thank you.

Yours sincerely

Gaone kediegile

Kediegile
08142117.

*Request acknowledged and
permission granted provided
Feedback is given to the
institution.*

*Request to be presented to
CEO - SP*



Appendix E: Response to request for permission - CEO Universitas Academic Hospital



health

Department of
Health
FREE STATE PROVINCE

17 January 2018

Dr Gaone Kedlegile
Department of Anaesthesia
School of Medicine
Faculty of Health Sciences
Box 339
BLOEMFONTEIN
9300

Dear Dr Kedlegile

**REQUEST FOR A PERMISSION TO CONDUCT A STUDY AT
UNIVERSITAS ACADEMIC HOSPITAL**

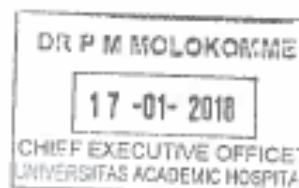
Your letter dated 8 December 2017 with regard to the abovementioned bears reference.

Please note that this institution needs approval from the Head: Health.

Hope you find this in order.

Kind regards


DR P M MOLOKOMME
CHIEF EXECUTIVE OFFICER



UNIVERSITAS ACADEMIC HOSPITAL

Private Bag X20660, Bloemfontein, 9300
Room 1129, First Floor, Logeman Street, Universitas, Bloemfontein, 9301
Tel: (051) 405 3557 Fax: (051) 444 0792
E-mail address: molokompm@universitas.fs.gov.za

Appendix F: Copy of research protocol approved by the HSREC

Knowledge of respiratory dysfunction among nurses working in surgical wards at
Universitas academic hospital

Kediegile, Gaone (Dr.)

Supervisor: Prof Kachelhoffer

Department-Anaesthesia

Year of study_4th Mmed

Protocol

Knowledge of respiratory dysfunction among nurses working in surgical wards at Universitas academic hospital

PROBLEM

Effective observation of ward patients is the first step in identifying deteriorating patient and effectively managing care. Clinical indicators of respiratory system deterioration precede adverse event such as cardiac arrest, critical care admission and in-hospital death according to literature. In Universitas academic hospital: surgical wards admit patients during peri operative period and act as a step down for patients who are discharged from surgical intensive care units. These surgical wards also admit patients who would have been admitted to intensive care units peri -operatively, but lacked intensive care beds. As such the patient who are admitted in our standard surgical ward are at higher risk of having respiratory system deterioration and nurse assessment should also focus on this system. Review of the inpatient hospital vitals chart at Universitas Hospital has revealed that only respiratory rate has been included as part of the standard vitals chart used by the nurses.

Introduction

The vital first phase of nursing process assessment consists of the patient history, physical examination and laboratory studies. The other nursing process phases –diagnosis formation, outcome identification, care planning, implementation depend on the quality of the assessment data for their effectiveness¹.

The presence of respiratory dysfunction is a known precursor to adverse events and the presence of respiratory dysfunction prior to adverse events is associated with increased mortality^{2,3,4}. Increased demand for intensive care beds and unplanned intensive care unit admissions^{5,6} will result in more sicker patients nursed in standard surgical wards.

Nurses are in a pivotal position to detect and report respiratory dysfunction and adverse events. Their ability to identify respiratory dysfunction accurately and correctly is essential if adverse events related to respiratory dysfunction are to be prevented⁷. From the trauma patient with multiple fractured ribs and broken limbs in the orthopedic area to the elective surgery patient with asthma or COPD, the value of the inclusion of comprehensive respiratory assessment skills in a ward nurses' repertoire is becoming important. When these skills include the accurate assessment of respiratory rate, work of breathing and auscultation together with the measurement of oximetry the improvement of health outcomes is significant³. On the other hand barriers to incorporation of respiratory assessment in nursing practice have been found to relate to lack of confidence in ability to competently perform physical assessment, lack of understanding of physical assessment to clinical application and even lack of time to implement new practices⁸.

Respiratory assessment and interpretation of abnormal signs is part of the undergraduate nurse training in south Africa^{9,10,11}. There has not been any literature published in the South African context that evaluated the base knowledge of respiratory dysfunction among surgical ward nurses.

Key words

Respiratory dysfunction: clinical abnormalities of respiratory system such as Hypoxaemia, dyspnea, Tachypnoea, Bradypnoea, acidosis.²

Adverse event –an injury related to medical management, in contrast to complication of the disease. Medical management includes all aspect of care, including diagnosis and

treatment, failure to diagnose or treat, and all the systems and equipment used to deliver care. Adverse event may be preventable or not preventable¹².

Aim of the study

To assess base knowledge regarding respiratory dysfunction among enrolled and registered nurses working in standard surgical wards at Universitas Academic Hospital. The specific objective is to evaluate if the nurses will recognize abnormalities of the respiratory system namely respiratory rate, bronchospasm, hypoventilation, hyperventilation, respiratory distress, Hypoxaemia, airway obstruction when given clinical scenario that describe such an abnormality.

Methods

Study design:

A prospective descriptive study will be carried out. The period of data collection will be made as short as possible (1 week) to avoid content disclosure to other potential participant with possibility of influence on actual results.

Population and sample:

Participants of the study will include enrolled and registered nurses working at adult surgical wards at Universitas academic hospital. Exclusion will be Pediatrics surgical and critical care (ICU) unit nurses. Student nurses undertaking undergraduate nursing training will also be excluded. An Enrolled nurse and Registered nurse will be regarded as an in-service nurse registered with the South African Nursing council as per their qualifications. The total number of nurses eligible for inclusion into the study is 95. There was no calculation of sample size. The researcher has been advised to include all the eligible nurses in the study population by the biostatistician from the department of biostatistics.

Measurement:

A questionnaire with two sections will be used. Section one will be demographics of the participants and Section two is nine multiple choice questions with one valid answer. The nine questions will be used to measure the knowledge of respiratory system abnormalities by the nurses. Nurses will be given the questionnaire at the start of a shift (morning for day shift and evening for night shift staff) of data collection by way of convenience sampling by the researcher. The questionnaires will be filled immediately and then placed in a box that will be provided by the researcher. A copy of the questionnaire is attached to this protocol.

Methodological and measurement errors:

- a) Bias-there may be bias in participants sampling and voluntary participation which can affect the results with less knowledgeable potential participants not taking part in the study. The researcher will not force or coerce any participant to take part in the study
- b) Confounding factors: The researcher has not identified any confounding factors that may arise during the study.

Pilot study

There will be no pilot study carried out as the study population is small which could lead to content disclosure of the questionnaire to other nurses by those who are enrolled in the

pilot study. The researcher could not find alternative suitable populations to enroll in the pilot study as the contents of the questionnaire are specific for surgical ward scenario. The researcher has opted to have questionnaire validity performed by two experienced nurses.

Validity:

The questionnaire has been formulated as per the course objectives of the undergraduate nursing training programme textbooks used in South Africa as recommended by the lecturers. Review of the questionnaire was also undertaken by my study supervisor (professor in anaesthesia) and two nurses before submission for ethical committee review. One of the nurses is a registered nurse for seven years and the second nurse had an experience as an enrolled nurse for 11 years and as registered nurse for 4 years and both currently practicing. The questionnaire was reviewed both for content and face validity.

Competency indicator –competency indicator is set at 77 percent of the nine clinical scenarios on section 2 of the questionnaire.

Data analysis

Data analysis will be done in conjunction with the biostatistician from the department of biostatistics, University of the Free State. Data will be provided in excel format to the biostatistician for analysis. Results will be reported in terms of bar graphs and tables.

Implementation of findings

The study results will be made available to the Universitas academic hospital management. The study results are expected to contribute positively to patient care by providing information that can be used for clinical audit, incorporate into planning for quality assurance and need for structured continued professional development of the nurses.

