

**Evaluation of self-reported confidence amongst radiology
staff in initiating basic life support across hospitals in the
Cape Town Metropole West region**

by

Dr Isak Dawid Vorster

MBChB (UP) FC Rad Diag SA

VRSISA002

*This study is in partial fulfilment of the requirements for the degree Masters of Medicine in the
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Supervisor(s): Prof Steve Beningfield and Associate Prof Stevan Buijns

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Abbreviations

ACLS	Advanced Cardiac Life Support
ATLS	Advanced Trauma Life Support
BLS	Basic Life Support
CPR	Cardio-Pulmonary Resuscitation
DNR	Do Not Resuscitate
EC	Emergency Centre
HREC	Health and Research Ethical Committee
RRT	Rapid Response Teams

PART A: LITERATURE REVIEW

Introduction

Requests for radiological imaging have increased in recent years as the direct consequence of imaging advances and improved ease of access. The bigger demand for diagnostic imaging has also led to an increase in the throughput of severely ill patients.(1) Given the risks of radiation exposure and strong magnetic fields encountered in radiological imaging, as well as the smaller workspaces that require clinical caregivers to vacate the imaging area, this also poses a greater risk of unrecognized clinical deterioration and delayed response – especially in the critically ill.

Cardiac arrest is the most immediately urgent condition within any hospital setting. Early recognition and rapid implementation of effective resuscitation are associated with increased survival rates.(2) As a result, clinical deterioration and cardiac arrest pose a substantial challenge within the radiology department.

Aim of the literature review

The aim of this review was to briefly summarise the literature related to radiology staff and their support staff in identifying cardiac arrest and initiating basic life support in the radiology department, with a specific focus on literature from Sub-Saharan Africa.

Literature search strategy

The Faculty of Health Sciences Library of the University of Cape Town, was used to perform the search and to obtain the original articles reviewed in this study. PubMed and Google Scholar were used to perform searches using the terms and phrases: “basic life support”, “BLS”, “BLS training”, “cardiopulmonary resuscitation”, “CPR”, “confidence in initiating CPR”, “BLS knowledge and training”, “CPR training in Africa”, “BLS and CPR in radiology department”, “Radiology residents” and “Radiographers” or “radiology technicians”. A snowball strategy was then used, whereby prominent articles cited in the papers obtained from the index search were also accessed and included in the review.

Inclusion criteria:

- Publication date: January 2000 – November 2018
- Language: English, including studies translated and published in English

Exclusion criteria:

- Studies outside of the stipulated timeframe
- Language other than English

Quality criteria:

Titles and abstracts were initially screened for relevance to the review to allow those deemed to have low relevance or poor external validity to be excluded by the author. High-quality evidence, including systematic reviews, was sought to address the aim and objectives. Articles were appraised against a checklist from the Oxford Centre for Evidence-Based Medicine.(3) As representation of appraised papers in tabular form is not required for the MMed this was omitted. As very little data directly addressing the principle aims was available, selection criteria were applied less stringently.

Cardiac arrest outcomes

Cardiac arrest has been identified as a leading cause of adult mortality and is therefore of significant public health concern.(4,5) In the United States of America (USA), between 370,000 and 750,000 in-hospital cardiac arrests occur every year, with many of these undergoing cardiopulmonary resuscitation. Only 30% of these patients are expected to survive the initial event and only 17% are discharged alive.(6,7) Despite advances in making cardiopulmonary resuscitation (CPR) protocols and algorithms known to all clinical hospital staff, outcomes remain poor with a high incidence of neurological sequelae and morbidity, even if the patient survives the initial event.(8,9,10) Recent studies that have focused on the timing and quality of the CPR as predictors of outcome have shown that delay in the initiation of CPR results in poor outcomes, with mortality increasing by 10% for every minute that good quality CPR is delayed.(6)

