

# Training, Knowledge, Experience and Perceptions regarding Cardiopulmonary Resuscitation of Doctors at Universitas Academic Hospital

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## **Declaration of authorship**

I, Nadia Sarah du Plessis, declare that the coursework Master's Degree mini-dissertation that I herewith submit in a publishable manuscript format for the Master's Degree qualification MMed Anaesthesiology at the University of the Free State is my independent work, and that I have not previously submitted for a qualification at another institution of higher education.



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## **Abstract**

### **Introduction:**

High-quality CPR is proven to improve immediate survival and survival to hospital discharge in patients having a cardiac arrest in hospital. Evidence shows that without frequent retraining in CPR, health-care providers lose their skill and knowledge earlier than the current recommendation i.e. to attend CPR retraining every two years. The purpose of this study was to determine the current competencies of doctors at Universitas Academic Hospital regarding CPR training, knowledge, experience and perceptions.

### **Methods:**

A questionnaire designed by the researcher and reviewed by CPR providers was distributed to interns, medical officers, registrars and consultants obtaining information regarding CPR training, CPR exposure and perceptions regarding CPR retraining and CPR knowledge. The knowledge aspect of the questionnaire consisted of questions on basic, advanced cardiac, paediatric, neonatal and obstetric life support.

### **Results:**

Of the 245 participants only 22,5 % achieved competency (a mark  $\geq 80\%$ ) for the knowledge aspect of the questionnaire. The majority of participants had not had retraining after two years although 96,7 % of participants felt that keeping up to date with CPR guidelines improved patient outcomes. The most common reasons given for not feeling confident in performing CPR was training related.

### **Conclusion:**

Doctors at Universitas Academic Hospital are currently not adequately trained in CPR and it reflects in their lack of CPR knowledge. Lack of training seems to be the most common reason for not feeling confident and being too busy to attend these retraining courses was reported as the most common reason. From this study it also seems that very little of the departments have CPR training for their doctors. Implementing a regular CPR training program within the hospital is suggested to improve CPR knowledge of doctors.

## **Keywords**

Cardiopulmonary resuscitation

Doctors

Knowledge

Medical education

Retraining

Skill

Training

## **List of abbreviations**

ACLS	Advanced Cardiac Life Support
AED	Automated External Defibrillator
AHA	American Heart Association
ATLS	Advanced Trauma Life Support
BLS	Basic Life Support
CPA	Cardiopulmonary Arrest
CPR	Cardiopulmonary Resuscitation
ESMOE	Essential Steps in the Management of Obstetric Emergencies
FS DoH	Free State Department of Health
HR	Human Resources
HSREC	Health Sciences Research Ethics Committee
ILCOR	International Liaison Committee on Resuscitation
MEPA	Management of Emergencies in Paediatric Anaesthesia
PALS	Paediatric Advanced Life Support
RCSA	Resuscitation Council of South Africa
SBT	Simulation-Based Training
UAH	Universitas Academic Hospital
UFS	University of the Free State

## **List of appendices**

- A Letter of approval from Health Sciences Research Ethics Committee
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## Chapter 1: Literature Review

Cardiopulmonary resuscitation (CPR) can be lifesaving following cardiopulmonary arrest.<sup>1</sup> Overall cardiac arrest survival rates are 7 % for out-of-hospital cardiac arrests and < 30 % for in-hospitals cardiac arrests and of these, 10 % to 50 % have poor neurological outcomes.<sup>2</sup> Basic CPR consists of identifying when someone is in cardiopulmonary arrest, calling for help and initiating external cardiac compressions and rescue breaths to maintain circulation and perfusion of vital organs. Current evidence-based guidelines for high-quality CPR is to provide cardiac compressions at a rate of 100-120 compressions per minute at a depth of 5,5 cm in adults and allowing complete chest recoil in between each compression. CPR should be initiated as soon as possible with minimal interruptions between compressions for pulse and rhythm checks. Shockable rhythms should be defibrillated as soon as a defibrillator or an automated external defibrillator (AED) is available.<sup>3</sup> High-quality CPR improves survival from cardiac arrest as well as neurological outcome after survival of cardiac arrest. A patient with cardiopulmonary arrest is four times more likely to survive if found by an advanced cardiac life support (ACLS)-trained nurse than if found by someone without ACLS training and knowledge.<sup>4</sup>

The CPR methods and principles are based on the physiological effects of these interventions. With external chest compressions, the intra-thoracic pressure is increased and the heart is compressed between the sternum and vertebral column. This contributes to an increase in both aortic and right atrial pressures that allows forward flow of blood to supply the brain and myocardium via the coronary arteries. The rate at which these chest compressions are done is another important aspect. When the compression rate is too fast, there is decreased filling time of the heart and also won't allow full chest recoil in between each compression. When the filling of the heart with blood is not optimal, the output produced by the following chest compression will also not be optimal. During the chest recoil phase, there is passive filling of the heart with blood and also filling of the lungs due to the negative pressure from the chest decompression.<sup>2</sup> For this reason chest compressions is the most important intervention during CPR. Chest compressions should not be interrupted and should rather be the focus than providing ventilations.

Deviating from the CPR guidelines is associated with a decreased likelihood of return of spontaneous circulation (ROSC) and decreased immediate survival and survival to hospital discharge as was found in Honarmand et al. From analysing 160 resuscitation events at three tertiary care centres, an association was found between the amount of deviations from the ACLS guidelines and successful ROSC. There was however no association between the amount of deviations from guidelines and the survival to hospital discharge.<sup>5</sup> From this literature, one can argue that health care providers should know the CPR guidelines well, and be up to date with the most recent evidence-based CPR guidelines to give the cardiac arrest patient the best possible chance of not just survival, but the best possible chance of a good neurological outcome post cardiac arrest survival. Not just the CPR intervention during the cardiac arrest, but also the post cardiac arrest care is of importance to know to ensure the best possible chance of a good neurological outcome in cardiac arrest survivors.

There are a variety of CPR guidelines and algorithms for all levels of rescuers, ranging from a lay person rescuer to a qualified health care provider. The most basic CPR guidelines are

the hands-only CPR which involves calling for help and providing chest compressions only as described above until help arrives.<sup>6</sup> Basic CPR guidelines is applicable to both adults and children and provides the additional two rescue breaths between every 30 compressions with pulse checks every two minutes. There are changes in compressions to ventilation ratios between adults and children given situations where there is only one rescuer providing CPR, compared to when there is more than one rescuer to provide CPR.

The more advanced CPR guidelines are the advanced cardiac CPR, paediatric and neonatal CPR as well as obstetric CPR.<sup>7</sup> These are meant to be performed by qualified healthcare providers and involves administration of resuscitative drugs and assessing the cardiac rhythm to determine if defibrillation or cardioversion is indicated or not.

In addition to administering resuscitative drugs and defibrillation with the advanced CPR guidelines, there are also other aspects of these specialised population groups that need to be taken into consideration. In pregnant patients with cardiac arrest, the uterus needs to be manually displaced during CPR and a decision needs to be made to perform a perimortem caesarean section. The compressions to ventilations ratio are different in neonates and chest compressions are started in neonates when the heart rate is < 60 beats per minute.

Ranging from the most basic hands-only CPR, to basic CPR, advanced CPR and CPR for specific population groups as described above, the most advanced form of CPR involves patient-centric or goal-directed CPR. There is evidence to support goal-directed CPR, with the caveat that the CPR provider should be experienced and have all the necessary monitoring available during the cardiac arrest. There are two main principles of goal-directed CPR. The first principle is to adjust cardiac compression depth according to the systolic blood pressure (SBP), aiming to maintain it at > 100 mmHg. The second principle is to adjust vasopressor administration regarding the timing, dose and intervals to maintain a coronary perfusion pressure (CPP) of > 20 mmHg. By achieving these goals during CPR, it was shown that there is an increased rate of ROSC, an increase in successful defibrillations, an improvement in short term and long-term survival and a higher rate of favourable neurological outcomes.<sup>8</sup> When these monitors are not available during CPR, guideline-directed CPR is still the gold standard, thus it remains a vital skill for health care providers.

The International Liaison Committee on Resuscitation (ILCOR) review the latest evidence-based resuscitation science every 2 years to update CPR guidelines accordingly every 5 years. ILCOR is a committee that was formed in 1992 providing a platform for liaison between resuscitation organizations across the world to discuss and review international data on resuscitation. ILCOR comprises of the American Heart Association (AHA), the European Resuscitation Council, the Heart and Stroke Foundation of Canada, the Australian and New Zealand Committee on Resuscitation, the Resuscitation Council of Southern Africa (RCSA), the Resuscitation Councils of Asia and the Inter-American Heart Foundation. These discussions produce international consensus guidelines on CPR.<sup>9</sup> The latest CPR guidelines were released in 2015 by ILCOR and updated guidelines are due to be released in 2020.

In South Africa the RCSA provides health care workers with the updated CPR algorithms and sources on the evidence of resuscitation on their website.<sup>10</sup> The RCSA also presents CPR training courses across the country by qualified CPR instructors. The AHA is also very involved in South Africa with qualified instructors presenting a variety of CPR training courses. The AHA CPR courses is the most popular CPR courses attended.

In South Africa, CPR is taught on a regular basis during undergraduate medical studies. This is seen as sufficient training to equip a newly qualified junior doctor to perform CPR. Although this is sufficient initially, it is important to remain updated with the latest evidence-based CPR guidelines and to have regular hands-on CPR skills training.

Undergraduate CPR training is part of the curriculum and usually happens in large groups with a lecture and then hands-on CPR skills training on manikins. When doing a CPR course after undergraduate training, it is a scheduled course which should be registered and paid for. These courses also have a limited number of participants attending per course, to ensure that every participant gets sufficient one-on-one training with the instructor. The regular format of such a CPR course involves a textbook that is distributed to the participants upon registration and payment for the course prior to attending the course. The textbook covers all the different scenarios of cardiac arrest management and also management of unstable cardiac arrhythmias, acute coronary syndromes and management of acute stroke. An online test is completed prior to attendance of the course. On attendance of the course there is a course test for which the participant needs to obtain a mark of  $\geq 84\%$  to complete the CPR course and qualify as a CPR provider. Depending on which CPR course is attended, the duration of the course varies from four hours, for the basic CPR course, to two days for the more advanced CPR courses. During the course there are video lectures, hands-on practical stations and at the end of the course each participant needs to pass a practical assessment that is based on a cardiac arrest simulation scenario. To pass the CPR course the participant will have to have completed the online pre-course test, achieve  $\geq 84\%$  for the course test, attended 100% of the lectures and practical sessions presented at the course and passed the practical assessment.

After completion and passing of the CPR course, the participant is given a card indicating that they are a qualified CPR provider. This qualification is valid for 2 years.

To register and attend any of the advanced CPR courses, a basic CPR course first has to be completed and still be within the two-year validity period. If the basic CPR qualification has expired, the basic CPR course has to be done again, before registering and attending any of the advanced CPR courses.

The American Heart Association currently recommends that health care providers should attend CPR retraining every 2 years.<sup>11</sup> These recommendations are made from evidence on the deterioration of CPR knowledge and skills. It was found that both knowledge and skill deteriorate over time, but the psychomotor skills deteriorate to a larger extent than the theoretical knowledge.<sup>12</sup> Even with a booster session three to five months after initial training there was deterioration in CPR knowledge and skill.<sup>13</sup> Retention of CPR knowledge and skills usually lasts about six months to one year.<sup>12</sup> Although the current recommendation is to attend CPR retraining at two year intervals, the aforementioned evidence may suggest that CPR retraining should happen at an even shorter interval.

Different methods of training have been studied to establish which methods are more effective to teach and retain CPR knowledge and skills. Features of training that are associated with improved learning and retention outcomes include; interactivity, practice exercises, feedback and repetition of the study material.<sup>12</sup> When video lectures for CPR training were introduced in 2007, a survey was done to get feedback on the usefulness of these video lectures. Of 180 participants, including first-time attendees as well as attendees

that have attended many CPR courses in the past, 70 % reported that the videos were useful to enhance the course. Of the 16 instructors that were also surveyed, 31 % also reported the videos to be useful. Another 13 % of the 180 participants reported that they would rather want more hands-on practice time.<sup>14</sup> A South African study done in Kwa-Zulu Natal also found that the new video-based CPR training proved to be an effective method.<sup>15</sup>

Comparing the conventional two-day face-to-face course with a blended e-learning and one-day face-to-face course, a number of studies found that although the cost was lower with the latter, the cardiac arrest simulation performance was poor although knowledge was similar. Perkins et al assessed 3732 healthcare workers from Australia and the United Kingdom attending CPR training in the two groups. It was confirmed that although the conventional two-day course involves higher costs, 80,2 % of participants passed compared to 74,5 % in the one-day course with e-learning group and the former also had better skill performance during a simulated cardiac arrest scenario.<sup>16</sup> Kaczorowski et al also showed that hands-on simulation training improves the CPR skill aspect of CPR training with fewer errors in life-support skills, compared to video lectures only.<sup>13</sup> Interestingly another study compared the constructivist simulation-based training (SBT) to the traditional lecture based SBT and found no difference in retention of knowledge and skill one month after the course between the two groups, but higher knowledge and skills performance marks during the course with the constructivist SBT.<sup>17</sup>

Assessing evidence on effective methods of CPR training, it is clear that hands-on SBT with video lectures is superior. But when deciding on the length of the course and whether it is beneficial to add an e-learning component to shorten the length of the course is still not clear. One can argue that with the similarity in knowledge marks and retention of CPR knowledge, the shorter, less expensive course is the obvious option. However, the practical CPR skill is the initial lifesaving life support to be provided to a patient with cardiopulmonary arrest, and this has lower performance marks with the shorter courses.