Time schedule

The study will approximately be completed in 4 months. Data collection is planned to be done in a maximum of a week with the researcher collecting data twice in a day (two nurse shifts currently are in place) which is planned to be commenced on the 1st of April to 7th of April 2018. Data analysis will be done with the help of biostatistics department personnel and submission of data for analysis will be 20th April 2018. Writing up of the report will be done by the researcher.

Budget

The total budget for the study is R945.50 and will be funded by the department of anaesthesia.

Ethical considerations

The proposal will be submitted to the Health Science Research Ethics Committee of the UFS for approval. Consent will be obtained from Head of department of Health (Dr Motau) and Nursing Manager (Matron Modisapoli) for the conduction of study among the nurses .**The questionnaire is anonymous and an informed consent will not be obtained.** An information document will be provided to each nurse prior to filling the questionnaire. A copy of the information document is attached to this protocol.

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osp.od.nih.gov/sites/default/files/resources/reporting_Guidelines.pdf

Appendix G: Forms for collecting data – Questionnaire

Questionnaire

Knowledge of respiratory dysfunction among nurses working in surgical wards at Universitas academic hospital

You have been asked to participate in a research study. Please note; by completion of this questionnaire you are voluntarily agreeing to participate in this research study. You will remain anonymous and no personal data will be collected. You may withdraw from this study at any given moment during the completion of the questionnaire. The questionnaire comprises of two parts; biographical data and patient scenarios. There is only one correct answer on the question from 5-13 which best suits the scenario. The results of the study may be published and will be used for my MMed mini dissertation.

SECTION 1

For Official use only

Biographical data	Participant number
(NB: Please tick the correct option)	
1. Highest level of qualification in nursing	
<input type="radio"/> Certificate	
<input type="radio"/> Diploma	
<input type="radio"/> Degree	
2. Years of practice	
<input type="radio"/> < 1 year	
<input type="radio"/> 1-5	
<input type="radio"/> 6-10	
<input type="radio"/> >10	
3. Appointment level (current)	
<input type="radio"/> Enrolled nurse	
<input type="radio"/> Registered nurse	
<input type="radio"/> Professional nurse	

4. Any other qualifications

- ☐ Critical care trained
☐ Midwifery trained
☐ Surgical nurse trained
☐ Theatre technique trained
☐ None

☐

7

SECTION 2

Official use only

NB: (Please circle the one most correct answer)

5. A 23 year old patient was done exploratory laparotomy today in theatre. He received 8 mg intravenous morphine 2 hours ago .You find he has a respiratory rate of 9 breaths per minute and saturating at 90% on room air. Name the possible respiratory abnormality based on respiratory rate?

- a) Hypoventilation
b) Respiratory distress
c) Apnoea
d) Bradypnoea

6. You are nursing a 42 year old female patient after open reduction internal fixation of right femur. On examination she has rapid and deep respirations. What is the finding based on respiratory rhythm and depth?

- a) Hypoventilation
b) Hyperventilation
c) Eupnoea
d) Bradypnoea

7. Mantwa is a 25 year old patient going for evacuation of the uterus for products of conception. Two hours ago she was transfused two units of blood. She is restless, has fever and blood stained sputum. Her saturation in room air is 90%. What is her respiratory abnormality based on saturation reading?

- a) Hyperoxia
b) Hypoxaemia
c) Hypercarbia
d) Hypocarbia

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8. Raleboga is 35 years old. He is admitted from theatre after evacuation of an intracranial bleed. On examination he is found to have a GCS of 6/15, stridor, collapse of chest wall and protrusion of abdomen with each inspiratory effort. Bilaterally you cannot auscultate breath sound and saturates at 75% on room air. From your assessment Raleboga has _____?

- a) Apnoea
- b) Airway obstruction
- c) Bronchospasm
- d) Hypocarbica

9. Dineo was diagnosed with a pneumothorax and an intercostal drainage tube inserted. She complained about chest pain. Paracetamol and tramadol were administered 30 minutes ago. You record her respiratory rate to be 26 breaths per minute. What is her respiratory rate abnormality?

- a) Tachypnoea
- b) Hypoventilation
- c) Eupnoea
- d) Bradypnoea

10. You are nursing a 42 year old Mrs Edna after right hip replacement under epidural anaesthesia and the infusion was continued post operatively for anaesthesia. On examination she has rapid shallow breaths with decreased chest movement. Her sensory level is at T4. Please name her respiratory evaluation finding based on respiratory depth and rhythm:

- a) Hypoventilation
- b) Hyperventilation
- c) Eupnoea
- d) Apnoea

11. Raleboga is 35 years old. He is admitted after a motor vehicle accident and sustained bilateral femur fractures, 4 ribs fractures on the right. On examination he complains of dyspnea, has respiratory rate of 30 breaths per minute, cyanosis, with use of neck, shoulder and abdominal muscle during breathing. Please name his respiratory evaluation finding:

- a) Hyperoxia
- b) Hypocarbica
- c) Eupnoea
- d) Respiratory distress

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14

12. Jennifer is 23 years old. She has been done caesarean section under spinal anaesthesia (12.5 mg bupivacaine with dextrose) 60 minutes ago. You find her unresponsive, not breathing and pale. Please name her respiratory system evaluation finding

- a) Bradypnoea
- b) Apnoea
- c) Hypoxia
- d) Hypoventilation

13. Mr Burger is 74 years old heavy smoker who was admitted with a history of dyspnea. You are preparing him for a theatre as he is scheduled for a diagnostic procedure and you noticed his condition changed. His respiratory rate is 38 breaths per minute, he is cyanosed and you auscultate his lungs and hear inspiratory and expiratory wheezes. You call for help. Name his respiratory evaluation finding

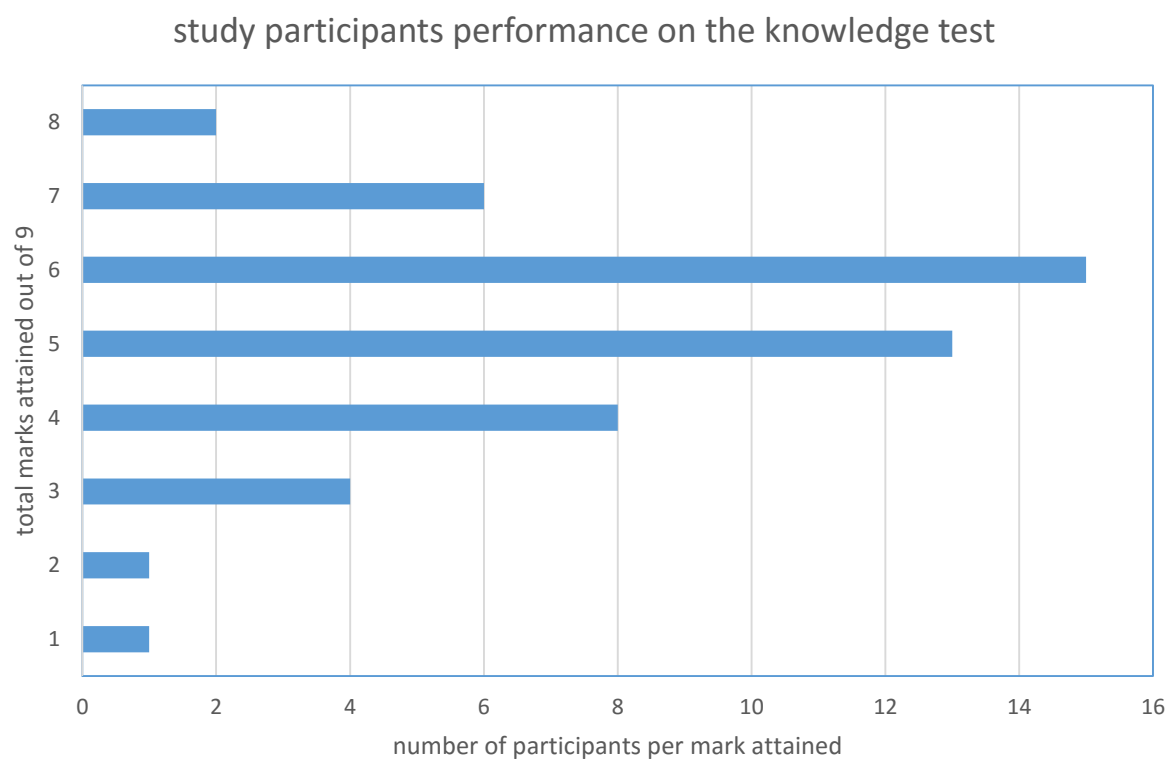
- a) Eupnoea
- b) Bronchospasm
- c) Laryngospasm
- d) Bradypnoea