Over the past 30 years, standard CPR practices which are primarily based on chest compressions and positive pressure ventilations have returned many pulseless, non-breathing patients to spontaneous respiration and circulation. To improve survival of cardiac arrest, a sequence of events should take place as quickly as possible. This sequence is called the “*chain of survival*” and includes the following: 1) recognition of early warning signs and prompt recognition of sudden cardiac arrest, 2) activation of the emergency medical support system, or in an in-hospital setting, the “*call for help*”, 3) basic cardiopulmonary resuscitation, 4) defibrillation, 5) intubation and 6) intravenous administration of medication. A failure to initiate these events or a deviation from the specific sequence is associated with poorer outcomes.(11) The first three steps in this process are considered the basics of resuscitation and health care workers of any level should have the skills to perform these steps.

Furthermore, CPR should be initiated directly after cardiac arrest, and a multitude of studies have shown improved survival as compared to late initiation of CPR.(2,11,12) The quality of CPR is also critical, and a combination of effective CPR and “*rescue breaths*”¹ has yielded the best effect.(2)

Increasing morbidity and radiology

Advances in medical imaging over the past few decades have shown indisputable benefits to patients by means of improved diagnoses and appropriate treatment leading to better survival and quality of life.(1) This, along with the growing fear of litigation, has seen an increase in the number of ill patients referred to the radiological suite for various imaging procedures. Although patients are usually stabilized prior to imaging, they still have a chance of cardiac arrest whilst in the radiology suite.(2, 13)

A study performed in Pakistan by Alam, et al. assessed the proficiency of radiologists and residents (registrars) in responding to and managing cardiopulmonary arrest. They found that 42% of radiologists and radiology residents had not attended a basic life support (BLS) course before and that this was the most important predictor of an inability or lack of confidence in initiating CPR. They concluded that most radiologists and radiology residents in Pakistan were unable to manage a cardiac arrest situation and that frequent, mandatory BLS training was required.(2)

Life support knowledge of healthcare staff in general

The paucity of further data specifically related to radiology staff, both internationally and locally, calls for the review of data derived from other groupings within the medical profession. The emergency medicine physician is considered the expert in the management of cardiac arrest and related emergencies. However, a Turkish study conducted by Kimaz, et al. in 2006 assessing the level of BLS and advance life support (ALS) knowledge of emergency medicine physicians found that the mean level of knowledge amongst this group was 45.4 on a hundred-point scale, which they considered a very low score. They also concluded that in-service training needed to be undertaken to improve the level of knowledge, and subsequently, the level of care.(14) A Jamaican study conducted by Howell, et al. in 2014 echoed these findings, with similar deficits in knowledge of cardiac arrest and CPR guidelines amongst emergency medicine physicians and anaesthetists. Only 46percent of participants

¹ Rescue breaths are the practice of manually putting oxygen into a patient's lungs (conventionally by mouth-to-mouth breathing, or by mask-ventilation, at a rate of 2 rescue breaths for every 30 chest compressions).(27)

in this study were aware of the correct compression-to-breath ratio and, although most doctors had received BLS training at some point, only 46% had valid BLS certification. They also concluded that training and recertification were necessary to improve knowledge and CPR performance.(15)

An Indian study conducted by Nambiar, et al. in 2016 aimed to determine the level of knowledge of BLS and advanced trauma life support (ATLS) amongst medical professionals in North Kerala. They included physicians, nurses and support staff. Most of the participants scored less than 50%, with decreased scores with advancing age and male sex. They found the highest scores amongst physicians with less than 5 years of experience. This they felt was problematic as senior doctors are often called upon to lead a resuscitation effort. Nambiar also argued that training was necessary to improve knowledge and outcomes.(16)

Nursing staff are less likely to initiate or lead a resuscitation attempt, often to the detriment of the patient. In many clinical scenarios nurses are usually the first responders and it is therefore felt of great importance that they are able to recognize a cardiac arrest and initiate CPR.(17) In 2000, a study by M Hazinski in Finland found that most? Nurses and nursing students were unable to perform a prompt assessment to determine the need for resuscitation and the authors also felt that the only way to improve both skills and confidence was by in-depth training.(18)