Across the globe there seems to be an indication that health care providers' CPR knowledge are inadequate. After a 20-question test on basic CPR and advanced cardiac CPR knowledge was completed by health care professionals at seven government and seven private hospitals in North-Kerala, India, it was found that their knowledge was inadequate. More than 50 % of the participants scored less than 50 % for the test and only 4,3 % scored > 80 %.<sup>18</sup> The participants that have had CPR training in the past generally scored better than those that have never had CPR training. Specifically looking at paediatric residents' CPR knowledge at a tertiary academic hospital in Baltimore, United States of America, not only was the participants found to be inadequately trained for paediatric CPR, but there was a major lack in knowledge regarding basic CPR and defibrillation.<sup>19</sup>

More recently, in an article published in April 2020, awareness of BLS among doctors at a tertiary hospital in Pakistan was assessed. This assessment indicated that 98 % of participants viewed BLS as important and compulsory for health care providers to attend training. Most of the participants have attended previous BLS training in the past (69 %), but only 30 % of these participants have attended training in the past two years. The lack of BLS knowledge was attributed to mostly a lack of CPR training (42, 2%), but also a lack of resources and a lack of interest to attend CPR training, despite the feeling that it is important

and should be mandatory to have adequate knowledge on how to provide correct and efficient CPR to patients with cardiac arrest.<sup>20</sup>

Frequent CPR retraining improved both retention of CPR knowledge and skill. There is also an improvement in patient outcome after cardiac arrest with frequent retraining.<sup>21</sup> Sodhi et al analysed 627 in-hospital arrests. Initially they did a retrospective analysis of outcomes of 284 in-hospital arrests prior to implementing a CPR training program for the health care professionals. This data showed ROSC in 18,3 % of arrests and survival to hospital discharge in 23,1 % of arrests. After implementing a CPR training program another 343 in-hospital cardiac arrests were analysed. There was a significant improvement in outcomes. The data showed ROSC in 28,3 % of arrests and survival to hospital discharge in 69,1 % of arrests.

In South Africa there is also evidence of poor CPR knowledge amongst our health care professionals. Basic resuscitation knowledge and skills of full-time medical practitioners were poor at public hospitals in Limpopo in 2000. A score of  $\geq 80$  % was required when testing for CPR knowledge and was only attained by 4,6 % of participants. An association with better scores were found if the participant had had previous CPR training, and especially if that training was within the past two years. Past CPR experience, without formal CPR training did not contribute to improved scores.<sup>22</sup> Inadequate CPR knowledge was also demonstrated in a study on basic CPR knowledge amongst interns, medical officers and registrars in 2011 at a tertiary Hospital in Gauteng where 80 % of the participants had previous CPR training, but none of the participants passed the CPR knowledge questionnaire. The mean score obtained for the 20-question basic CPR knowledge questionnaire was 35,1 %.<sup>23</sup>

At Universitas Academic Hospital (UAH) in 2008 a survey was done on basic CPR knowledge of the nursing staff in the wards, as they are usually the first responders to an in-hospital cardiac arrest. The attendance of CPR courses and training was exceptionally well. A total of 286 nurses were surveyed: 93,1 % had attended CPR training courses and of these, 60,9 % had attended these courses in the past year. However, the participants performed poorly with the knowledge questionnaire. The pass mark for the basic CPR questionnaire was  $\geq 80$  % and attained by only 11 % of participants.<sup>24</sup> Interns that rotated through anaesthesia at UAH and Pelonomi Hospital in 2014 were also assessed on their CPR knowledge and skill before and after CPR training in 2014. The pre-rotation average mark was 58,4 %, with no improvement in the post-rotation mark after a CPR course was presented to them and after two months of their anaesthesia rotation was completed.<sup>25</sup>

As not only health care professionals, but qualified medical doctors at a tertiary, academic hospital, CPR knowledge and skill should be a topic that doctors at UAH are well versed in. From the literature it is clear that high-quality CPR improve patient outcomes and to provide this high-quality CPR, health care professionals should attend CPR training not just once, but retrain regularly. Reasons for this being that CPR knowledge and skills deteriorate if not practiced frequently and CPR guidelines are updated every five years according to the latest CPR evidence.

At UAH there is little data available on the outcomes of in-hospital cardiac arrests. No records are kept of doctors' CPR training and knowledge although it is recommended for many posts that the relevant CPR training has been done, prior to appointment.

On completing this literature review it was evident to the researcher that there is a global problem with doctors not keeping up to date with CPR training, and possibly having inadequate CPR knowledge possibly as a result. This could be translated to poor patient outcomes, which could potentially be improved with adequate CPR training and knowledge. This motivated the reason for doing this study.

The aim of this study was to evaluate the CPR training doctors at UAH had received and if their CPR knowledge was up to date. Assessing CPR exposure and perceptions regarding CPR training and retraining was also an important aspect of this study. When assessing these four aspects in context, it was hoped that the study would identify if the problem seen across the globe regarding inadequate CPR training and knowledge, was also a problem at UAH. Finally, the act of doing this study could also bring awareness to doctors, and other health care professionals, about the importance of frequent retraining in CPR knowledge and skills.

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## Chapter 2: Publishable Manuscript

### Abstract

**Introduction:** High-quality CPR is proven to improve immediate survival and survival to hospital discharge in patients having a cardiac arrest in hospital. Evidence shows that without frequent retraining in CPR, health-care providers lose their skill and knowledge earlier than the current recommendation i.e. to attend CPR retraining every two years. The purpose of this study was to determine the current competencies of doctors at Universitas Academic Hospital regarding CPR training, knowledge, experience and perceptions.

**Methods:** A questionnaire designed by the researcher and reviewed by CPR providers was distributed to interns, medical officers, registrars and consultants obtaining information regarding CPR training, CPR exposure and perceptions regarding CPR retraining and CPR knowledge. The knowledge aspect of the questionnaire consisted of questions on basic, advanced cardiac, paediatric, neonatal and obstetric life support.

**Results:** Of the 245 participants only 22,5 % achieved competency (a mark  $\geq 80\%$ ) for the knowledge aspect of the questionnaire. The majority of participants had not had retraining after two years although 96,7 % of participants felt that keeping up to date with CPR guidelines improved patient outcomes. The most common reasons given for not feeling confident in performing CPR was training related.

**Conclusion:** Doctors at Universitas Academic Hospital are currently not adequately trained in CPR and it reflects in their lack of CPR knowledge. Lack of training seems to be the most common reason for not feeling confident and being too busy to attend these retraining courses was reported as the most common reason. From this study it also seems that very little of the departments have CPR training for their doctors. Implementing a regular CPR training program within the hospital is suggested to improve CPR knowledge of doctors.

### Introduction:

Cardiopulmonary resuscitation (CPR) is a potentially lifesaving intervention for patients with cardiopulmonary arrest (CPA). Doctors are usually trained in CPR as undergraduate students. Thereafter, attending retraining and staying up to date with regular, updated, evidence-based CPR guidelines is the responsibility of the doctors themselves. Studies have shown that health care providers who have attended CPR training in the past, but have not attended CPR retraining within the past two years, have inadequate CPR knowledge.<sup>1,2,3,4</sup>

Scientific evidence regarding CPR and patient outcomes are reviewed frequently by the International Liaison Committee on Resuscitation (ILCOR) and updated CPR guidelines are published every 5 years.<sup>5</sup> The current recommendation from the American Heart Association (AHA) is to attend retraining in CPR every 2 years.<sup>6</sup>

An improvement in immediate survival and survival to hospital discharge in patients that had a cardiopulmonary arrest while in hospital was demonstrated in centres where regular retraining programmes of health care providers had been implemented.<sup>7,8,9</sup>



Three studies have been conducted in South African hospitals investigating CPR knowledge amongst doctors. In a study conducted at a tertiary hospital, including interns, medical officers and registrars in all the clinical departments, it was found that the majority of these participants had not attended CPR training within the past two years and obtained an average test score of 35,1% for their knowledge on CPR (well below the pass mark of 80 %).<sup>10</sup> Another study investigated CPR skills and knowledge amongst interns during their two month anaesthesia rotation. There was no improvement in the pre-rotation and post-rotation scores for the written test (none scored > 80% for the written test) and their CPR skills were also a concern by not providing good quality CPR.<sup>2</sup> A study investigating CPR knowledge in doctors in Limpopo, excluding interns, also found that the participants' knowledge on CPR was very poor. In addition, it demonstrated that having experience in performing CPR, but with no formal CPR training was not beneficial.<sup>3</sup>

These studies indicate that there is a problem with CPR training and knowledge of doctors in South Africa.

At Universitas Academic Hospital (UAH) it is not known how many doctors attend retraining in CPR. It is not an employment requirement in most departments to have an up-to date CPR course attendance or qualification of any level (BLS, ACLS, PALS etc), although it is a preferred qualification. There are very few departments which offer "in-house" CPR retraining despite access to a University simulation training facility.

There is no published data regarding the outcome of UAH patients with in-hospital cardiopulmonary arrest who received CPR. There is a resuscitation committee at UAH that reviews all reported CPR's and statistics are kept by a resuscitation co-ordinator. However, under-reporting is problematic, limiting analysis of this data.

### *Study Aim*

The aim of this study was to determine if doctors at UAH were adequately trained in CPR and knew how to perform CPR. The study also investigated doctors' attitudes towards CPR training and their perceived self-confidence in performing CPR.

### *Study Objective*

The objective of this study was to determine whether doctors at UAH were adequately trained in CPR by means of a questionnaire obtaining information on their past and current CPR training. The questionnaire also obtained information on doctors' CPR knowledge, their attitudes towards CPR training and how they perceived their self-confidence in performing CPR.

## **Methods:**

### *Design*

The study was conducted in the form of a descriptive observational study, utilising a structured questionnaire which included a CPR knowledge test.

### *Setting*

UAH is the tertiary academic hospital in the Free State. UAH is also affiliated with the University of the Free State (UFS) Health Sciences Faculty for both undergraduate and postgraduate training in clinical medicine, pathology, nursing and allied health professions.

### *Participants*

All interns, medical officers, registrars and consultants working in clinical departments at UAH were included. They were invited to participate in the study during October 2019 and November 2019 at their weekly departmental academic meetings.

Participants were excluded if they were not present at the departmental academic meeting on the day the questionnaire was administered or if they decided not to participate in the study.

According to information from the human resources (HR) department there was a total of 316 registrars and consultants employed in all the clinical departments of UAH at the time of the study. The number of medical officers and interns were not included in this information from the HR department, but was estimated to be around 100.

### *Ethical Considerations*

Approval of the study protocol (UFS-HSD2019/1498/2910) was obtained from the Health Sciences Research Ethics Committee (HSREC), Free State Department of Health (FS DoH) FS\_201909\_011 and authorities of the University of the Free State.

### *Questionnaire Design and Distribution*

The questionnaire was developed and designed for this specific study by the first author. It was reviewed and refined by three qualified CPR providers in Basic Life Support (BLS), Advanced Cardiac Life Support (ACLS) and Paediatric Life Support (PALS) from the departments of Clinical Simulation and Skills, Family Medicine and Trauma, at the University of the Free State.

The questionnaire evaluated five aspects of the participant; demographic information, CPR training, current CPR exposure, perception regarding CPR retraining and CPR knowledge. The CPR knowledge aspect was made up of 20 questions divided into six questions on basic CPR, eight questions on advanced cardiac CPR, two questions on paediatric CPR, two questions on neonatal CPR and two questions on obstetric CPR.

Algorithms from the Resuscitation Council of South Africa (RCSA)<sup>11</sup> and the statement from the AHA on cardiopulmonary arrest during pregnancy<sup>12</sup> were used as a reference to guide the development of the knowledge aspect of the questionnaire.

For this study a mark of  $\geq 80\%$  for the CPR knowledge aspect of the questionnaire was interpreted as adequate knowledge in CPR. This is in keeping with the standard of the AHA BLS, ACLS and PALS courses that requires candidates to achieve a mark of  $\geq 84\%$  for the test to receive their qualification.

A pilot study was conducted that consisted of distributing the questionnaire to the two medical doctors who were staff members at the Clinical Simulation and Skills Unit at the UFS. These two participants were general practitioners. This data was not included in the data set of the main study and no changes needed to be made to the questionnaire after the pilot study was completed.

The questionnaire was distributed to each member of the UAH clinical departments during one of their weekly academic meetings, as arranged in advance with the head of that clinical department. It was a voluntary and anonymous questionnaire. The questionnaire was distributed and collected in the same sitting by the first author.

### *Data Analysis*

Data was captured into an Excel spreadsheet and analysed by the UFS Department of Biostatistics. All questionnaires were included in the data analysis of the first three aspects of the questionnaire, namely demographic information, CPR training and CPR exposure.

Nine questionnaires were excluded from the knowledge analysis. Of these nine, four had no knowledge questions completed and another five, after being reviewed, were excluded since the participant had apparently missed an entire page while completing the questionnaire. For the rest of the incomplete knowledge aspect of questionnaires, a question which was not answered was taken as an indication that the participant did not know the answer to that particular question.

For the knowledge aspect of the questionnaire, all participants were expected to complete the first six questions on basic CPR. Thereafter participants were only assessed on the questions applicable to them with regards to the groups of patients they were required, according to the speciality they were working in, to perform CPR on, i.e. adults, paediatrics, neonates and obstetrics. Based on the questions applicable to each participant, an overall percentage was calculated for questions answered correctly as well as a percentage of correctly answered questions for each relevant subsection. Numerical variables were summarised by means and standard deviations and categorical variables by frequencies and percentages.