15

16

Appendix H: Supplementary tables and graphs

Bar chart 1: Cumulative marks attained by study participants



Supplementary graphs showing different responses to each question from question 5-13. Red represents the correct response while blue is the incorrect responses.

Question 5

A 23 year old patient was done laparotomy today in theatre. He received 8 mg intravenous morphine 2 hours ago. You find he has a respiratory rate of 9 breaths per minute and saturating at 90% on room air. Name the possible respiratory abnormality based on respiratory rate?

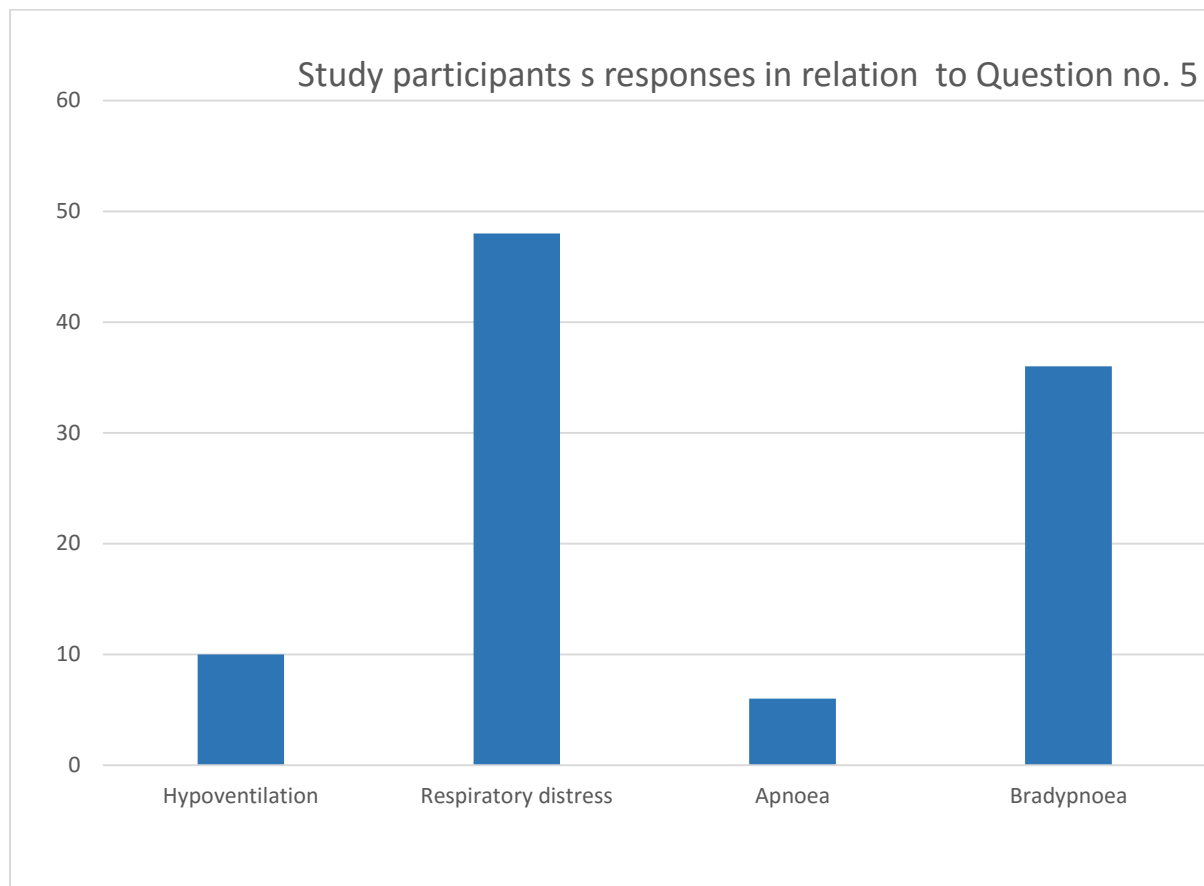


Fig 4: study participant different responses to a clinical scenario about bradypnoea. Only 36 percent of participants correctly answered the question.

Question 6

You are nursing a 42 year old female patient after open reduction internal fixation of right femur. On examination she has rapid and deep respirations. What is the finding based on respiratory rhythm and depth?

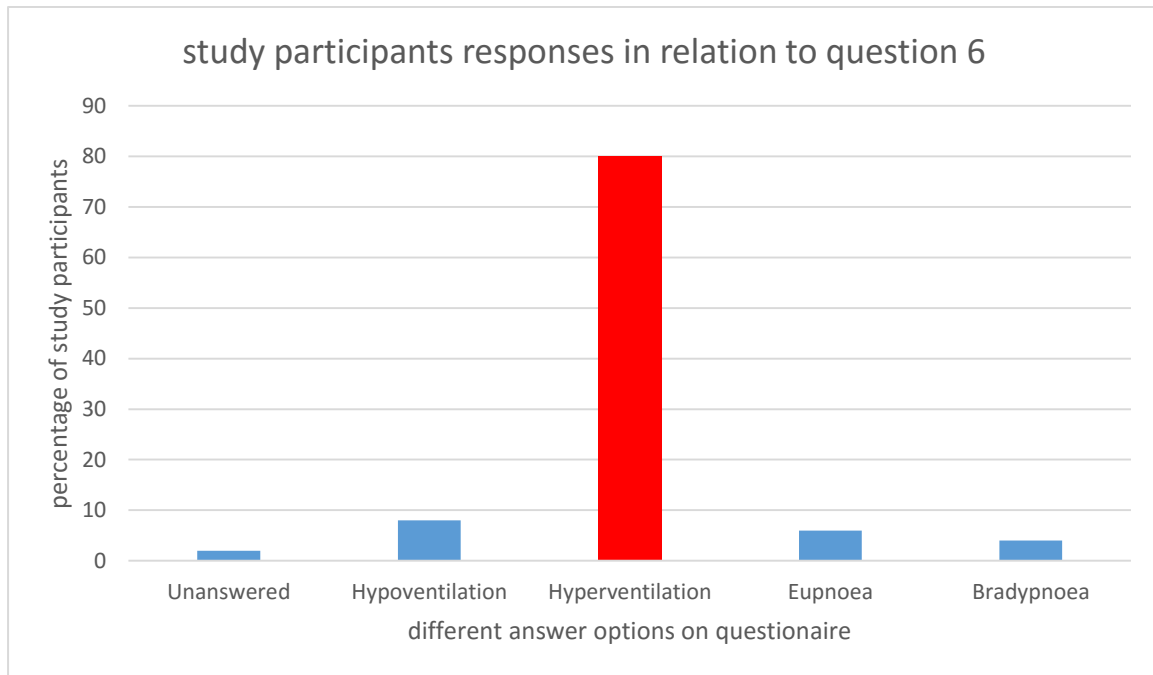


Fig 5: Study participants' responses to clinical scenario about hyperventilation. 80 percent of study participants correctly identified the correct answer.