An Indian study by Saramma, et al. published in 2016, attempted to assess the impact of resuscitation training among nurses. They did this by assessing pre- and post-training CPR skills by means of knowledge and performance tests and demonstrated a statistically significant increase in mean knowledge and overall performance after formal certified training. All the participants in the trial agreed that the training was useful and 69% reported increased confidence in initiating and performing CPR. Much of the group also agreed that annual retraining was necessary to retain skills.(19) Nambiar also assessed CPR knowledge amongst nurses and demonstrated a significant improvement in those nurses who had undergone BLS/ ACLS training in the past, with employment in the private sector being strongly associated with better scores. This study did however demonstrate low scores despite formal training amongst support staff which they attributed to a lack of prior formal professional education and infrequent exposure to actual cardiac arrests.(16)

Who does it best?

Formal resuscitation training appears to be the strongest predictor of skills and knowledge amongst nursing personnel.(19,20) A British study in 2004 by Giligan, et al. revealed that nurses who had undergone ALS training performed as well as senior house officers in resuscitation scenarios and had greater knowledge of possible reversible causes.(21)

Local studies echo the trend of international studies. A Cape Town study by Maharaj in 2012 assessed the self-reported confidence of nurses working in emergency centres in initiating basic life support. Nurses in both the private and the public sectors demonstrated low levels of confidence in all aspects of BLS, from recognizing a cardiac arrest scenario to initiating and performing CPR. Access to formal training appeared lacking in the public sector, with only 62% of participants reporting access to training programs. The study concluded that nurses in emergency centres in Cape Town were not confident to initiate or perform CPR in the absence of a doctor.(22)

To assess whether CPR deficiencies amongst health care professionals stem from inadequate training during undergraduate studies, a study by Sangamesh, et al. in 2017 aimed to assess the attitudes, awareness and knowledge of BLS amongst medical, dental and nursing students at training hospitals in India. The participants in this study showed a positive attitude towards BLS training across the professions and recognized its importance as a life-saving practice. Junior doctors and interns favoured the inclusion of BLS into the curriculum, but medical and dental undergraduates were less enthusiastic about the academic inclusion.(23) It was felt that this may reflect a lack of exposure of students to cardiac arrests and subsequent unawareness regarding the need for formal training to provide high quality resuscitative care. The frequency of retraining was also felt to be a predictor of proficiency and it appeared that frequent refresher training was more beneficial overall in improving performance and boosting confidence.(24)

The popularity of rapid response teams (RRT's) to reduce mortality related to in-hospital cardiac arrest has grown. The Institute for Healthcare Improvement - an independent not-for-profit organisation founded in 1991 and based in Boston, Massachusetts, suggests the implementation of RRT's as a strategy to reduce preventable in hospital demise.(25) They felt RRT's should contain members with different skill sets so that they could perform tasks concurrently during a resuscitation effort and thereby rely on coordinated and effective team work.(26)

However, although a systematic review assessing the effect of RRTs on in-hospital mortality showed a 33.8% reduction in non-ICU cardiac arrest rates, it failed to demonstrate improved overall mortality.(25) It was postulated that the excess deaths that were prevented may rather have been due to the globally improved hospital care as a result of the training, education and other related quality improvements. The unchanged mortality rates may also relate to a number of variables, for instance certain patient groups such as *Do Not Resuscitate* (DNR) being excluded from RRT intervention. Alternatively, although the initial RRT intervention may have succeeded in preventing death from the initial cardiopulmonary arrest, the overall impact may be short-lived and not alter the eventual outcome in the severely ill patient.(25)

Summary

In summary, there is some evidence both globally and locally that a lack of formal resuscitation care training has resulted in inadequate skills and impaired confidence in performing basic resuscitative measures, leading to poorer outcomes. This problem appears to affect doctors and nurses alike and is likely the product of insufficient undergraduate training, followed by the lack of ongoing training. Although there are limited data to assess the proficiency and confidence of radiology staff in performing CPR, radiologists face the same difficulties with underprovided training and subsequent lack of knowledge and confidence. At present this area has received very little attention in sub-Saharan Africa.