### **Results:**

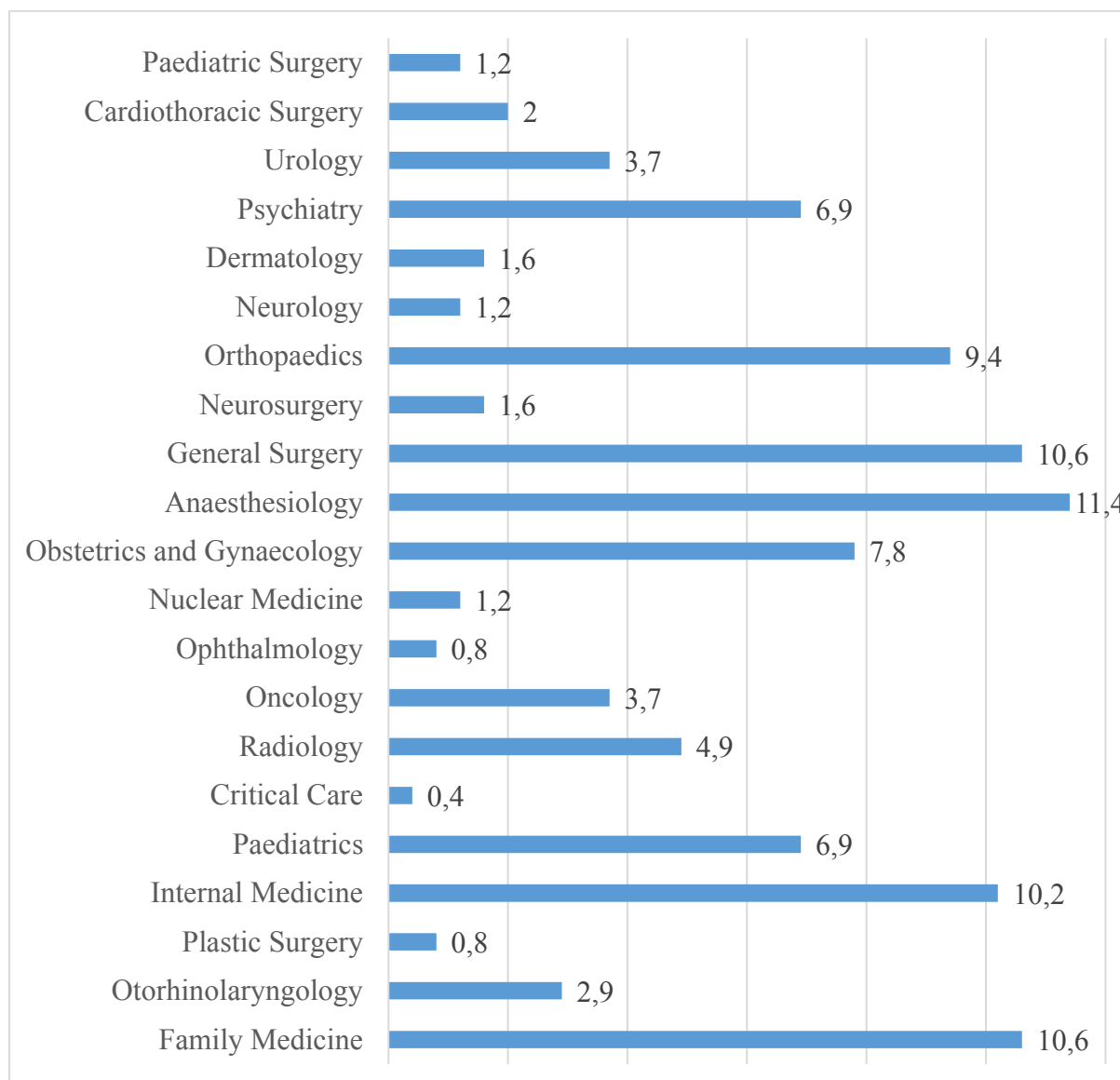
In total, 245 doctors participated in this study. The response rate for this study was estimated to be 58,9 % when taking into account all interns, medical officers, registrars and consultants employed at UAH clinical departments.

Most of the respondents were either registrars or consultants (Table 1), qualified for between 6 to 10 years. When determining the response rate of registrars and consultants only, which were best represented in this sample population, the response rate was 64,9%. The distribution of participants according to clinical departments is illustrated in Figure 1. The departments who had the most participants were the departments of anaesthesiology, general surgery and family medicine.

**Table 1. Demographic information of participants**

<b>Years in practice</b>	<b>n = 244</b>	<b>Percentage</b>
<b>0 – 5 years</b>	43	17,6 %
<b>6 – 10 years</b>	109	44,7 %
<b>11- 15 years</b>	39	16,0 %
<b>16 – 20 years</b>	14	5,7 %
<b>&gt; 20 years</b>	39	16,0 %
<b>Designation</b>	<b>n = 245</b>	<b>Percentage</b>
<b>Intern</b>	27	11,0 %
<b>Medical Officer</b>	13	5,3 %

<b>Registrar</b>	138	56,3 %
<b>Consultant</b>	67	27,4 %



**Figure 1. Participants included in study according to clinical department (%)**

### *CPR Training*

Regarding CPR training, 24 (9.4%) doctors had never received undergraduate training in CPR.

Although many doctors had received undergraduate CPR training and/or attended courses in basic and advanced CPR training, most had not attended retraining within two years (Table 2), with most doctors saying they were too busy to do so (Table 3).

**Table 2. Previous CPR training of participants**

	<b>n = 245 (%)</b>	<b>Percentage &gt; 2 years ago</b>
<b>Undergraduate CPR training</b>	221 (90,6)	
<b>Basic CPR training</b>	222 (90,6)	64,9 %

<b>Advanced CPR training</b>	149 (60,8)	73,2 %
<b>Paediatric CPR training</b>	76 (31,0)	67,1 %
<b>Neonatal CPR training</b>	36 (14,7)	75,0 %

**Table 3. Reasons participants stated for not being up to date with CPR training**

	<b>n = 183</b>	<b>Percentage</b>
<b>Too busy to attend</b>	109	59,6 %
<b>Do not see the need to attend</b>	32	17,5 %
<b>Financial cost</b>	31	16,9 %
<b>Other</b>	11	6,0 %

Almost half of participants (49,4 %) indicated that their department does not provide in-house CPR training and some (14,8 %) were unsure if their department provided CPR training.

#### *Perceptions of Need for CPR Retraining*

Almost all (96,7 %) doctors felt that keeping up to date with current CPR guidelines improved patient outcomes. Participants' view on how often CPR retraining was necessary is indicated in Table 4.

**Table 4. How often participants considered CPR retraining was necessary**

	<b>n = 241</b>	<b>Percentage</b>
<b>Bi-annually</b>	7	2,9 %
<b>Annually</b>	39	16,2 %
<b>Every 2 years</b>	146	60,6 %
<b>Every 3 years</b>	25	10,4 %
<b>&gt; Every 3 years</b>	6	2,5 %
<b>Don't know</b>	18	7,5 %

Training viewed as essential for doctors to attend, according to the groups of patients the participants are exposed to, is indicated in Table 5. For each category, 30-40% of doctors did not consider CPR training as essential. Over a third of doctors (38,5 %) acknowledged that their CPR skills were not up-to-date.

**Table 5. Training viewed as essential by participants**

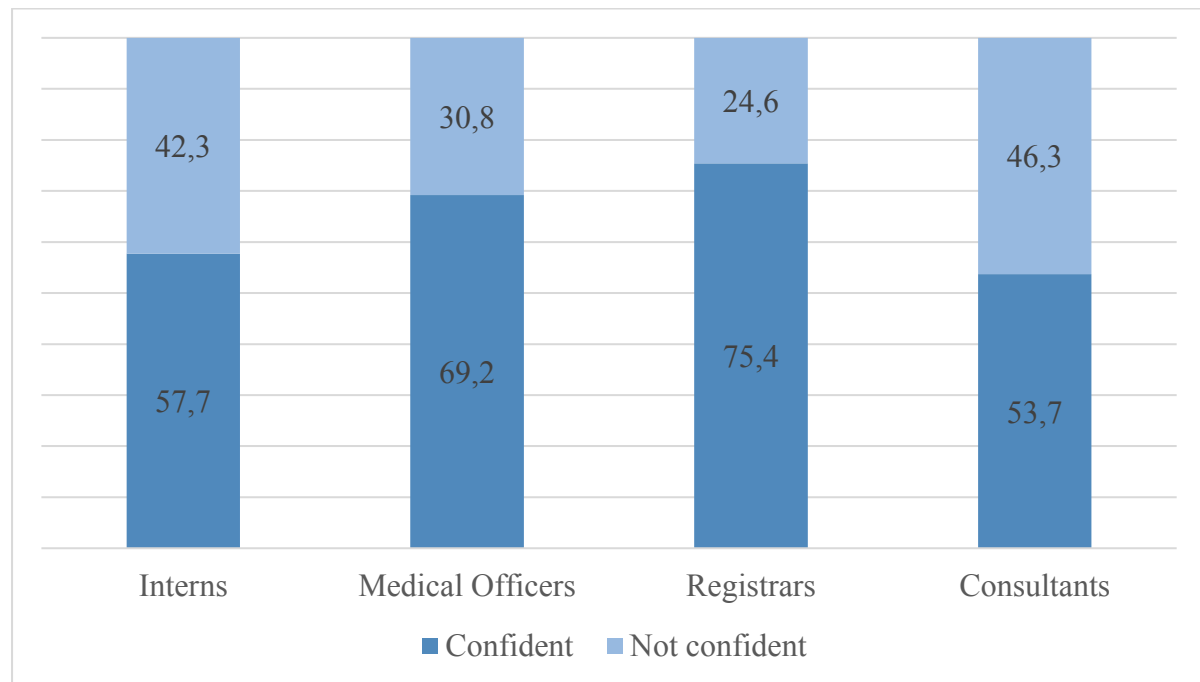
	<b>n = Total Participants as per group of patients required to perform CPR on</b>	<b>n = Essential training as indicated by participants</b>	<b>Percentage</b>
<b>Basic CPR</b>	All participants = 243	171	70,4 %
<b>Advanced CPR</b>	Participants managing adult patients = 223	161	72,2 %
<b>Paediatric CPR</b>	Participants managing paediatric patients = 125	76	60,8 %
<b>Neonatal CPR</b>	Participants managing neonates = 92	68	73,9 %

#### *CPR Exposure*

When looking at participants' current exposure in performing CPR, 13,5 % of participants last performed CPR three to six months ago and 22,1 % of participants performed CPR at least twice a year.

### *CPR Confidence*

On questioning if the participant felt confident in performing CPR, registrars were the group with the highest positive result and consultants the least, even less than interns (Figure 2).

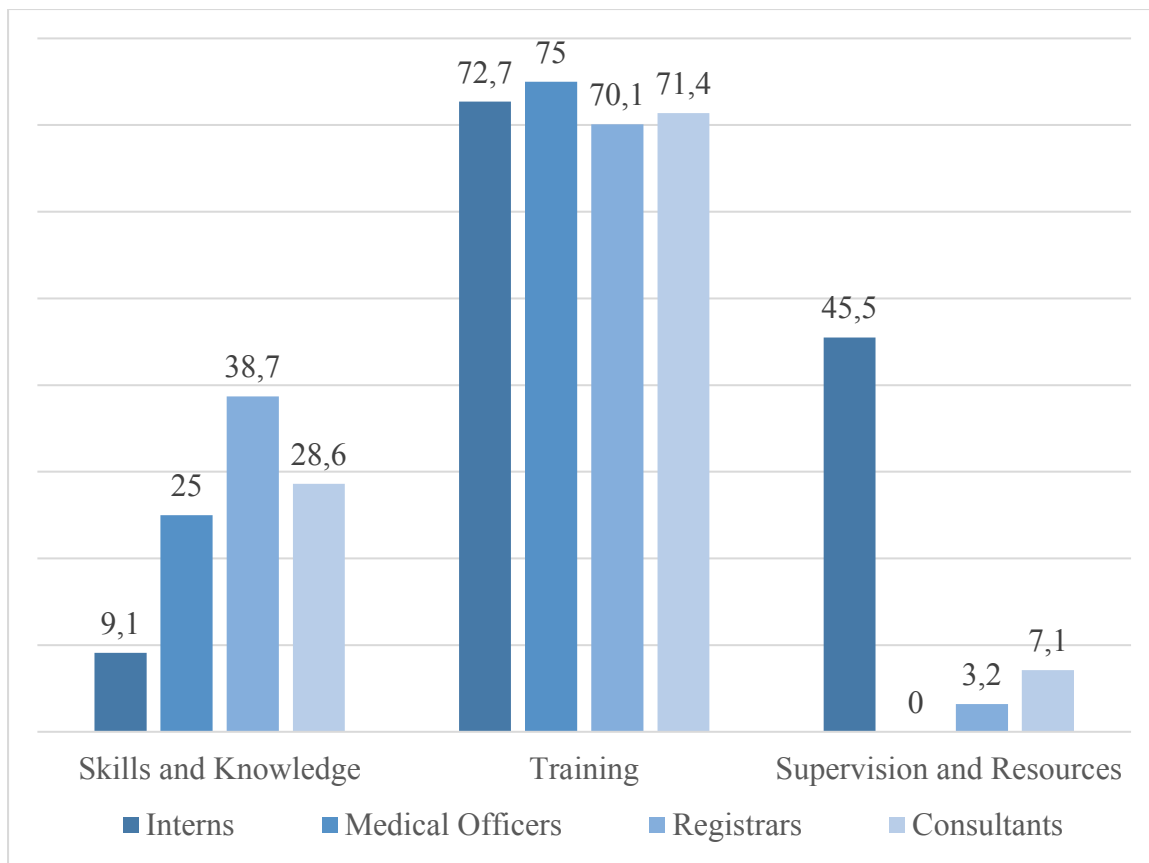


**Figure 2. Participants' confidence in performing CPR (%)**

The two most common stated individual reasons for not being confident in performing CPR were: 'not doing CPR often enough' (35,1 %) and 'not enough/no recent training' (28,1 %).

Over 70% of doctors, regardless of seniority, attributed their lack of confidence in CPR to lack of CPR training (Figure 3).