Question 7

Mantwa is a 25 year old patient going for evacuation of the uterus for retained products of conception. Two hours ago she was transfused two units of blood. She is restless, has fever and blood stained sputum. Her saturation on room air is 89%. What is her respiratory abnormality based on saturation reading?

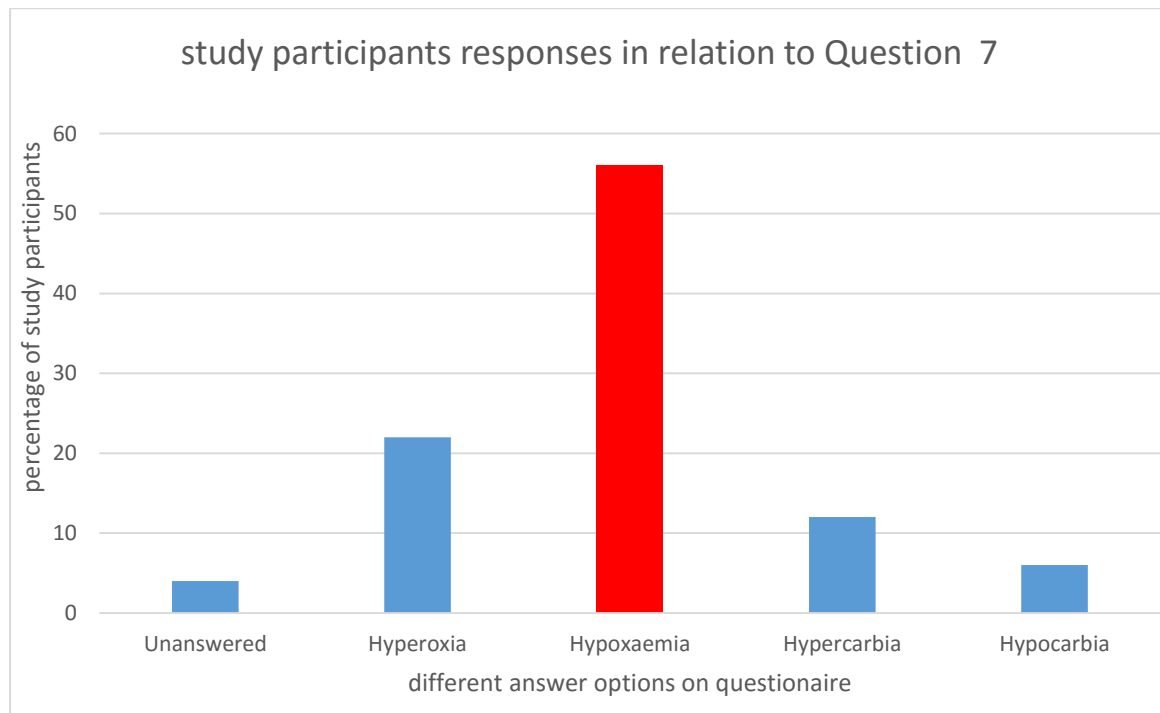


Fig 6.study participants' responses to a clinical scenario about hypoxaemia.56 percent of study participants correctly answered the question.

Question 8

Raleboga is 35 years old. He is admitted from theatre after evacuation of an intracranial bleed. On examination he is found to have a GCS of 6/15, stridor, collapse of chest wall and protrusion of abdomen with each inspiratory effort. Bilaterally you cannot auscultate breath sound and saturates at 75% on room air. From your assessment Raleboga has _____?

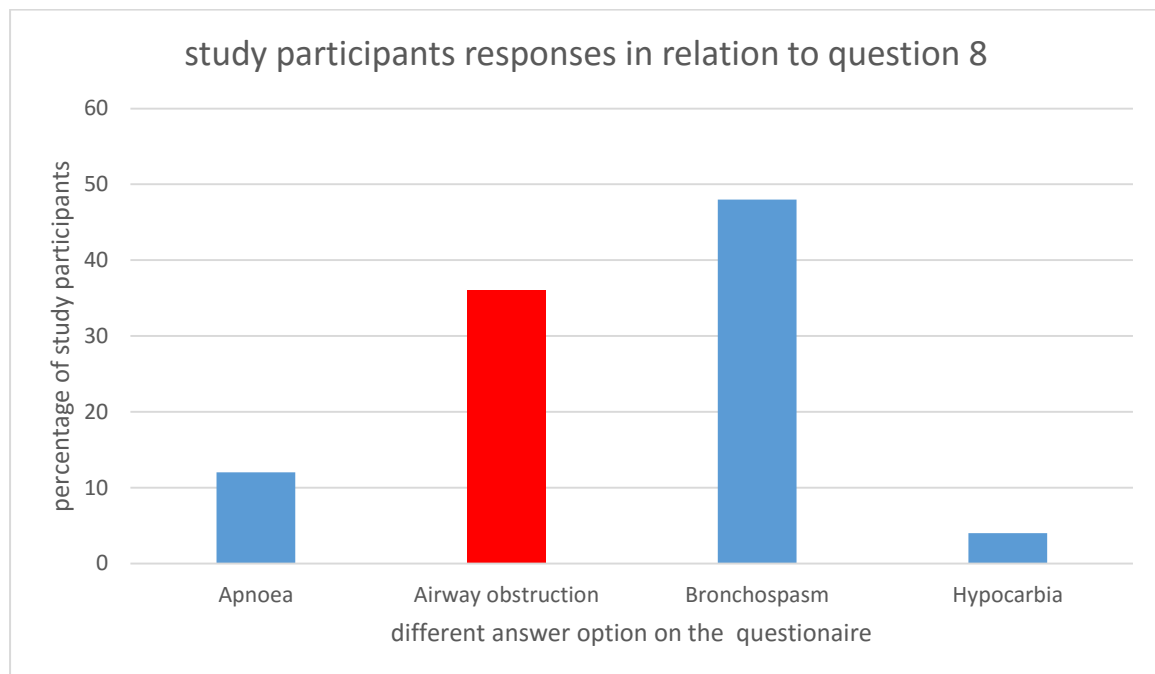


Fig 7: Study participants' responses to a clinical scenario about airway obstruction. Only 36 percent of study participants answered the question correctly.

Question 9

Dineo was diagnosed with a pneumothorax and an intercostal drainage tube inserted. She complained about chest pain. Paracetamol and tramadol were administered 30 minutes ago. You record her respiratory rate to be 26 breaths per minute. What is her respiratory rate abnormality?