References:

1. Hendee WR, Becker GJ, Borgstede JP, et al. Addressing overutilization in medical imaging. *Radiology*. 2010 Oct; 257:240-5.
2. Alam T, Khattak YJ, Anwar M, et al. Basic life support: a questionnaire survey to assess proficiency of radiologists and radiology residents in managing adult life support in cardiopulmonary arrest and acute anaphylactic reaction. *Emergency Medicine International*. 2014 Feb 12; 14:1-4.
3. University of Oxford. (2014, 01 01). *Critical appraisal tools*. Retrieved 12 01, 2017, from Centre for Evidence-Based Medicine: [https://www.cebm.net/2014/06/critical appraisal](https://www.cebm.net/2014/06/critical%20appraisal).
4. Iwami T, Graham N, Hiraide A, et al. Continuous improvements in "chain of survival" increased survival after out-of-hospital cardiac arrests. *Circulation*. 2009 Jan 26; 119:728-734.
5. Swor R, Khan I, Domeier R, et al. CPR training and CPR performance: Do CPR-trained bystanders perform CPR? *Academic Emergency Medicine*. 2006 Jun;13(6):596-601.
6. Abella BS, Sandbo N, Vassilatos P, et al. Chest compression rates during cardiopulmonary resuscitation are suboptimal. *Circulation*. 2005 Feb 1; 111:428-434.
7. Chan PS, Krumholz HM, Nichol G, et al. American Heart Association National Registry of Cardiopulmonary Resuscitation Investigators. Delayed time to defibrillation after in-hospital cardiac arrest. *New England Journal of Medicine*. 2008 Jan 3;358(1):9-17
8. International Liaison Committee on Resuscitation. International consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. Part 4: advanced life support. *Resuscitation*. 2005;67:213-47.

9. Eisenberg MS, Mengert TJ. Cardiac resuscitation. *N Engl J Med.* 2001; 344:1304-1313.
10. Becker LB. The epidemiology of sudden cardiac death. In: Paradis NA, Halperin HR, Nowak RM, eds. *Cardiac Arrest: The science and practice of resuscitation medicine.* Baltimore, Md: Williams and Wilkins; 1996:28-47.
11. Cummins RO, Ornato JP, Thies WH, et al. Improving survival from sudden cardiac arrest: the "chain of survival" concept. *Circulation.* 1991 May 1;83(5):1832-47.
12. Zheng J, Croft JB, Giles H, et al. Sudden cardiac arrest in the United States, 1989-1998. *Circulation.* 2001;104:2158-2163.
13. Hope W, Von der Embse K, Mostafa G. Cardiopulmonary arrest occurring in the radiology department: Patient characteristics, incidences and outcomes. *Am Surg.* 2011; 3:273-276.
14. Kimaz S, Sosal S, Çimrin AH, et al. Assessment of physicians employed in emergency medical services about their level of knowledge on basic life support, advanced cardiac life support and medicolegal responsibilities. *Turkish Journal of Trauma and Emergency Surgery.* 2006 Jan 1;12(1):59-67.
15. Howell P, Tennant I, Augier R, et al. Physicians' knowledge of cardiopulmonary resuscitation guidelines and current certification status at the University Hospital of the West Indies, Jamaica. *The West Indian medical journal.* 2014 Dec;63(7):739.
16. 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 Journal of Emergency Medicine.* 2016;7(4):263
17. Saramma PP, Raj LS, Dash PK, et al. Assessment of long-term impact of formal certified cardiopulmonary resuscitation training program among nurses. *Indian Journal of Critical Care Medicine.* 2016 Apr;20(4):226
18. Nyman J, Sihvonen M. Cardiopulmonary resuscitation skills in nurses and nursing students. *Resuscitation.* 2000 Oct 1;47(2):179-84.
19. Hamilton R. Nurses' knowledge and skill retention following cardiopulmonary resuscitation training: a review of the literature. *Journal of Advanced Nursing.* 2005 Aug;51(3):288-97.
20. Oh SI, Han SS. A study on the sustainable effects of re-education on cardiopulmonary resuscitation on nurses' knowledge and skills. *Journal of Korean Academy of Nursing.* 2008 Jun 1;38(3):383-92.