A variety of other reasons were given by participants for not being confident in performing CPR. These reasons were grouped by the researcher into 'skills and knowledge', 'training and supervision' and 'resources', and indicated a deficiency or lack of these properties, as expressed by the participants, that contributed to not being confident in performing CPR.



**Figure 3. Reasons stated by participants for not being confident in performing CPR (%)**

#### *CPR Knowledge*

Doctors were only assessed on the questions applicable to the groups of patients they had indicated they were in contact with and would therefore be required to perform CPR on, if the need arose. Table 6 indicates the overall score as well as scores achieved for subsections of the questionnaire. Only 22,5 % of participants achieved an overall score  $\geq 80$  %.

The paediatric, neonatal and obstetric subsections consisted only of two questions per subsection, so a participant could only achieve a mark of 0 %, 50 % or 100 % per subsection. The majority of participants scored  $\geq 50\%$  for the subsections.

The results for each individual question are indicated in Table 7. The questions participants did the best in were questions 5, 6, (BLS) 8 and 14 (ACLS) and the questions participants did the worst in were questions 1, (BLS) 7, 9, (ACLS) 15 (Paediatric CPR) and 19 (Obstetric CPR). In the appendix the breakdown of all the questions and options for answers are shown.

**Table 6. CPR knowledge results**

	<b>N</b>	<b>Median</b>	<b>Participants ≥ 50 %</b>	<b>Participants ≥ 80 %</b>
<b>Overall</b>	236	64,6 %	76,3 %	22,5 %
<b>Basic CPR questions 1 – 6</b>	239	66,7 %	80,8 %	35,6 %
<b>Advanced CPR questions 7 – 14</b>	236	75,0 %	82,2 %	31,4 %
<b>Paediatric CPR questions 15 – 16</b>	121	50 %	72,7 %	
<b>Neonatal CPR questions 17 – 18</b>	91	50 %	78,0 %	
<b>Obstetric CPR questions 19 - 20</b>	72	50 %	76,4 %	

**Table 7. Individual CPR knowledge question results**

	<b>Question</b>	<b>Correct (%)</b>
<b>Basic CPR</b>	1. When do you change the compressions to ventilations ratio for 30:2 to 15:2?	44,8 %
	2. How frequently should you do a rhythm and pulse check (you have a timekeeper)?	57,3 %
	3. At what rate should you administer chest compressions to an adult?	58,2 %
	4. How frequently can you administer adrenaline if repeat doses are required?	58,6 %
	5. How much adrenaline is in one ampoule at Universitas Academic Hospital?	83,7 %
	6. Which of the following, should you do first, when you find an unresponsive adult patient?	80,8 %
<b>Advanced Cardiac CPR</b>	7. At what rate should you administer rescue breaths to an adult patient?	49,2 %
	8. During which cardiac rhythm is a shock advised?	82,2 %
	9. What is the dose of monophasic defibrillation in an adult patient?	37,3 %
	10. What dose of adrenaline should be administered during cardiopulmonary arrest in an adult?	75,4 %
	11. During which cardiac arrhythmia should adenosine be administered?	72,0 %
	12. During which situation should you administer atropine as the FIRST LINE medication?	58,5 %
	13. After a shock is delivered, what is your next step?	67,4 %
	14. With regards to achieving successful patient outcome following a cardiopulmonary arrest, what is the most important time interval? Witnessed arrest to...	88,1 %
<b>Paediatric CPR</b>	15. What dose of adrenaline should be administered during a cardiopulmonary arrest in a child?	48,8 %



<b>Neonatal CPR</b>	16. A child is in ventricular fibrillation, what dose of shock should you deliver?	60,3 %
	17. What is the rate of compressions to ventilation in neonates during cardiopulmonary resuscitation?	52,8 %
	18. At which heart rate should you start chest compressions in a neonate?	65,9 %
<b>Obstetric CPR</b>	19. During CPR in a pregnant patient, how should you position the patient?	26,4 %
	20. When should a caesarean delivery be done during CPR in a pregnant patient?	56,9 %

## Discussion:

This study showed that current competencies of doctors at UAH regarding CPR training and knowledge was inadequate. Their perceptions regarding CPR retraining at regular intervals and the association with patient outcomes did not correlate with their confidence in performing CPR and CPR knowledge.

When interpreting the data collected, it can be viewed in context of each subsection of the questionnaire and then as a whole.

The majority of participants were registrars. This fits in with the majority of participants that were 6 – 10 years in practice since doctors usually enter a registrar program a year or two after completing their internship and community service, and registrar programs are typically 4 – 5 years depending on the discipline.

It is evident from the results of this study that the majority of doctors felt that keeping up to date with the latest CPR guidelines improves patient outcomes. The majority of participants also felt that at least basic CPR training is essential and that it is necessary to attend CPR retraining every 2 years. However, despite these sentiments, only a minority of participants had attended retraining and most of these had not attended retraining for over two years.

Although guidelines suggest retraining is required every two years, there is literature to suggest that retraining should happen even more frequently, based on evidence that skills and knowledge deteriorate within 3-12 months from initial training.<sup>6</sup> It also appears that motor skills deteriorate more rapidly than theoretical knowledge.<sup>13</sup>

This is of concern as high-quality CPR has been proven to improve patient outcomes, especially following an in-hospital cardiopulmonary arrest. The motor skills of CPR training are the essence of providing good quality CPR, in addition to early recognition of cardiopulmonary arrest, initiation of CPR, defibrillation where indicated and administration of applicable drugs.<sup>14</sup>

The most common reason stated for not attending retraining was that participants stated they were too busy to attend retraining courses. In addition, many participants mentioned that they were not allowed special leave to attend CPR retraining courses. This should be something that doctors should not have to take annual leave to attend and clinical departments should actively encourage attendance at biannual retraining or even make it compulsory to attend.

Another common reason stated for not attending retraining, was that participants did not see the need to attend CPR retraining. Unfortunately, it was not specified whether this was because the participants felt that they knew enough and did not require retraining or for other reasons. Regardless of reasons, this is of concern given the poor results from the knowledge questions of this study. Most participants that scored poorly on the knowledge tests, did not feel the need to update their CPR knowledge, thereby indicating a falsely elevated self-evaluation of their knowledge and skills.

Financial cost was also given as a reason for not attending retraining. To register and attend the advanced CPR training, a participant first has to obtain the basic CPR qualification and register for the advanced courses before two years, otherwise they will have to redo the basic CPR course. With this system, significant financial costs are involved. Currently these courses cost between R 1 000.00 to R 4 000.00, and travel and accommodations costs may also be incurred. These costs could be reduced by arranging in-house departmental CPR training courses, probably at a fraction of the cost of formal CPR courses. At UAH these in-house courses could be presented at the adjacent UFS Clinical Simulation and Skills Unit by suitably qualified staff. A program like this will not provide a formal certificate of qualification, but will provide regular skill and knowledge refreshers to improve the quality of CPR provided to patients.

The provision of CPR training at UAH was found to be a major problem – most participants did not know if their department provided CPR training or indicated that it did not. The departments that did provide CPR training, largely incorporated this training in the management of certain emergency situations e.g. ESMOE (Essential Steps in the Management of Obstetric Emergencies), ATLS (Advanced Trauma Life Support) and MEPA (Managing Emergencies in Paediatric Anaesthesia). These courses trained participants on management of relevant emergencies, but the focus was not on CPR training. Only a few departments provided basic CPR training.

The majority of participants felt confident in performing CPR, particularly the registrars. Reasons for this could be because registrars were in a training post, often require them to be first on-call for emergencies and thus are more involved in the emergency care of patients, including CPR situations, than other groups of doctors. Consultants were least confident – possibly because they had last received CPR training longer ago than others, were less ‘hands-in’ in acute emergencies or lacked the confidence of youth.

In this study, most doctors performed CPR at least twice a year, with variation between disciplines. Some departments see more acutely ill patients and were confronted with CPR situations more often than other departments.

Although the majority of doctors (64 %) felt confident in performing CPR, a significant number did not, which is of concern, as every doctor should be competent in at least basic CPR. The results showed that most attributed this lack of confidence to training issues. For the doctors who were least experienced, i.e. interns, problems were also identified with supervision during CPR. Registrars, who were as a group more experienced in terms of years of service, additionally attributed their lack of confidence in CPR to skills and knowledge issues.

The most common individual reasons given for lack of confidence in CPR, included doing CPR infrequently and having had no recent training or practice in CPR. This is consistent with literature: without frequent exposure or retraining one loses the knowledge and skill required for competent performance of CPR.<sup>13,15</sup> Of note, several participants felt insufficiently confident to administer the required medications during CPR, although it is not known if this was because they were unsure which medications to use or that they did not know the doses. Others were not confident in using a defibrillator since Automated External Defibrillators (AED) had replaced manual defibrillators in most clinical areas of the hospital and they had only been trained to use the latter. However, this problem could easily have been rectified by the participant requesting AED training as these devices are simple to use and can even be used by non-healthcare practitioners.

Compared to some studies, the test scores for overall CPR knowledge of doctors, in this study were higher. In these studies, most health care providers achieved less than 50 % for basic and advanced cardiac CPR knowledge.<sup>1,2,3,10</sup> These studies assessed medical doctors of different levels of practice, including interns, medical officers, registrars and consultants, the same population as this study. The participants of this study at UAH achieved an overall median score of 64,6 % compared to the other studies' mean scores of 35,1 % and 44,5 %.<sup>1,10</sup> The study populations and the difficulty of the CPR knowledge questions were similar, except for the additional questions on paediatric, neonatal and obstetric CPR, which may have enabled the participants in this study to score higher.

These speciality related questions were only assessed according to the groups of patients the participants had self-declared they managed clinically; it was deemed that by inference, these would be the types of patients the participants were required to perform CPR on. This gave the participants the best opportunity to score well as was related to the patients they regularly treated. Despite this, less than a quarter of doctors (22,5 %) achieved an overall CPR knowledge score considered as adequate ( $\geq 80$  %). Comparing this result to other studies, the participants at UAH also had better results. In Niambar and Ragavan studies, only 4,3 % and 4,6 % of participants, respectively, obtained marks of  $\geq 80$  %.<sup>1,3</sup>

It was disappointing to find that questions regarding adrenaline, the most commonly used medication in CPR, were frequently answered incorrectly. Several (16.3%) participants could not say how much adrenaline was in a single ampoule; this can be attributed to the common practice of giving "an ampoule" of a medication without checking its concentration. Over half the participants (51,2 %) regularly treating children, did not know the correct dose of adrenaline in  $\mu\text{g/kg}$  for a child during a cardiac arrest. Similarly, this is probably because of the practice of drawing up "an ampoule" of adrenaline in a certain volume of diluent, and then giving the adrenaline as millilitres/kg for a child, without actually knowing how many micrograms were injected. This practice is inherently dangerous as manufacturers potentially can make ampoules of a different concentration, and different institutions or clinical areas may have different regimes for diluting adrenaline, leading to potentially over- or under dosage, when a clinician is solely familiar with given a certain volume of adrenaline per kg of a child's weight.

#### *Limitations:*

Interns and medical officers were poorly represented in this study sample, so it was not representative of this group of doctors. Most probably, this was because many were not

present during the departmental meetings when the questionnaire was completed owing to clinical work load, with registrars given preference to attend departmental meetings.

This study did not evaluate the motor skills of CPR, which studies have shown as the CPR skill that deteriorate to a greater extent and more rapidly than the theoretical knowledge. A future study could incorporate practical CPR assessment as well as theoretical knowledge assessment.

Due to time limitations and the assumption that the participants would be unlikely to participate in completing a long questionnaire, the number and depth of knowledge of questions were limited. There were only two questions regarding paediatric, neonatal and obstetric CPR respectively, to keep the questionnaire at a reasonable length encouraging completion.

This study did not include evaluating the nursing staff of the hospital. Nursing staff in the wards are usually the first responders to a patient with cardiorespiratory arrest. They initiate basic CPR until the resuscitation team arrives and takes over. This study did not include evaluating the nursing staff of the hospital. Keenen et al (2009), in a survey on nurses' basic CPR knowledge and training at UAH, found that only 11 % of nurse participants, of all levels of qualifications and seniority, obtained a mark of  $\geq 80$  % for their basic CPR knowledge. This reflected poor CPR knowledge despite the fact that 93,1 % of participants reported to have attended CPR courses, the majority of which were in the past year (60,9 %).<sup>16</sup>

Although this questionnaire, designed by the first author, was reviewed by qualified CPR providers, it has not been validated in a formal study.

### **Conclusion:**

The results of this study demonstrated that the majority of doctors at UAH were not adequately trained in CPR and had inadequate CPR knowledge. Many lacked confidence in performing CPR. Most doctors recognised that it was important to remain up to date with CPR training, but had not attended retraining and were not up to date with current CPR guidelines.

Doctors at UAH should attend CPR training courses and/or scheduled in-house CPR training, in order to be updated with CPR guidelines and to re-establish CPR skills.

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## Appendices

### Appendix A: Letter of approval from Health Sciences Research Ethics Committee

UNIVERSITY OF THE  
FREE STATE  
UNIVERSITEIT VAN DIE  
VRYSTAAT  
YUNIBESITHI YA  
FREISTATA



UFS·UV  
HEALTH SCIENCES  
GESONDHEIDSWETENSKAPPE

Health Sciences Research Ethics Committee

18-Oct-2019

Dear Dr Nadia Du Plessis

Ethics Clearance: Training, Knowledge, Experience and Perceptions regarding Cardiopulmonary Resuscitation of Doctors at Universitas Academic Hospital

Principal Investigator: Dr Nadia Du Plessis

Department: Anaesthesiology Department (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-HSD2019/1498/2910

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

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



## **Appendix B: Participant information form**

### **Information document**

#### ***Training, Knowledge, Experience and Perceptions regarding Cardiopulmonary (CPR) of Doctors at Universitas Academic Hospital (UFS-HSD2019/1498/2910)***

Dear participant,

I, Nadia du Plessis, a registrar in the department of Anaesthesiology, am conducting a postgraduate research study and you are invited to participate.