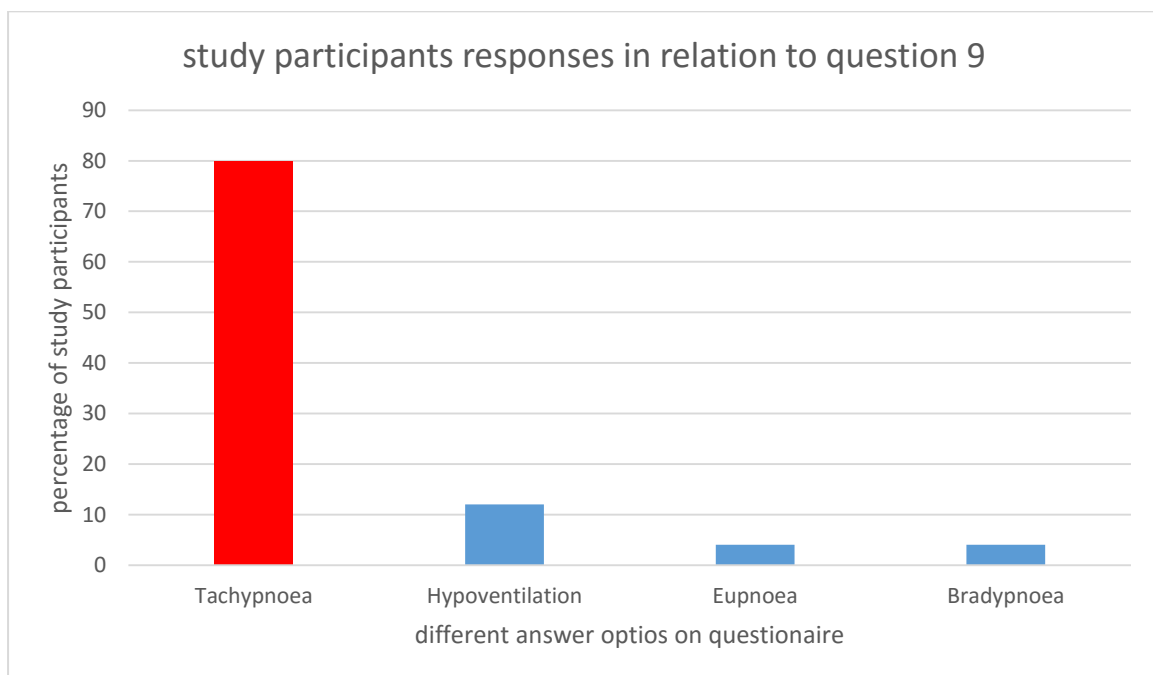


Fig 8: Study participants' responses to clinical scenario about tachypnoea. Most of the study participant (80%) correctly identified the respiratory abnormality.

Question 10

You are nursing a 42 year old Mrs Edna after right hip replacement under epidural anaesthesia and the infusion was continued post operatively for anaesthesia. On examination she has rapid shallow breaths with decreased chest movement .Her sensory level is at T4. Please name her respiratory evaluation finding based on respiratory depth and rhythm:

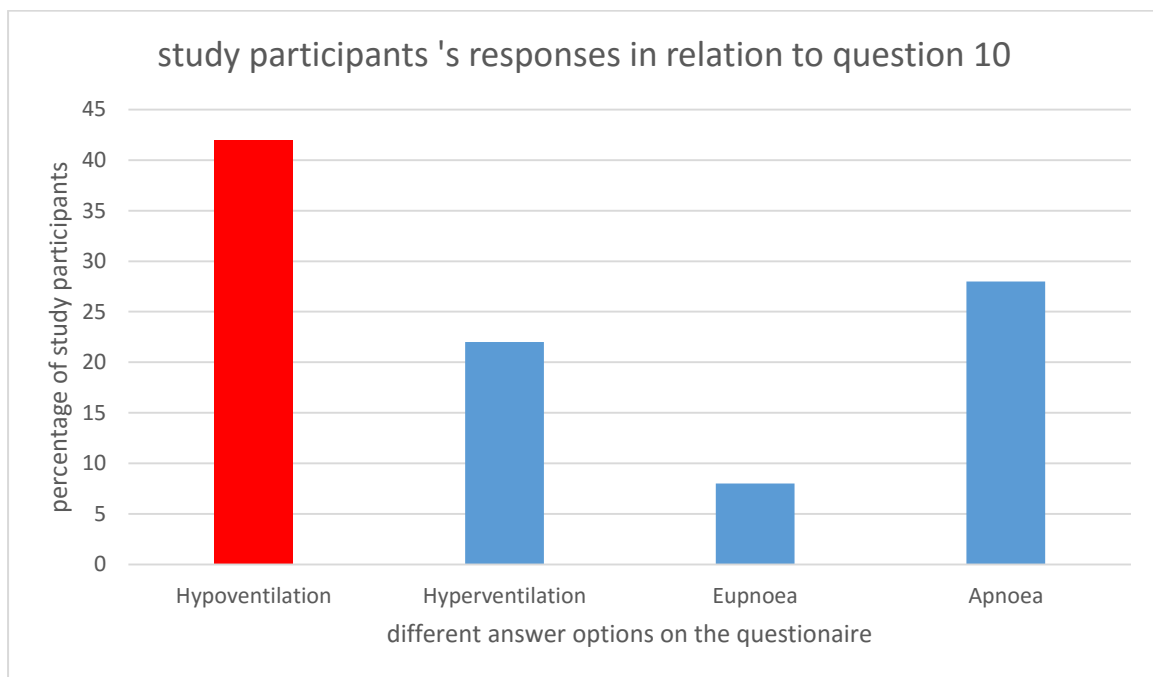


Fig 9: study participants' responses to a clinical scenario about hypoventilation. Less than half of the participants (42%) correctly answered the question.

Question 11

Raleboga is 35 years old. He is admitted after a motor vehicle accident and sustained bilateral femur fractures and 4 ribs fractures on the right. On examination he complains of dyspnea, has respiratory rate of 30 breaths per minute, cyanosis, with use of neck, shoulder and abdominal muscle during breathing. Please name his respiratory evaluation finding:

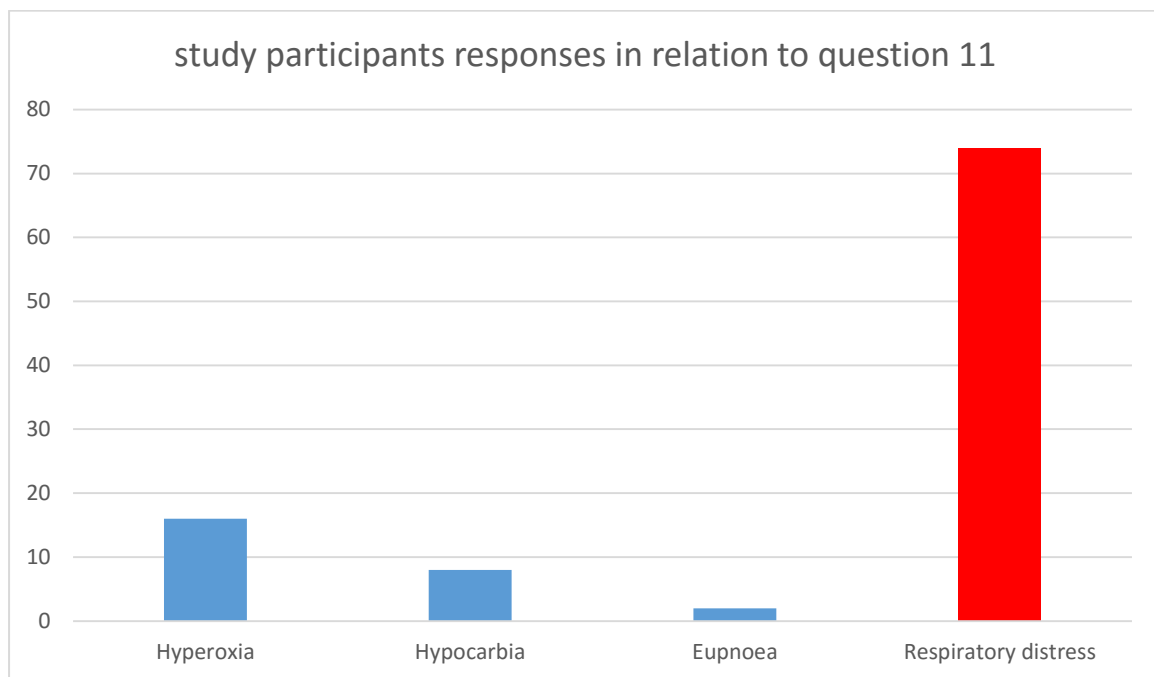


Fig 10: study participants' responses to clinical scenario about respiratory distress. Most participants (74%) correctly identified the respiratory abnormality.