21. Gilligan P, Bhattacharjee C, Knight G, et al. To lead or not to lead? Prospective controlled study of emergency nurses' provision of advanced life support team leadership. *Emergency Medicine Journal*. 2005 Sep 1;22(9):628-32.
22. Maharaj S. A survey to determine whether emergency centre nurses are confident in initiating BLS across emergency centres in the Western Cape metropole. MMed thesis. Stellenbosch University; 2013
23. Sangamesh NC, Vidya KC, Pathi J, et al. Awareness, attitude, and knowledge of basic life support among medical, dental and nursing faculties and students in the university hospital. *Journal of International Society of Preventive & Community Dentistry*. 2017 Jul;7(4):161.
24. Berden HJ, Willems FF, Hendrick JM, et al. How frequently should basic cardiopulmonary resuscitation training be repeated to maintain adequate skills? *BMJ: British Medical Journal*. 1993 Jun 12;306(6892):1576.
25. Chan PS, Jain R, Nallmothu BK, et al. Rapid response teams: a systematic review and meta-analysis. *Archives of Internal Medicine*. 2010 Jan 1;170(1):18-26.
26. Fernandez R, Vozenilek JA, Hegarty CB, et al. Developing expert medical teams: toward an evidence-based approach. *Academic Emergency Medicine*. 2008 Nov; 15:1025-1
27. American Heart Association. (2018, 01 01). *About CPR & ECC*. Retrieved 11 27, 2018, from CPR & First Aid: Emergency cardiovascular care:
https://cpr.heart.org/AHA/ECC/CPRECC/AboutCPRECC/WhatIsCPR/UCM_499896_What-is-CPR.jsp

PART B: MANUSCRIPT IN ARTICLE FORMAT

TITLE PAGE

EVALUATION OF SELF-REPORTED CONFIDENCE AMONGST RADIOLOGY STAFF IN INITIATING BASIC LIFE SUPPORT ACROSS HOSPITALS IN THE CAPE TOWN METROPOLE WEST REGION

- Author:** Dr Isak Dawid Vorster
Department of Diagnostic Radiology, Faculty of Health Sciences, University of Cape Town
Dr Vorster conducted the research and was the principal author of the manuscript
VRSISA002@myuct.ac.za
- Supervisors:** Prof Steve Beningfield: Division of Radiology, Faculty of Health Sciences, University of Cape Town
Ass Prof Stevan Bruijns: Division of Emergency Medicine, Faculty of Health Sciences, University of Cape Town
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- Corresponding author:** Dr Isak Dawid Vorster
Tel: (+27) 82 432 2424
E-mail: VRSISA002@myuct.ac.za
31 Barkly Road
Sea Point
Cape Town

ABSTRACT

Introduction:

The immediate response to a cardiac arrest is regarded as one of the most time-critical interventions in clinical medicine. First responders for cardiac arrest in imaging departments are often radiology staff. The study aim was to determine radiology staff-members' confidence in initiating basic life support.

Methods:

A multi-centre, cross-sectional survey was conducted using peer-validated, anonymous questionnaires. Confidences were recorded using a 10-point Likert scale for recognising cardiac arrest, securing an airway, providing rescue breaths and initiating cardiac compressions. Questionnaires were distributed to and completed by radiology staff working in public sector hospitals within the Cape Town Metropole West. Due to the limited subject pool a convenience sample was collected (with no power calculation). Data were therefore statistically analysed using only summary statistics (mean, standard deviation (SD), proportions, etc.). Detailed between group comparisons were not made, given the sample size and type.