This study is designed as a questionnaire to be completed by participants **voluntarily and anonymously**. All efforts will be made to keep data confidential.

The objective of this study is to ascertain the level of knowledge and training of doctors at Universitas Academic Hospital as well as to determine their experience and perceptions regarding CPR and CPR training.

The results of this study will help guide Hospital Management and Heads of Departments determine if more regular CPR training is required.

Agreement to participate in this study also includes using the information obtained for research and publication purposes.

Participants may withdraw from this study at any given moment during the completion of the questionnaire with no penalty.

Thank you for participating in this study.

#### **Contact details of researcher:**

Dr Nadia du Plessis

Department of Anaesthesiology UFS

0823404688

#### **Contact details of Health Science Research Ethics Committee (HSREC):**

HSREC Head of Ethics Administration

Mrs MGE Marais

051 401 7795

[ethicsFHS@ufs.ac.za](mailto:ethicsFHS@ufs.ac.za)

## Appendix C: Permission from Free State Department of Health



health

Department of  
Health  
FREE STATE PROVINCE

04 October 2019

Dr N Du Plessis  
Dept. of Anaesthesiology  
UFS

Dear Dr N Du Plessis

Subject: Training, Knowledge, Experience and Perceptions regarding Cardiopulmonary Resuscitation of Doctors at Universitas 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 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 [scheelats@fshealth.gov.za](mailto:scheelats@fshealth.gov.za) / [makenamr@fshealth.gov.za](mailto:makenamr@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)
- **As part of feedback you will be required to present your study findings/results at the Free State Provincial health research day**

Trust you find the above in order.  
Kind Regards

Dr D Motau

HEAD: HEALTH

Date: 9/10/19

Head : Health  
PO Box 227, Bloemfontein, 9300  
4<sup>th</sup> Floor, Executive Suite, Bophelo House, cnr Matland and, Harvey Road, Bloemfontein  
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[www.fs.gov.za](http://www.fs.gov.za)





health

Department of  
Health  
FREE STATE PROVINCE

04 October 2019

Dr N Du Plessis  
Dept. of Anaesthesiology  
UFS

Dear Dr N Du Plessis

Subject: Training, Knowledge, Experience and Perception regarding cardiopulmonary resuscitation of doctors at Universitas Academic Hospital.

Please find below the contact details of Universitas Hospital CEO for logistical arrangements.

Universitas Academic Hospital	
<b>Name:</b> Dr M Molokomme <b>Email:</b> <a href="mailto:molokomm@fshealth.gov.za">molokomm@fshealth.gov.za</a> <b>Tel:</b> 051 405 3557	<b>PA:</b> Me M Van Der Berg <b>Email:</b> <a href="mailto:vdbergsu@universitas.fs.gov.za">vdbergsu@universitas.fs.gov.za</a>

Trust you find the above in order.

Kind Regards

## Appendix D: Permission from Student Affairs



Office of the Vice-Rector: Research and Internationalisation  
Kantoor van die Viserektor: Navorsing en Internasionalisering

17-Oct-2019

Dear Dr Nadia Du Plessis

### **UFS AUTHORITIES APPROVAL**

Research Project Title:

**Training, Knowledge, Experience and Perceptions regarding Cardiopulmonary Resuscitation of Doctors at Universitas Academic Hospital**

This letter serves as confirmation that your request to collect data from students and/or staff members at the University of the Free State for your research project has been approved provided that you also have ethical clearance for the research from the ethics committee at the University of the Free State.

Please make sure that you also obtain your ethics clearance letter containing your reference number from the ethics committee after you have received this letter before you conduct your research.

Kind Regards



**PROF RC WITTHUHN  
VICE-RECTOR: RESEARCH & INTERNATIONALISATION  
CHAIR: SENATE RESEARCH ETHICS COMMITTEE**

205 Nelson Mandela Drive/Ryslaan  
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[www.ufs.ac.za](http://www.ufs.ac.za)



**Appendix E: Copy of the research protocol approved by the HSREC**

Training, Knowledge, Experience and Perceptions regarding Cardiopulmonary  
Resuscitation of Doctors at Universitas Academic Hospital

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Research Protocol

Nadia du Plessis, Prof G Lamacraft  
9/26/2019

## **Index:**

1. Title
2. Researchers
3. Introduction
4. Objectives
5. Methodology
  - 5.1. Study design
  - 5.2. Sample
  - 5.3. Measurements
  - 5.4. Pilot study
  - 5.5. Methodological and measurement errors
6. Analysis
7. Implementation of findings
8. Time schedule
9. Budget
10. Ethical aspects
11. References

## **1.Title**

Training, Knowledge, Experience and Perceptions regarding Cardiopulmonary Resuscitation  
of Doctors at Universitas Academic Hospital

## **2. Researchers:**

Dr NS du Plessis  
MBChB (UFS)  
Registrar Anaesthesia  
Department Anaesthesia  
University of the Free State  
Student number 2007012020  
Cell number 082 340 4688  
e-mail [nadia.vonwielligh@gmail.com](mailto:nadia.vonwielligh@gmail.com)

Prof G Lamacraft  
MBBS, MRCP, FRCA, PhD  
Associate Professor/Chief Specialist  
Department Anaesthesia  
University of the Free State  
Tel number 051 405 3307  
e-mail [LamacraftG@ufs.ac.za](mailto:LamacraftG@ufs.ac.za)

### **3. Introduction:**

Cardiopulmonary resuscitation (CPR) is an emergency lifesaving intervention that can improve survival after a cardiac arrest. This is an intervention that anyone whether in a medical profession or not can be trained in. As medical doctors it is expected and assumed that we are competent in CPR knowledge and skills. However, literature suggests that it may not be the case.<sup>1</sup>

During medical undergraduate studies CPR training is something that is taught on a regular basis and is thought to be sufficient to equip junior doctors when they enter clinical practice as intern doctors and community service doctors. Although this may initially be sufficient training it is important to stay updated and attend retraining courses, as the guidelines are reviewed every two years by the International Liaison Committee on Resuscitation (ILCOR) and updated according to the latest evidence-based resuscitation science. ILCOR was formed in 1992 and provides a platform for liaison between resuscitation organizations from across the world to discuss and review international data on resuscitation and produce international consensus and guidelines on CPR.<sup>2</sup>

High-quality CPR improves patient outcomes. High-quality CPR involves early recognition and initiation of CPR, early defibrillation if there is a shockable rhythm and chest compressions that are deep enough, allow complete chest recoil and are fast enough.<sup>3</sup> Deviating from Advanced Cardiac Life Support (ACLS) guidelines is associated with a decreased likelihood of return of spontaneous circulation (ROSC) and decreased immediate survival and survival to hospital discharge.<sup>4</sup> There is evidence to show that there is a drastic improvement in immediate survival and survival to hospital discharge in patients after in-hospital cardiac arrest after training and retraining of health care providers in Basic Life Support (BLS) and ACLS. An improvement of 10% in immediate survival and 46% in survival to hospital discharge has been described.<sup>5,6</sup>

The American Heart Association (AHA) recommends CPR retraining at a maximum interval of two years, but also comments that evidence suggest deterioration of core knowledge and skills within 3 – 12 months from completing the initial training. The AHA suggests that more frequent simulation-based retraining improves learning as well as knowledge and skills retention compared to less frequent more comprehensive training.<sup>7</sup>

On evaluating BLS and ACLS knowledge of health care providers, it was found that their knowledge was inadequate after completing a 20-question test on BLS and ACLS knowledge.<sup>8</sup> The majority of health care providers scored less than 50%. Of these healthcare providers most have completed CPR training in the past but have not attended retraining.<sup>9,10,11</sup> Both knowledge and skill deteriorate over time, but the psychomotor skills deteriorate to a larger extent than the theoretical knowledge.<sup>12</sup>

It seems that at an interval of three months there is still good retention of CPR skills and knowledge, but after three months without any retraining there is measurable deterioration of skills and knowledge. With retraining within this time period by various methods retention remains good.<sup>13</sup> This statement can also be strengthened by data that shows that health care providers that work in an emergency department that regularly have to provide CPR in real-life emergency situations, and have regular retraining have better knowledge and skill retention than health care providers that work in an out-patient department or a ward that do not regularly have to provide CPR.

From the literature one can conclude that retraining in CPR should happen at least once every three to twelve-months, with hands-on mannequin simulation-based and instructor led training programs.<sup>14,15</sup> It appears from personal communication with doctors working at Universitas Academic Hospital (UAH), that many have not had recent training in CPR. At present, there is little in-house training in CPR provided and most doctors have to organize their own training/retraining privately. Furthermore, there is no hospital employment requirement making training in CPR mandatory, so there is little incentive for doctors to update their CPR training.

I have therefore designed a study, guided by the above literature, and using algorithms from the Resuscitation Council of South Africa (RCSA)<sup>16</sup> and a statement from American Heart Association (AHA) on cardiac arrest during pregnancy<sup>17</sup> to design a questionnaire, to ascertain how recently doctors at Universitas Academic Hospital have been trained/retrained in CPR and to evaluate their level of knowledge in CPR. The purpose of this study is to determine if training/retraining programs in CPR at UAH are required.



#### **4. Objectives:**

The primary objective of this study is to evaluate if doctors at Universitas Academic Hospital are adequately trained in cardiopulmonary resuscitation.

The secondary objectives are to evaluate experience in CPR, the perception of importance of training and regular retraining in CPR and the CPR knowledge of doctors at Universitas Academic Hospital regarding cardiopulmonary resuscitation.

## **5. Methodology:**

### **5.1 Study design:**

The study will be conducted in the form of a descriptive observational study.

### **5.2 Sample:**

All interns, medical officers, registrars and consultants employed in clinical departments at Universitas Academic Hospital. The sample size is estimated to be approximately 300 participants.

Exclusion criteria will be members of the departments that are not present at the academic meeting on the day the questionnaires are administered and members that decide not to participate in the study.

### **5.3 Measurement:**

A questionnaire will be administered to each member of the clinical departments during one of their weekly academic meetings. It will be a voluntary, anonymous questionnaire. The questionnaire will be handed out and collected in the same sitting by the researcher.

The questionnaire has been developed and designed for this specific study by the researcher and reviewed internally by members of the department of anaesthesiology. Algorithms from the Resuscitation Council of South Africa (RCSA) and statement from the American Heart Association (AHA) on cardiac arrest during pregnancy were used as a reference to guide developing the knowledge aspect of the questionnaire.

The questionnaire evaluates four aspects of the participant:

1. Demographic information
2. CPR training
3. Current CPR experience and perception regarding CPR training
4. CPR knowledge

For this study a mark of  $\geq 80\%$  for the CPR knowledge aspect of the questionnaire would be interpreted as adequate knowledge in CPR.

Appendix A: Information document to participants

Appendix B: Questionnaire

Appendices C to G: RCSA algorithms

### **5.4 Pilot study:**

A pilot study will be conducted. It will consist of administering the questionnaire to the three medical staff members at the Simulation Unit at the University of the Free State. This will facilitate finding problems in the questionnaire and these will be remedied before commencing the main study. This data will not be included in the data set of the main study.

### **5.5 Methodological and measurement errors:**

Measurement errors may occur due to not every doctor being present at these academic meetings due to being on leave or covering a shift at one of the other hospitals on the day the questionnaire is being administered.

Participants may also exhibit the Hawthorne effect of altering their answers due to knowing they are being assessed. To overcome this, the questionnaire will be anonymous. But even then, this effect may be present.

Incomplete questionnaires could also contribute to measurement errors. Incomplete questionnaires will be included in the data set. Adjustments will be made in the data analysis to compensate for missing information if any.

There may also be errors in answering if the questions are misinterpreted. To avoid this the researcher or the research supervisor will be present when the questionnaires are being completed to answer any questions regarding the interpretation of the questions, but not to assist with the answers.

A limitation of this study is that the questionnaire method does not allow for any practical testing of CPR skills.

## **6. Analysis:**

Data collected on the questionnaires will be entered into an Excel spread sheet by the researcher and analysis of the data will be done by Department of Biostatistics UFS. Results will be summarized by frequencies and percentages (categorical variables) and means and standard deviations, or percentiles (numeric variables).

## **7. Implementation of findings:**

The findings of this study will demonstrate the level of knowledge of doctors at Universitas Academic Hospital regarding CPR and if their training is current. This will help guide the Hospital Management and Heads of Clinical Departments determine if cardiopulmonary resuscitation training is required and how many doctors in the various departments need this.

By performing the questionnaire, doctors may also be encouraged to update their CPR training, if they experience difficulty in answering the questions.

## **8. Time schedule:**

Submitting research protocol to be reviewed by the ethics committee August 2019

Data Collection October-November 2019

Data Analysis December 2019-February 2020

Article writing March-April 2020

Submission of final research report May 2020

Time line	2019												2020				
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	
Research topic																	
Literature review																	
Writing of protocol and questionnaire																	
Submit to ethics committee																	
Data collection																	
Data analysis																	
Article writing																	
Submit final research report																	

### **9. Budget:**

<b>Budget</b>	<b>Quantity</b>	<b>Price</b>	<b>Total</b>
Printing of questionnaire	300 x 3 pages	x 80c/page	R 720.00
Printing of information document	300 x 1 page	x 80c/page	R 240.00
Printing and binding of thesis	2	R2 500	R 5000.00
Unforeseen expenses			R 500.00
<b>Grand total</b>			<b>R 6460.00</b>

Expenses will be covered by the researcher and the University of the Free State department of Anaesthesia.

## **10. Ethical aspects:**

Before administering the information documents and questionnaires the researcher will give a short description to the group on the topic of the research, the questionnaire and for what the data will be used for and that the questionnaire is voluntary and anonymous.