Question 12

Jennifer is 23 years old. She has been done caesarean section under spinal anaesthesia (12.5 mg bupivacaine with dextrose) 60 minutes ago. You find her unresponsive, not breathing and pale. Please name her respiratory system evaluation finding.

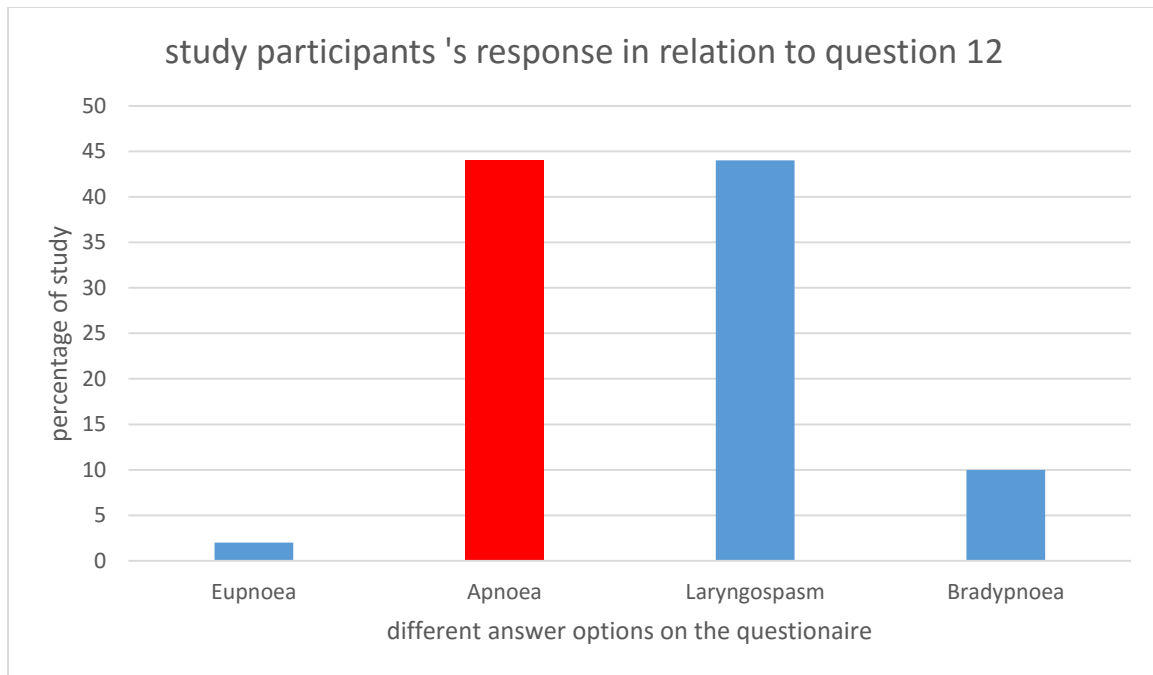


Fig 11: study participants' responses to clinical scenario about apnoea. 44 % of study participants correctly identified the respiratory abnormality.

Question13

Mr Burger is 74 years old heavy smoker who was admitted with a history of dyspnea. You are preparing him for a theatre as he is scheduled for a diagnostic procedure and you notice his condition has changed. His respiratory rate is 38 breaths per minute, he is cyanosed and you auscultate his lungs and hear inspiratory and expiratory wheezes. You call for help. Name his respiratory evaluation finding.

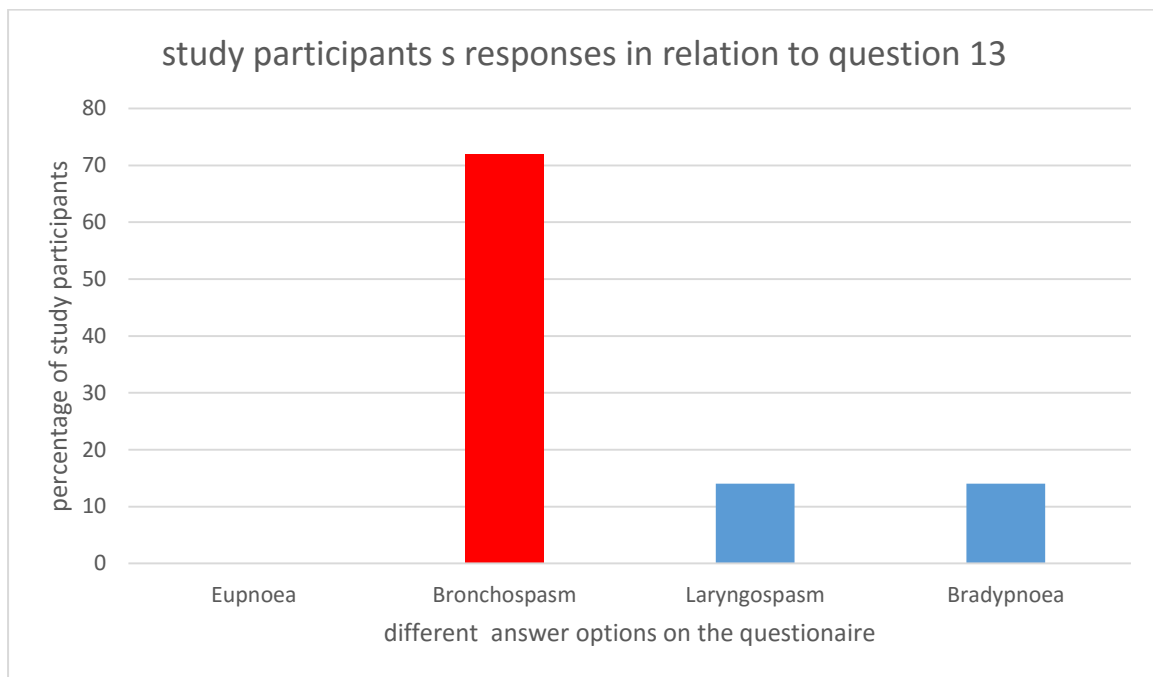



Fig 12: Study participants' responses to clinical scenario about bronchospasm. Most participants (72%) correctly identified the respiratory abnormality.

Appendix I: Instruction to authors – The South African Medical Journal



SAMJ

The South African Medical Journal

Leading research impacting clinical care in Africa

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Registration and login are required to submit items online and to check the status of current submissions.

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The SAMJ has launched a new submission and tracking system. Authors will be required to register a profile on the Editorial Manager platform in order to submit a manuscript.

To submit a manuscript, please proceed to the SAMJ Editorial Manager website:
www.editorialmanager.com/samj

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To access and submit an article already in production, please see the guidelines [here](#).

Author Guidelines

Please view the [Author Tutorial](#) for guidance on how to submit on Editorial Manager.

Please take the time to familiarise yourself with the policies and processes below. If you still have any questions, please do not hesitate to ask our editorial staff (tel.: [+27 \(0\)21 532 1281](tel:+270215321281), email: submissions@hmpg.co.za).

SAMJ policies

- Types of articles considered by the SAMJ
- Article Processing Charges
- Authorship
- Conflict of interest
- Research ethics committee approval
- Clinical trials
- Protection of patient's rights to privacy
- Copyright notice
- Privacy statement
- Ethnic classification
- CPD

Manuscript preparation

- Preparing an article for anonymous review
- General article format/layout
- Preparation notes by article type
- Illustrations
- Tables
- References

From submission to acceptance

- Submission and peer-review
- Production process
- Changing contact details or authorship

Publication

- Online versus print
- Errata and retractions
- Indexing

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SAMJ Policies

Type of articles considered by the SAMJ

The *SAMJ* will no longer limit the articles accepted to those that have 'general medical content', but is intending to capture the spectrum of medical and health sciences, grouped by relevance to the country's burdens of disease. This content will include research in the social sciences and economics that is relevant to the medical issues around our burden of disease. Please see '[A new vision for the SAMJ – and a call for papers](#)' for a full discussion of the new directions for the *SAMJ*.

We accept the following types of articles:

- [Research](#)
- [Reviews](#)
- [Clinical trials](#)
- [Editorials](#)
- [In Practice](#) (Previously Forum incl. Case Reports)
- [Correspondence](#)
- [Obituaries](#)
- [Book reviews](#)
- [Ad hoc supplements](#) e.g. guidelines, conference/congress abstracts, Festschrifts*

The following articles are by invitation only:

- Guest editorial
- Continuing Medical Education (CME)

*Contact claudian@hmpg.co.za for information on submitting ad hoc/commissioned supplements, including guidelines, conference/congress abstracts, Festschrifts, etc.

Guidelines

Guidelines should always be discussed with the Editor prior to submission.

Because of the intensive review process required to ensure Guidelines are independent, evidence-based and free from commercial bias, they are usually published as a supplement to the *SAMJ*, the costs of which must be covered by sponsorship, advertising or payment by the guideline authors/association. We will provide a quote based on the expected length of the guideline and whether it is to appear online only, or in print, which must be accepted by the body putting the guidelines together before submitting the work to the *SAMJ*.

The Editor reserves the right to determine the scheduling of supplements. Understandably, a delay in publication must be anticipated dependent upon editorial workflow.

All guidelines should include a clear, transparent statement about all sources of funding and an explicit, clear statement of conflicts of interest of any of the participants in the guidelines about industry funding for lectures, research, conference participation etc.

All guidelines should be structured according to [Agree II](#).

Please access this website before putting the guidelines together, download the Agree 11 instrument and use this to put the guidelines together.

All submitted guidelines will be sent to the local Agree II appraisal committee for review and must be endorsed by an appropriate body prior to consideration and all conflicts of interest expressed.

A structured abstract not exceeding 400 words (recommended sub-headings: *Background, Recommendations, Conclusion*) is required. Sections and sub-sections must be numbered consecutively (e.g. 1. Introduction; 1.1 Definitions; 2.etc.) and summarised in a Table of Contents.

General article format/layout

Accepted manuscripts that are not in the correct format specified in these guidelines will be returned to the author(s) for correction, which will delay publication.

General:

- Manuscripts must be written in UK English.
- The manuscript must be in Microsoft Word format. Text must be single-spaced, in 12-point Times New Roman font, and contain no unnecessary formatting (such as text in boxes).
- Please make your article concise, even if it is below the word limit.
- Qualifications, **full** affiliation (department, school/faculty, institution, city, country) and contact details of ALL authors must be provided in the manuscript and in the online submission process.
- Abbreviations should be spelt out when first used and thereafter used consistently, e.g. 'intravenous (IV)' or 'Department of Health (DoH)'.
- Include sections on Acknowledgements, Conflict of Interest, Author Contributions and Funding sources. If none is applicable, please state 'none'.
- Scientific measurements must be expressed in SI units except: blood pressure (mmHg) and haemoglobin (g/dL).
- Litres is denoted with an uppercase L e.g. 'mL' for millilitres).
- Units should be preceded by a space (except for % and °C), e.g. '40 kg' and '20 cm' but '50%' and '19°C'.
- Please be sure to insert proper symbols e.g. μ not u for micro, α not a for alpha, β not B for beta, etc.
- Numbers should be written as grouped per thousand-units, i.e. 4 000, 22 160.
- Quotes should be placed in single quotation marks: i.e. The respondent stated: '...'
- Round brackets (parentheses) should be used, as opposed to square brackets, which are reserved for denoting concentrations or insertions in direct quotes.
- If you wish material to be in a box, simply indicate this in the text. You may use the table format –this is the *only* exception. Please DO NOT use fill, format lines and so on.

SAMJ is a generalist medical journal, therefore for articles covering genetics, it is the responsibility of authors to apply the following:

- Please ensure that all genes are in italics, and proteins/enzymes/hormones are not.
- Ensure that all genes are presented in the correct case e.g. TP53 not Tp53.

****NB:** Copyeditors cannot be expected to pick up and correct errors wrt the above, although they will raise queries where concerned.

- Define all genes, proteins and related shorthand terms at first mention, e.g. '188del11' can be glossed as 'an 11 bp deletion at nucleotide 188.' - Use the latest approved gene or protein symbol as appropriate:

- Human Gene Mapping Workshop (HGMW): genetic notations and symbols
- HUGO Gene Nomenclature Committee: approved gene symbols and nomenclature
- OMIM: Online Mendelian Inheritance in Man (MIM) nomenclature and instructions
- Bennet et al. Standardized human pedigree nomenclature: Update and assessment of the recommendations of the National Society of Genetic Counselors. J Genet Counsel 2008;17:424-433: standard human pedigree nomenclature.

- **Preparation notes by article type**

- [Research](#)
- [Editorials](#)
- [CME](#)
- [In Practice and Case reports](#)
- [Reviews](#)
- [Clinical trials](#)
- [Correspondence](#)
- [Obituaries](#)
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Research

Guideline word limit: 4 000 words

Research articles describe the background, methods, results and conclusions of an original research study. The article should contain the following sections: introduction, methods, results, discussion and conclusion, and should include a structured abstract (see below). The introduction should be concise – no more than three paragraphs – on the background to the research question, and must include references to other relevant published studies that clearly lay out the rationale for conducting the study. Some common reasons for conducting a study are: to fill a gap in the literature, a logical extension of previous work, or to answer an important clinical question. If other papers related to the same study have been published previously, please make sure to refer to them specifically. Describe the study methods in as much detail as possible so that others would be able to replicate the study should they need to. Results should describe the study sample as well as the findings from the study itself, but all interpretation of findings must be kept in the discussion section, which should consider primary outcomes first before any secondary or tertiary findings or post-hoc analyses. The conclusion should briefly summarise the main message of the paper and provide recommendations for further study.

Select figures and tables for your paper carefully and sparingly. Use only those figures that provided added value to the paper, over and above what is written in the text.

Do not replicate data in tables and in text .

Structured abstract

- This should be 250-400 words, with the following recommended headings:

Background: why the study is being done and how it relates to other published work.

Objectives: what the study intends to find out

Methods: must include study design, number of participants, description of the intervention, primary and secondary outcomes, any specific analyses that were done on the data.

Results: first sentence must be brief population and sample description; outline the results according to the methods described. Primary outcomes must be described first, even if they are not the most significant findings of the study.

Conclusion: must be supported by the data, include recommendations for further study/actions.

- Please ensure that the structured abstract is complete, accurate and clear and has been approved by all authors.
- Do not include any references in the abstracts.

[Here](#) is an example of a good abstract.

Main article

All articles are to include the following main sections: Introduction/Background, Methods, Results, Discussion, Conclusions.

The following are additional heading or section options that may appear within these:

- Objectives (within Introduction/Background): a clear statement of the main aim of the study and the major hypothesis tested or research question posed
- Design (within Methods): including factors such as prospective, randomisation, blinding, placebo control, case control, crossover, criterion standards for diagnostic tests, etc.
- Setting (within Methods): level of care, e.g. primary, secondary, number of participating centres.
- Participants (instead of patients or subjects; within Methods): numbers entering and completing the study, sex, age and any other biological, behavioural, social or cultural factors (e.g. smoking status, socioeconomic group, educational attainment, co-existing disease indicators, etc) that may have an impact on the study results.

Clearly define how participants were enrolled, and describe selection and exclusion criteria.

- Interventions (within Methods): what, how, when and for how long. Typically for randomised controlled trials, crossover trials, and before and after studies.
- Main outcome measures (within Methods): those as planned in the protocol, and those ultimately measured. Explain differences, if any.