On handing out the information documents and questionnaires the potential participants can read through the information document and decide if they want to participate or not. Participants may still decide not to participate, even if the questionnaire is completed before returning the completed questionnaire to the researcher and placed in a box to ensure anonymity. Once the completed questionnaire is returned to the researcher the data will be included.

Completing this questionnaire as part of this study will not affect daily work or patient care as the questionnaires will be administered during scheduled academic meetings in the different departments and should also not take longer than ten minutes to complete.

Ethics approval will be obtained from the Health Science research Ethics Committee of the University of the Free State (HSREC-UFS) and permission will be obtained from the Head of Department of Anaesthesiology and the Free State Department of Health.



## 11. References:

1. Botha L, Geyser MM, Engelbrecht A. Knowledge of cardiopulmonary resuscitation of clinicians at a South African tertiary hospital. *South African Fam Pract.* 2012 Sep; 54(5):447–54.
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3. Möhr D. Cardiopulmonary resuscitation: state of the art in 2011. *Southern African Journal of Anaesthesia and Analgesia.* 2011:225–39.
4. Honarmand K, Mephram C, Ainsworth C, Khalid Z. Adherence to advanced cardiovascular life support (ACLS) guidelines during in-hospital cardiac arrest is associated with improved outcomes. *Resuscitation.* 2018 Aug; 129:76–81.
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8. Nambiar M, Nedungalaparambil NM, Aslesh OP. Is current training in basic and advanced cardiac life support (BLS & ACLS) effective? A study of BLS & ACLS knowledge amongst healthcare professionals of North-Kerala. *World J Emerg Med.* 2016 Dec; 7(4):263–9.
9. Geldenhuys J. The resuscitation knowledge and skills of intern doctors working in the Department of Anaesthesiology at the Bloemfontein Academic Hospital Complex [Internet]. University of the Free State; 2015. Available from: <https://scholar.ufs.ac.za/handle/11660/4049>
10. Ragavan S, Schneider H, Kloeck WG. Basic resuscitation: knowledge and skills of full-time medical practitioners at public hospitals in Northern Province. *S A M J South African Medical Journal* 2000; 90:504–8.
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12. Kaczorowski J, Levitt C, Hammond M, Outerbridge E, Grad R, Rothman A, et al. Retention of neonatal resuscitation skills and knowledge: a randomized controlled trial. *Fam Med.* 1998 Nov; 30(10):705–11.
13. Govender K, Rangiah C, Ross A, Campbell L. Retention of knowledge of and skills in cardiopulmonary resuscitation among healthcare providers after training: original research. *South African Family Practice.* 2010; 52:459–62.
14. Perkins GD, Kimani PK, Bullock I, Clutton-Brock T, Davies RP, Gale M, et al. Improving the efficiency of advanced life support training: a randomized, controlled trial. *Ann Intern Med* 2012 Jul 3; 157(1):19–28.
15. Wayne DB, Didwania A, Feinglass J, MJ F, JH B, WC M. Simulation-based education improves quality of care during cardiac arrest team responses at an academic teaching hospital: a case-control study. *Chest.* 2008 Jan; 133(1):56–61.
16. Resuscitation Council of South Africa. Algorithms. 2019. <http://resus.co.za/algorithms/> (22 June 2019).

17. Jeejeebhoy FM, Zelop CM, Lipman S, Carvalho B, Joglar J, Mhyre JM, et al. Cardiac Arrest in Pregnancy: A Scientific Statement from the American Heart Association. *Circulation*. 2015 Nov 3; 132(18):1747–73.

## Appendix F: Questionnaire

### Questionnaire:

#### Training, Knowledge, Experience and Perceptions regarding Cardiopulmonary Resuscitation of Doctors at Universitas Academic Hospital

*You have been asked to participate in a research study. Please note that by completing this questionnaire you are voluntarily agreeing to participate in this research study. You will remain anonymous and your data will be treated confidentially at all times. You may withdraw from this study at any given moment during the completion of the questionnaire. The results of the study may be published.*

*(Please **CIRCLE** your selected answers)*

#### Demographics

1. How many years are you in practice since completing undergraduate MBChB degree (including internship and community service)?  
☐ 0-5 years   ☐ 6-10 years   ☐ 11-15 years   ☐ 16-20 years   ☐ > 20 years
2. What is your designation?  
☐ Intern   ☐ Medical Officer   ☐ Registrar   ☐ Consultant
3. Which groups of patients do you have contact with? (You may select more than one option)  
☐ Neonates   ☐ Paediatrics   ☐ Adults   ☐ Obstetrics
4. Department  
\_\_\_\_\_

#### Cardiopulmonary Resuscitation (CPR) training

1. As an undergraduate, were you trained in cardiopulmonary resuscitation (CPR)?  
☐ Yes   ☐ No
2. Have you received certified basic life support (BLS) or equivalent training?  
☐ Yes   ☐ No

If YES: When was the last time you attended this course?

☐ 0 to < 6 months ago   ☐ 6 to < 12 months ago   ☐ 1 year to < 2 years ago   ☐ ≥ 2 years ago

3. Have you received certified advanced cardiac life support (ACLS) or equivalent training?

☐ Yes ☐ No

If YES: When was the last time you attended this course?

☐ 0 to < 6 months ago ☐ 6 to < 12 months ago ☐ 1 year to < 2 years ago ☐ ≥ 2 years ago

4. Have you received certified paediatric advanced life support (PALS) or equivalent training?

☐ Yes ☐ No

If YES: When was the last time you attended this course?

☐ 0 to < 6 months ago ☐ 6 to < 12 months ago ☐ 1 year to < 2 years ago ☐ ≥ 2 years ago

5. Have you received certified neonatal life support (NLS) or equivalent training?

☐ Yes ☐ No

If YES: When was the last time you attended this course?

☐ 0 to < 6 months ago ☐ 6 to < 12 months ago ☐ 1 year to < 2 years ago ☐ ≥ 2 years ago

6. If any of the above courses you attended was more than 2 years ago, give reason why you have not attended a refresher course.

☐ Financial cost ☐ Course not available ☐ Too busy to attend ☐ Do not see the need to attend

☐ Other:

7. Does your department provide CPR skills training?

☐ Yes ☐ No ☐ Unsure

If YES: In which type of CPR course(s)?

☐ BLS ☐ ACLS ☐ PALS ☐ NLS ☐ Other:

### **Current CPR Experience and Perceptions regarding CPR Training**

1. For the speciality you are currently working in, which type(s) of CPR training are essential? (You may select more than one option)

☐ Basic life support ☐ Advanced cardiac life support ☐ Paediatric advanced life support  
☐ Neonatal life support ☐ None

2. How often is it necessary to attend CPR training refresher courses?  
☐ Bi-annually   ☐ Annually   ☐ Every 2 years   ☐ Every 3 years   ☐ > every 3 years   ☐ Don't know
3. Does keeping up to date with CPR courses improve patient outcome during a cardiopulmonary resuscitation?  
☐ Yes   ☐ No
4. Do you think your CPR knowledge and skills are up to date?  
☐ Yes   ☐ No   ☐ Don't know
5. When last did you perform CPR on a patient?  
☐ Less than a week ago   ☐ 1 to 4 weeks ago   ☐ 1 to < 3 months ago   ☐ 3 to < 6 months ago  
☐ 6 to < 12 months ago   ☐ 1 to < 2 years ago   ☐ 2 to < 5 years ago   ☐ 5 to < 10 years ago  
☐ ≥ 10 years ago
6. Estimate how often you are required to perform CPR, in your current field of work?  
*(Mark the closest answer to your estimate)*  
☐ Daily   ☐ Weekly   ☐ Monthly   ☐ Twice a year   ☐ Once a year   ☐ Less often than once a year  
☐ Never
7. Which group(s) are you required to perform CPR on? *(You may select more than one option)*  
☐ Neonates   ☐ Children   ☐ Adults   ☐ Obstetric patients
8. Do you feel confident in a CPR situation?  
☐ Yes   ☐ No
9. If NO, explain why you do not feel confident?  


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### **Knowledge**

*(Please **CIRCLE** the correct answer. **ONLY ONE CORRECT ANSWER PER QUESTION**)*

1. When do you change the compressions to ventilations ratio from 30:2 to 15:2?
  - a. In all children with 1 rescuer
  - b. In all adults with 1 rescuer
  - c. In all children with 2 rescuers
  - d. In all adults with 2 rescuers

2. How frequently should you do a rhythm and pulse check (you have a timekeeper)?
  - a. Every 5 minutes
  - b. After every fifth cycle of CPR
  - c. Every 2 minutes
  - d. After every 100 compressions
3. At what rate should you administer chest compressions to an adult?
  - a. 60-80 per minute
  - b. 100-120 per minute
  - c. 80-100 per minute
  - d. 120-140 per minute
4. How frequently can you administer Adrenaline if repeat doses are required?
  - a. Every 2 minutes
  - b. Every 3-5 minutes
  - c. After every cycle of CPR
  - d. After every fourth cycle of CPR
5. How much adrenaline is in one adrenaline ampoule at Universitas Academic Hospital?
  - a. 100 mcg
  - b. 1 mg
  - c. 10 mcg
  - d. 10 mg
6. Which of the below, should you do first, when you find an unresponsive adult patient?
  - a. Start rescue breaths
  - b. Call for help
  - c. Start chest compressions
  - d. Intubate the patient
7. At what rate should you administer rescue breaths to an adult patient?
  - a. 8 breaths per minute
  - b. One breath every 6 seconds
  - c. 20 breaths per minute
  - d. One breath every 10 seconds
8. During which cardiac rhythm is a shock advised?
  - a. Ventricular tachycardia with a pulse
  - b. Pulseless electrical activity (PEA)
  - c. Ventricular fibrillation
  - d. Asystole

9. What is the dose of monophasic defibrillation in an adult patient?
- 300 J
  - 150 J
  - 360 J
  - 75 J
10. What dose of adrenaline should be administered during a cardiopulmonary arrest in an adult?
- 100 mcg IVI
  - 10 mcg IVI
  - 1 mg IVI
  - 10 mg IVI
11. During which cardiac arrhythmia should adenosine be administered?
- Ventricular tachycardia
  - Supraventricular tachycardia
  - Ventricular fibrillation
  - Torsade de Pointes
12. During which situation should you administer atropine as the FIRST LINE medication?
- A child with a sinus bradycardia
  - Third degree heart block
  - An adult with a symptomatic sinus bradycardia
  - Pulseless electrical activity with a ventricular rate of < 50 bpm
13. After a shock is delivered, what is your next step?
- Pulse and rhythm check
  - Administer adrenaline
  - Recharge the defibrillator for the next shock
  - Resume CPR for 2 minutes
14. As regards achieving successful patient outcome following a cardiopulmonary arrest, what is the most important time interval? Witnessed arrest to...
- Intubation
  - IV fluid administration
  - Adrenaline administration
  - Chest compressions and defibrillation if indicated

15. What dose of Adrenaline should be administered during a cardiopulmonary arrest in a child?
- 10 mcg/kg IVI
  - 1 mg/kg IVI
  - 100 mcg/kg IVI
  - 1 mcg/kg IVI
16. A child is in ventricular fibrillation, what dose of shock should you deliver?
- 50 J
  - 1 J/kg
  - 4 J/kg
  - 100 J
17. What is the rate of compressions to ventilation in neonate cardiopulmonary resuscitation?
- 15:2
  - 5:1
  - 15:1
  - 3:1
18. At which heart rate should you start chest compressions in a neonate?
- <100 per minute
  - < 80 per minute
  - < 60 per minute
  - Any heart rate if the infant is not breathing
19. During CPR in a pregnant patient, how should you position the patient?
- Supine
  - Supine with manual left uterine displacement
  - Left lateral position
  - Supine with a wedge to ensure 15-degree left tilt
20. When should a caesarean delivery be done during CPR in a pregnant patient? (*ROSC = return of spontaneous circulation*)
- If there is no ROSC within 4 minutes of commencing CPR
  - If there is no ROSC after 1 cycle of CPR
  - Regardless of ROSC or time since starting CPR
  - Immediately when patient arrests



## Appendix G: Knowledge questions memorandum

### Knowledge Questions- MEMORANDUM

#### Breakdown:

Q 1-6:	Basic Life Support
Q 7-14:	Advanced Cardiac Life Support
Q 15-16:	Paediatric Life Support
Q 17-18:	Neonatal Life support
Q 19-20:	Obstetric CPR

1. When do you change the compressions to ventilations ratio from 30:2 to 15:2?

a. In all children with 1 rescuer	17,2 %
b. In all adults with 1 rescuer	10,0 %
<b>c. In all children with 2 rescuers</b>	<b>44,8 %</b>
d. In all adults with 2 rescuers	26,0 %
Unanswered	2,0 %
2. How frequently should you do a rhythm and pulse check (you have a timekeeper)?

a. Every 5 minutes	6,7 %
b. After every fifth cycle of CPR	28,0 %
<b>c. Every 2 minutes</b>	<b>57,3 %</b>
d. After every 100 compressions	5,9 %
Unanswered	2,0 %
3. At what rate should you administer chest compressions to an adult?

a. 60-80 per minute	17,7 %
<b>b. 100-120 per minute</b>	<b>58,2 %</b>
c. 80-100 per minute	21,3 %
d. 120-140 per minute	3,4 %
Unanswered	0,4 %
4. How frequently can you administer Adrenaline if repeat doses are required?

a. Every 2 minutes	23,9 %
<b>b. Every 3-5 minutes</b>	<b>58,6 %</b>
c. After every cycle of CPR	7,5 %
d. After every fourth cycle of CPR	9,2 %
Unanswered	0,8 %