Results

- Start with description of the population and sample. Include key characteristics of comparison groups.
- Main results with (for quantitative studies) 95% confidence intervals and, where appropriate, the exact level of statistical significance and the number need to treat/harm. Whenever possible, state absolute rather than relative risks.
- Do not replicate data in tables and in text.
- If presenting mean and standard deviations, specify this clearly. Our house style is to present this as follows:
 - E.g.: The mean (SD) birth weight was 2 500 (1 210) g. Do not use the \pm symbol for mean (SD).
- Leave interpretation to the Discussion section. The Results section should just report the findings as per the Methods section.

Discussion

Please ensure that the discussion is concise and follows this overall structure – subheadings are not needed:

- Statement of principal findings
- Strengths and weaknesses of the study
- Contribution to the body of knowledge
- Strengths and weaknesses in relation to other studies
- The meaning of the study – e.g. what this study means to clinicians and policymakers
- Unanswered questions and recommendations for future research

Conclusions

This may be the only section readers look at, therefore write it carefully. Include primary conclusions and their implications, suggesting areas for further research if appropriate. Do not go beyond the data in the article.

Editorials

Guideline word limit: 1 000 words

These opinion or comment articles are usually commissioned but we are happy to consider and peer review unsolicited editorials. Editorials should be accessible and interesting to readers without specialist knowledge of the subject under discussion and should have an element of topicality (why is a comment on this issue relevant now?) There should be a clear message to the piece, supported by evidence.

Please make clear the type of evidence that supports each key statement, e.g.:

- expert opinion
- personal clinical experience
- observational studies
- trials
- systematic reviews.

CME (by invite only)

CME is intended to provide readers with practical, up-to-date information on medical and related matters. It is aimed at those who are not specialists in the field. From January 2016, all CME articles will be printed in full in the *SAMJ*. Please try to adhere strictly to the guidelines on word count as we have a page limit for the print issue of the *SAMJ*. We reserve the right to place some tables and reference lists online if this is necessary for space.

In practice, this means that each CME topic usually covers two issues of the print issue of the *SAMJ*.

The guest editor, in consultation with the editor, is responsible for convening a team of authors, deciding on the subjects to be covered and for reviewing the manuscripts submitted. The suggestion is for 4 - 5 articles, although there is some room for flexibility contingent on discussions with the editor.

For queries about these guidelines please feel free to contact the CME editor, Dr Bridget Farham, by email (ugqirha@iafrica.com) or telephone (+27 (0)21 789 2331).

Review process

The guest editor reviews the articles and returns them to the CME editor for review and final approval.

Guest editorials

Guideline word limit: 1 000 words

- Include the guest editor's personal details (qualifications, positions, affiliation, e-mail address, and a short personal profile (50 words)).
- If possible, include a photograph of the author(s) at high enough resolution for print. It is preferable to provide two guest editorials, one for each issue, so that the content of the articles in each issue is covered.

Articles

Guideline word limit: 2 000 - 3 000 words

- Each article requires an abstract of ± 200 words.
- The editor reserves the right to shorten articles but will send a substantially shortened article back for author approval.

Personal details

Please supply: Your qualifications, position and affiliations and MP number (used for CPD points); Address, telephone number and fax number, and your e-mail address; and a short personal profile (50 words) and a few words about your current fields of interest.

In Practice

Guideline word limit: 2 000 - 3 000 words

This section includes articles that would previously have been accepted into the Forum section, and case reports.

In practice articles are those that draw attention to specific issues of clinical, economic or political interest regarding medicine and healthcare in southern Africa. They are assigned to a topic:

Case report

Clinical practice

Clinical alert

Issues in medicine

Issues in public health

Healthcare delivery

Medicine and the environment

Medicine and the law

Cochrane corner

An In Practice article should follow the following format – sub-headings are not necessary, but may be used for clarity:

- Author affiliations and qualifications: to be the same as for Research. Provide all authors' names and initials, qualifications and full affiliations, and corresponding author.
- Short abstract: does not need to be structured, but should capture the essential features of the article

- Introduction: the reason for the article and the issue being addressed
- Recent research, discussion, local policy around the issue – include your own research where appropriate
- All statements should be referenced and, if opinion only, this should be stated
- Discussion: how this article adds to the discussion around a particular topic
- If a clinical practice or policy point is at issue, this needs to be emphasised, using a box with highlights if appropriate.

Essentially In practice is an opportunity for a more discursive approach to topics of clinical, economic or political importance in southern African health systems. It is not an opportunity to put forward unsubstantiated opinions!

Case reports

The *SAMJ* has recently started to accept case reports. The cases must come from Africa, preferably southern Africa unless the condition is common to all African countries, and must be either a completely new description of a clinical condition or result (use Google!) or a case that highlights important practice or management issues.

Please use the following format for case reports:

- Title of case: do not include the words ‘a case report’ in the title
- Summary/abstract: up to 150 words summarising the case presentation and outcome
- Background: why is this case important and why did you write it up?
- Case presentation: presenting features, medical, social, family history as appropriate
- Case management: should be according to best practice, and if not, please explain why
- Investigations, if relevant: save space by simply saying ‘normal’ if, for example, renal function was completely normal, rather than listing normal results, highlight the abnormal – or indeed the normal if this is clinically significant
- Differential diagnosis, if relevant
- Treatment, if relevant
- Outcome and follow-up
- Discussion – a VERY BRIEF review of similar published cases
- Teaching points: 3 - 5 bullet points
- References: as per the *SAMJ* house style
- Tables and figures: keep to a minimum. Use clinical images where relevant – we need hi-res versions for print, and identifiable persons must have a consent form
- Patient consent: please include a statement about patient consent to a written case report. This should be uploaded as a supplementary file.

Clinical trials

Guideline word limit: 4000 words

As per the recommendations published by the International Committee of Medical Journal Editors (ICMJE), clinical trial research is any research that assigns individuals to an intervention, with or without a concurrent comparison/control group to study the cause-and-effect relationship between the intervention and health outcomes. All clinical trials should be registered with the appropriate national clinical trial registry (or any international primary register, if relevant), and the trial registration number should be cited at the end of the abstract. Since 1st December 2005, all clinical trials conducted in South Africa have been required to be registered in the [South African National Clinical Trials Register](#). The *SAMJ* therefore requires that clinical trials be registered in the relevant public trials registry at or before the time of first patient enrollment as a condition for publication. The trial registry name and registration number must be included in the manuscript.

Please refer to the general guidelines for all papers at the top of this article for additional requirements with respect to ethics approval, funding, author contributions, etc. The format of original research articles should be followed for reporting of clinical trial results.

Review articles

Guideline word limit: 4 000 words

These are welcome, but should be either commissioned or discussed with the Editor before submission. A review article should provide a clear, up-to-date account of the topic and be aimed at non-specialist hospital doctors and general practitioners.

Please ensure that your article includes:

- Abstract: unstructured, of about 100-150 words, explaining the review and why it is important
- Methods: Outline the sources and selection methods, including search strategy and keywords used for identifying references from online bibliographic databases. Discuss the quality of evidence.
- When writing: clarify the evidence you used for key statements and the strength of the evidence. Do not present statements or opinions without such evidence, or if you have to, say that there is little or no evidence and that this is opinion. Avoid specialist jargon and abbreviations, and provide advice specific to southern Africa.
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- *Chapter/section in a book:* Weinstein L, Swartz MN. Pathogenic Properties of Invading Microorganisms. In: Sodeman WA, Sodeman WA, eds. Pathologic Physiology: Mechanisms of Disease. Philadelphia: WB Saunders, 1974:457-472.

- *Internet references:* World Health Organization. The World Health Report 2002 - Reducing Risks, Promoting Healthy Life. Geneva: WHO, 2002. <http://www.who.int/whr/2002> (accessed 16 January 2010).

- Legal references

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- Green/white papers:

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