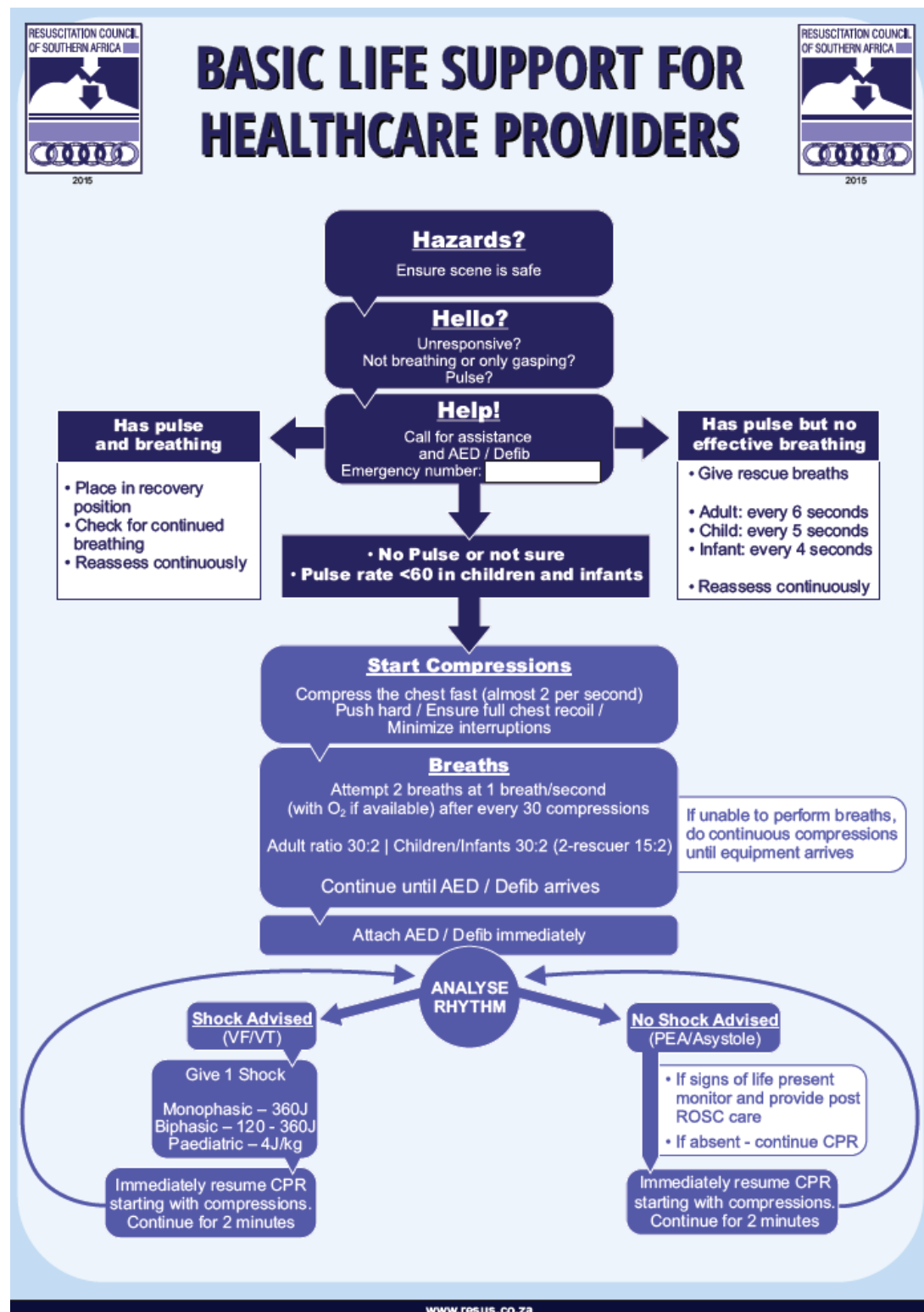
5. How much adrenaline is in one adrenaline ampoule at Universitas Academic Hospital?
- |                |               |
|----------------|---------------|
| a. 100 mcg     | 6,3 %         |
| <b>b. 1 mg</b> | <b>83,7 %</b> |
| c. 10 mcg      | 4,6 %         |
| d. 10 mg       | 4,2 %         |
| Unanswered     | 1,2 %         |
6. Which of the below, should you do first, when you find an unresponsive adult patient?
- |                             |               |
|-----------------------------|---------------|
| a. Start rescue breaths     | 1,7 %         |
| <b>b. Call for help</b>     | <b>80,8 %</b> |
| c. Start chest compressions | 16,7 %        |
| d. Intubate the patient     | 0,0 %         |
| Unanswered                  | 0,8 %         |
7. At what rate should you administer rescue breaths to an adult patient?
- |                                      |               |
|--------------------------------------|---------------|
| a. 8 breaths per minute              | 17,0 %        |
| <b>b. One breath every 6 seconds</b> | <b>49,2 %</b> |
| c. 20 breaths per minute             | 14,8 %        |
| d. One breath every 10 seconds       | 14,4 %        |
| Unanswered                           | 4,6 %         |
8. During which cardiac rhythm is a shock advised?
- |   |               |
|---|---------------|
| a. Ventricular tachycardia with a pulse | 4,7 %         |
| b. Pulseless electrical activity (PEA)  | 6,8 %         |
| <b>c. Ventricular fibrillation</b>      | <b>82,2 %</b> |
| d. Asystole                             | 4,7 %         |
| Unanswered                              | 1,7 %         |
9. What is the dose of monophasic defibrillation in an adult patient?
- |                 |               |
|-----------------|---------------|
| a. 300 J        | 30,9 %        |
| b. 150 J        | 10,1 %        |
| <b>c. 360 J</b> | <b>37,3 %</b> |
| d. 75 J         | 0,4 %         |
| Unanswered      | 1,3 %         |
10. What dose of adrenaline should be administered during a cardiopulmonary arrest in an adult?
- |                    |               |
|--------------------|---------------|
| a. 100 mcg IVI     | 13,6 %        |
| b. 10 mcg IVI      | 8,5 %         |
| <b>c. 1 mg IVI</b> | <b>75,4 %</b> |
| d. 10 mg IVI       | 2,1 %         |
| Unanswered         | 0,4 %         |

11. During which cardiac arrhythmia should adenosine be administered?
- |  |               |
|--|---------------|
| a. Ventricular tachycardia             | 7,6 %         |
| <b>b. Supraventricular tachycardia</b> | <b>72,0 %</b> |
| c. Ventricular fibrillation            | 6,4 %         |
| d. Torsade de Pointes                  | 10,2 %        |
| Unanswered                             | 3,8 %         |
12. During which situation should you administer atropine as the FIRST LINE medication?
- |  |               |
|--|---------------|
| a. A child with a sinus bradycardia                                  | 16,1 %        |
| b. Third degree heart block  | 6,8 %         |
| <b>c. An adult with a symptomatic sinus bradycardia</b>              | <b>58,5 %</b> |
| d. Pulseless electrical activity with a ventricular rate of < 50 bpm | 12,3 %        |
| Unanswered   | 6,4 %         |
13. After a shock is delivered, what is your next step?
- |  |               |
|--|---------------|
| a. Pulse and rhythm check                        | 29,7 %        |
| b. Administer adrenaline                         | 0,9 %         |
| c. Recharge the defibrillator for the next shock | 1,7 %         |
| <b>d. Resume CPR for 2 minutes</b>               | <b>67,4 %</b> |
| Unanswered                                       | 0,4 %         |
14. As regards achieving successful patient outcome following a cardiopulmonary arrest, what is the most important time interval? Witnessed arrest to...
- |  |               |
|--|---------------|
| a. Intubation  | 7,6 %         |
| b. IV fluid administration                                   | 1,3 %         |
| c. Adrenaline administration                                 | 1,3 %         |
| <b>d. Chest compressions and defibrillation if indicated</b> | <b>88,1 %</b> |
| Unanswered   | 1,7 %         |
15. What dose of Adrenaline should be administered during a cardiopulmonary arrest in a child?
- |                         |               |
|-------------------------|---------------|
| <b>a. 10 mcg/kg IVI</b> | <b>48,8 %</b> |
| b. 1 mg/kg IVI          | 6,6 %         |
| c. 100 mcg/kg IVI       | 15,7 %        |
| d. 1 mcg/kg IVI         | 25,6 %        |
| Unanswered              | 3,3 %         |
16. A child is in ventricular fibrillation, what dose of shock should you deliver?
- |                  |               |
|------------------|---------------|
| a. 50 J          | 12,4 %        |
| b. 1 J/kg        | 14,1 %        |
| <b>c. 4 J/kg</b> | <b>60,3 %</b> |
| d. 100 J         | 9,9 %         |
| Unanswered       | 3,3 %         |

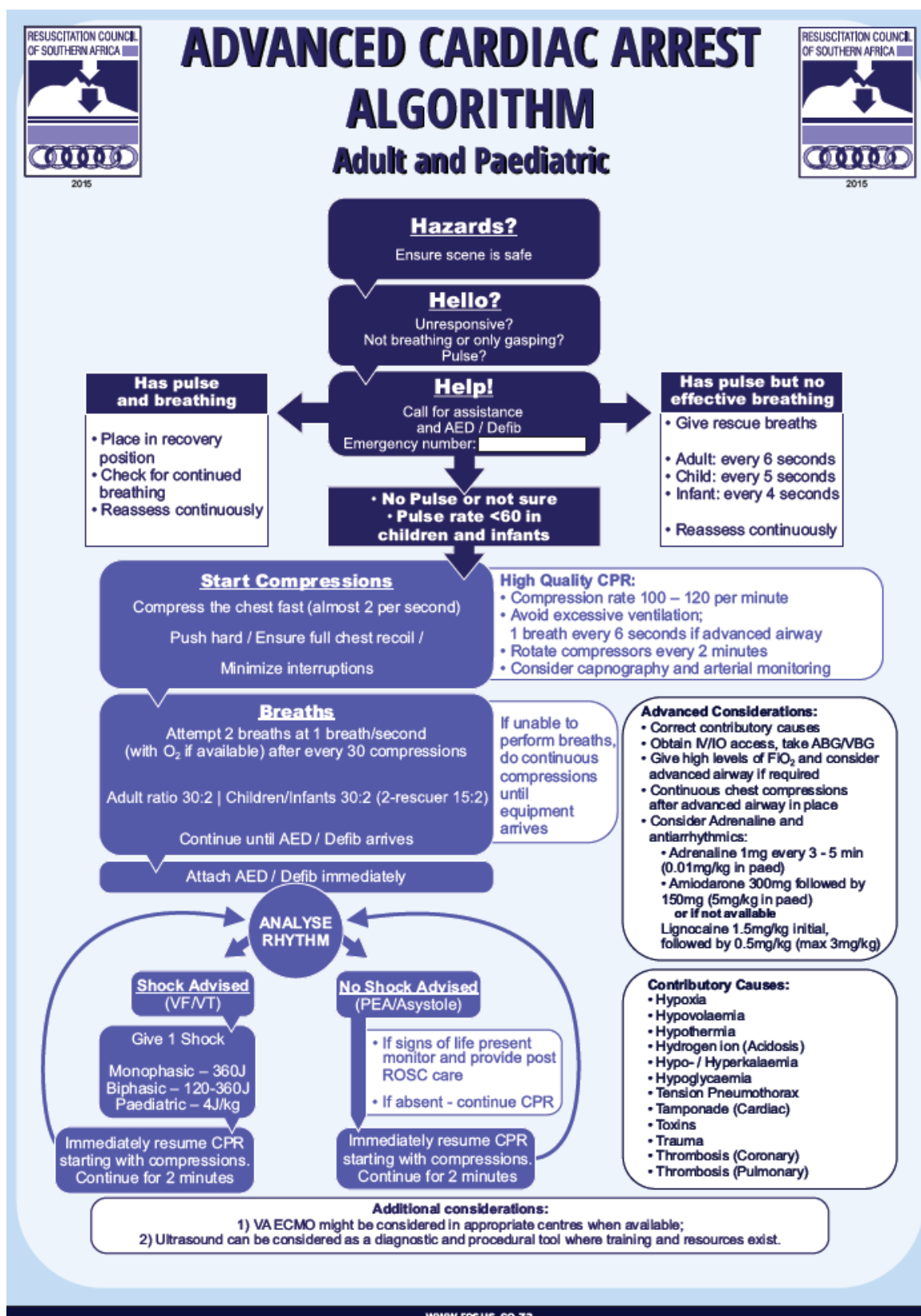
17. What is the rate of compressions to ventilation in neonate cardiopulmonary resuscitation?
- |               |               |
|---------------|---------------|
| a. 15:2       | 34,1 %        |
| b. 5:1        | 8,8 %         |
| c. 15:1       | 1,1 %         |
| <b>d. 3:1</b> | <b>52,8 %</b> |
| Unanswered    | 3,3 %         |
18. At which heart rate should you start chest compressions in a neonate?
- |  |               |
|--|---------------|
| a. <100 per minute                               | 23,1 %        |
| b. < 80 per minute                               | 2,2 %         |
| <b>c. &lt; 60 per minute</b>                     | <b>65,9 %</b> |
| d. Any heart rate if the infant is not breathing | 5,5 %         |
| Unanswered                                       | 3,3 %         |
19. During CPR in a pregnant patient, how should you position the patient?
- |  |               |
|--|---------------|
| a. Supine  | 0,0 %         |
| <b>b. Supine with manual left uterine displacement</b> | <b>26,4 %</b> |
| c. Left lateral position                               | 18,1 %        |
| d. Supine with a wedge to ensure 15-degree left tilt   | <b>54,2 %</b> |
| Unanswered   | 1,4 %         |
20. When should a caesarean delivery be done during CPR in a pregnant patient?
- |  |               |
|--|---------------|
| <b>a. If there is no ROSC within 4 minutes of commencing CPR</b> | <b>56,9 %</b> |
| b. If there is no ROSC after 1 cycle of CPR                      | 13,9 %        |
| c. Regardless of ROSC or time since starting CPR                 | 13,9 %        |
| d. Immediately when patient arrests                              | 12,5 %        |
| Unanswered   | 2,8 %         |

## Appendix H: Resuscitation Council of South Africa (RCSA) algorithms

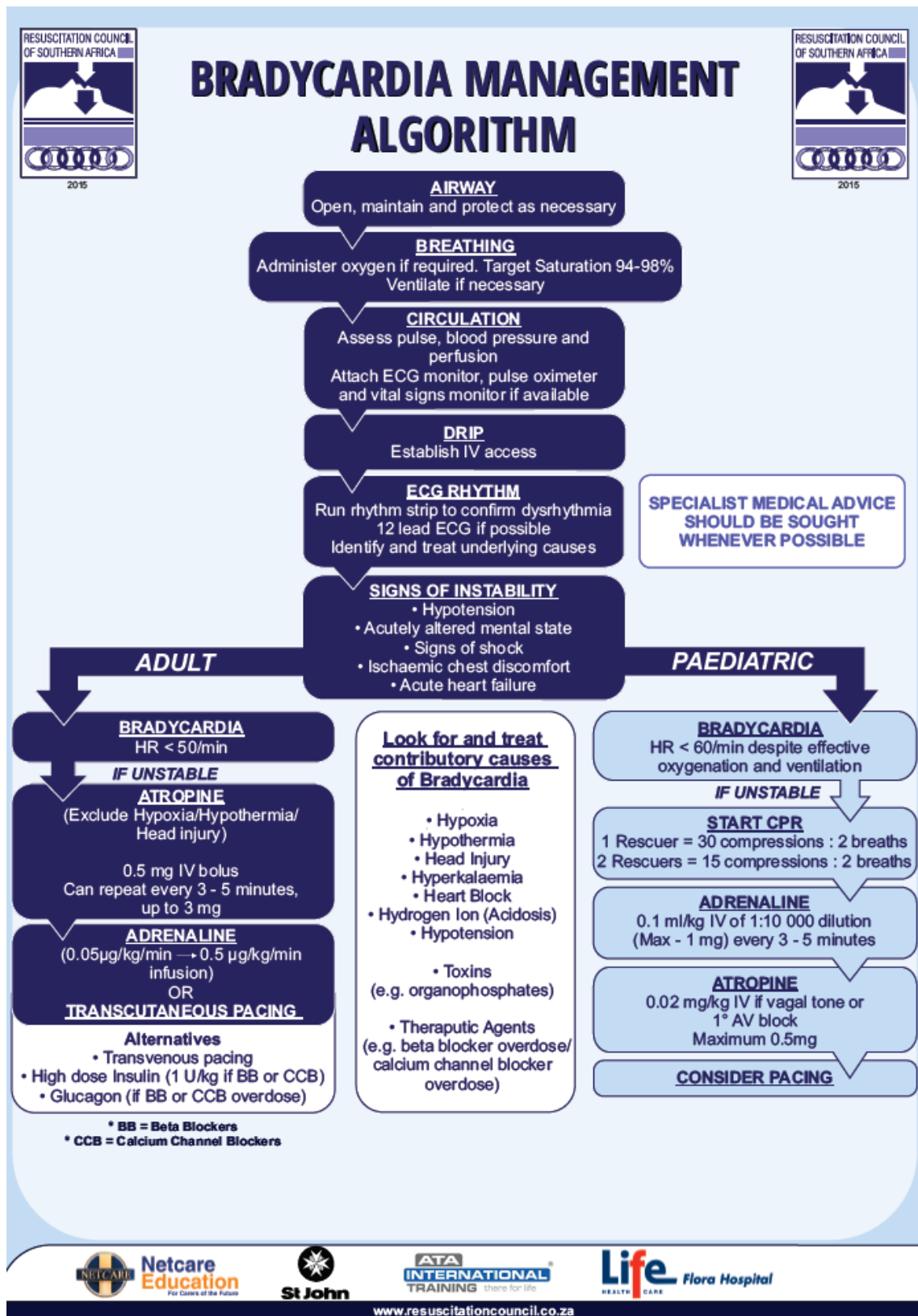
### a. Basic Life Support Algorithm



## b. Advanced Cardiac Arrest Algorithm

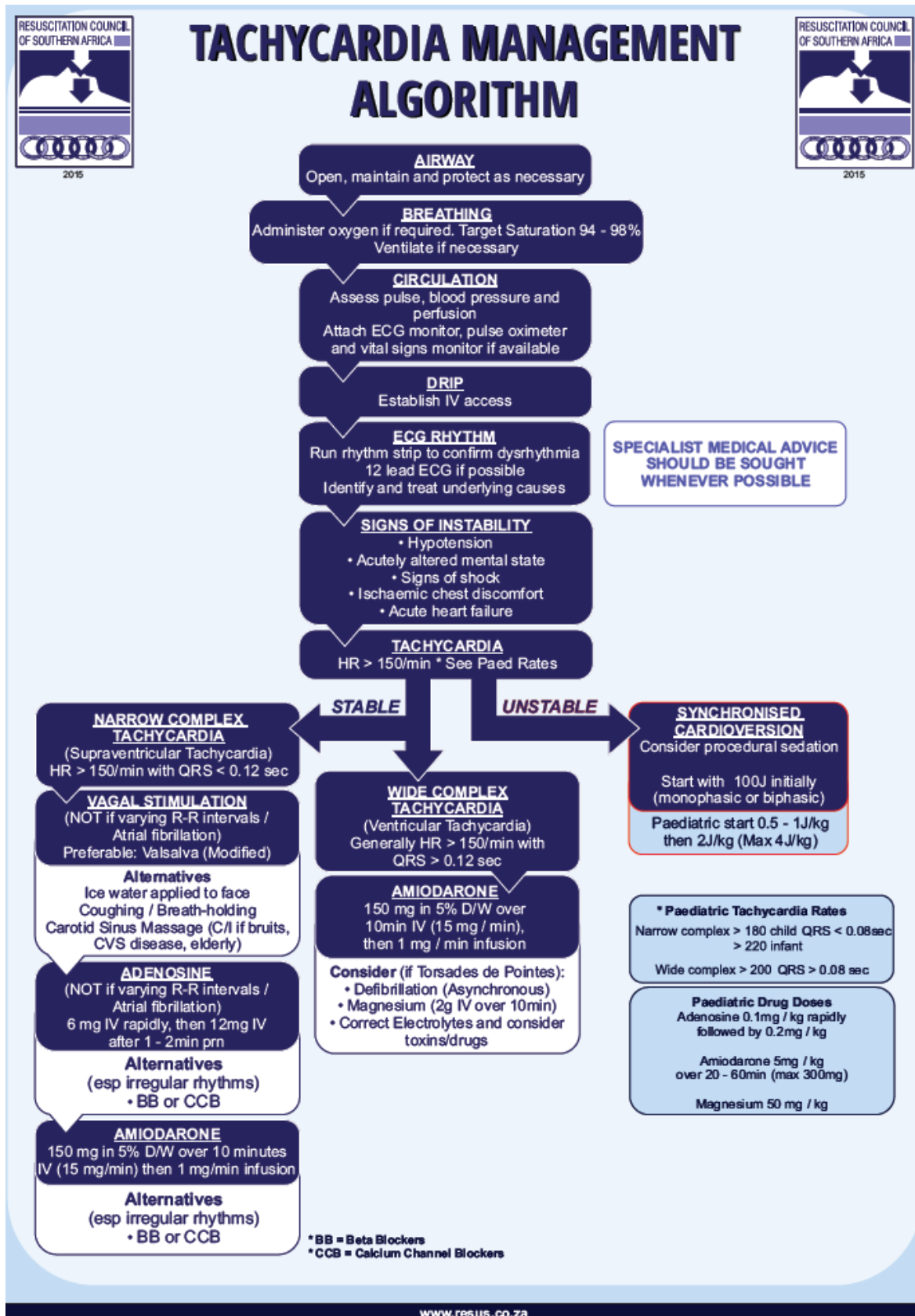


## c. Bradycardia Management Algorithm



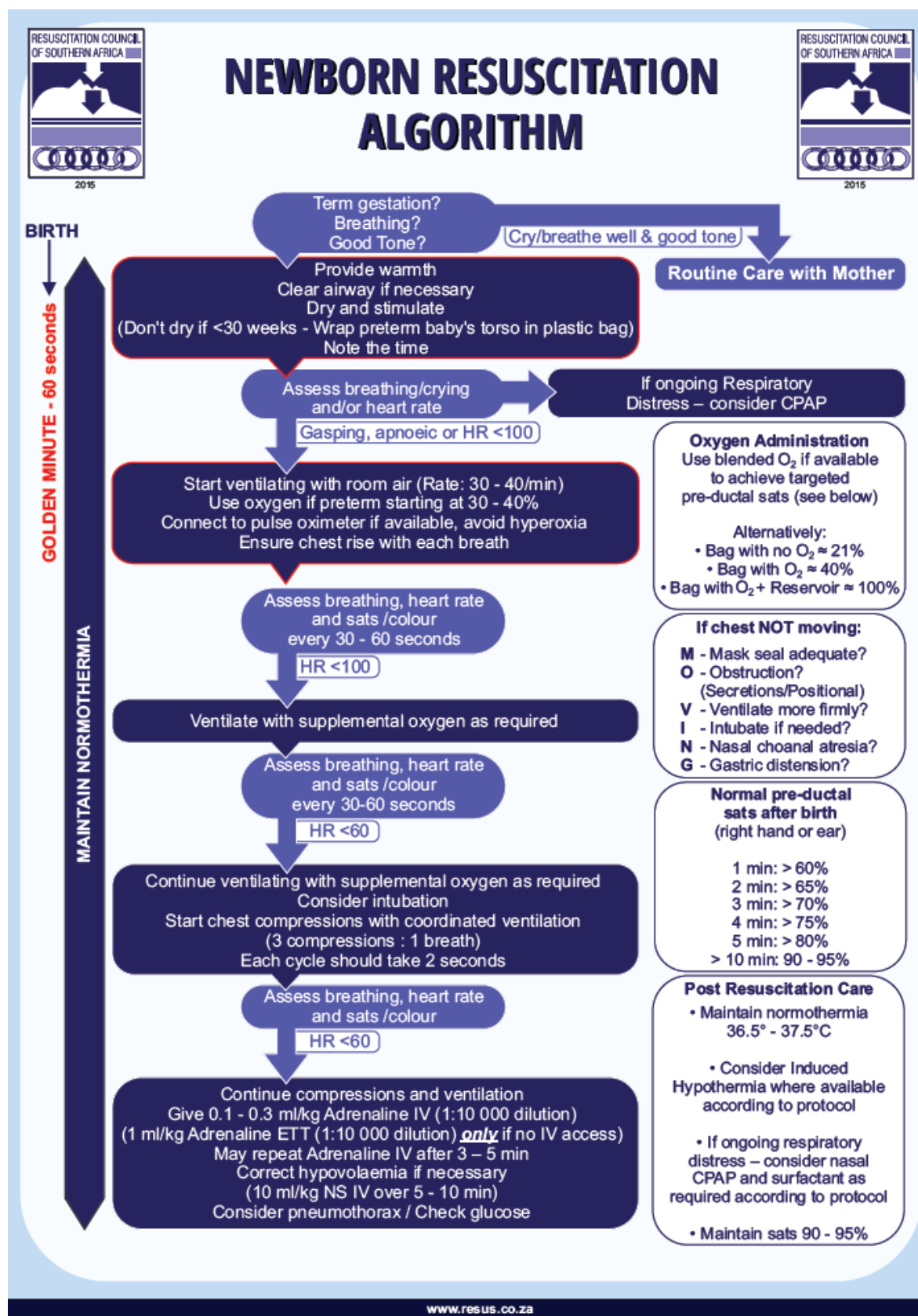


## d. Tachycardia Management Algorithm





## e. Newborn Resuscitation Algorithm



## **Appendix I: Instructions to authors of the South African Medical Journal (SAMJ)**

### **Author Guidelines SAMJ**

#### **Manuscript preparation**

##### *Preparing an article for anonymous review*

To ensure a fair and unbiased review process, all submissions are to include an anonymised version of the manuscript. The exceptions to this are Correspondence, Book reviews and Obituary submissions.

Submitting a manuscript that needs additional blinding can slow down your review process, so please be sure to follow these simple guidelines as much as possible:

An anonymous version should not contain any author, affiliation or particular institutional details that will enable identification.

Please remove title page, acknowledgements, contact details, funding grants to a named person, and any running headers of author names.

Mask self-citations by referring to your own work in third person.

##### *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.  $\mu$  not u for micro,  $\alpha$  not a for alpha,  $\beta$  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 Counsellors. *J Genet Counsel* 2008; 17:424-433: standard human pedigree nomenclature.

## **Preparation notes by article type: 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.

### *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 – sub-headings 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.

## Appendix J: Summary report complied in the Turnitin Plagiarism Search Engine

### Training, Knowledge, Experience and Perceptions regarding Cardiopulmonary Resuscitation of Doctors at Universitas Academic Hospital

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**Training, Knowledge, Experience and Perceptions  
regarding Cardiopulmonary Resuscitation of Doctors at  
Universitas Academic Hospital**

Nadia Sarah du Plessis  
20070313000

**Abstract**

**Introduction**

High quality CPR is proven to improve immediate survival and survival to hospital discharge in patients having a cardiac arrest in hospital. Evidence shows that without frequent retraining in CPR, health-care providers lose their skill and knowledge earlier than the current recommendation (i.e. at least CPR retraining every one year). The purpose of this study was to determine the current competencies of doctors at Universitas Academic Hospital regarding CPR training, knowledge, experience and perceptions.

**Methods**

A questionnaire designed by the researcher and answered by CPR providers was distributed to nurses, medical officers, registrars and consultants obtaining information regarding CPR training, CPR exposure and perceptions regarding CPR retraining and CPR knowledge. The