Results:

We disseminated 200 questionnaires, of which 74 were completed (37%). There were no incomplete questionnaires or exclusions from the final sample. Using the Likert scale, the mean ability to recognise cardiac arrest was 6.45 (SD±2.7), securing an airway 4.86 (SD±2.9), and providing rescue breaths and initiating cardiac compressions 6.14 (SD±2.9). Only 2 (2.7%) of the participants had completed a basic life support course in the past year, while 11 (14.8%) had never completed any basic life support course and 28 (37.8%) had never completed any type of life support or critical care course. Radiologists, radiology trainees and nurses had the greatest confidence in providing rescue breaths and initiating cardiac compressions from all the groups.

Conclusion:

The study demonstrates substantial lack of confidence in providing basic life support in a large part of the staff in Cape Town's public hospital imaging departments. The participants indicated that regular training and improved support systems would increase confidence levels and improve skills.

MANUSCRIPT

Introduction

Cardiac arrest is among the most serious and life-threatening emergencies in any hospital setting.(1) Over 80% of cases of sudden death worldwide are due to cardiovascular causes.(3) Early detection and implementation of resuscitation have been found to optimize a patient's chance of survival.(2) The chances of survival following cardiac arrest are greatly improved by promptly and effectively administering cardiopulmonary resuscitation (CPR) as the first line intervention.(1)

The median survival rate of in-hospital cardiac arrest is higher than out-of-hospital cardiac arrest.(4) However, the in-hospital survival varies in different areas, and all areas don't contribute to this better survival rate in equal measure.(5) Although most cardiac arrests will predictably occur in emergency centres (ECs) and high dependency or intensive care units, some do occur in other parts of the hospital. The imaging or radiology department is such an area of the hospital as it accommodates patients of all degrees of illness for short periods of time whilst completing investigations, and with increased degree of illness comes a greater risk of cardiac arrest.

While there are no South African studies directly evaluating the performance of basic life support (BLS) by radiology staff, one did assess in-hospital overall outcomes of cardiac arrest. (6) This study (also conducted in Cape Town) showed that cardiac arrests in the imaging department had the worst outcomes in the hospital.(6) A further Cape Town study revealed poor knowledge of the use of defibrillators and low confidence in initiating BLS by EC staff.(7) International studies focusing on nursing staff BLS knowledge and training over the last two decades concluded that in general both knowledge and training were deficient.(8-13) It is likely that BLS knowledge and training in local imaging departments are inadequate as well.

The aim of this study was to determine whether radiology staff (radiologists, radiographers and both radiologist and radiography trainees, as well as nursing support staff) from public hospitals in the Western Metro of Cape Town, South Africa felt sufficiently confident to manage BLS. In other words,

would they feel comfortable in recognising cardiac arrest, securing an airway, providing rescue breaths and initiating cardiac compressions should the need arise .

Methods

A survey design was used to address the study aim. Data were collected from radiology staff at five sites across Cape Town over a three-month period. The sites included two tertiary centres: Groote Schuur Hospital and Red Cross War Memorial Children's Hospital; and three secondary centres: Mitchells Plain Hospital, New Somerset Hospital and Victoria Hospital. The metropole's tertiary centres (including Tygerberg Hospital) combined provide 2,631 beds to the public healthcare service in Cape Town and manage more than 700,000 outpatients and 120,000 emergency centre contacts annually. The secondary centres provide 1,393 beds to the public healthcare service in Cape Town and manage more than 240,000 outpatients and 165,000 emergency centre contacts annually.⁽¹⁴⁾ For the 4.5 million people in the Western Cape who access public health care, a total of 60,531 CT scans were performed annually in 2013. Just over 29,000 (48%) of these CT scans were performed in the Western Metropole's hospitals in the region covered in our study.⁽¹⁵⁾

Participants included radiologists, radiology trainees, radiographers, radiography trainees and nursing support staff working in the imaging departments of the included centres at the time of the survey. A convenience sample of available prospective subjects was collected as it was appreciated that the pool of potential participants was limited. It was also anticipated that staff may be reluctant to contribute to the survey due to unfamiliarity with the subject matter. The sample was captured over a three-month period from September to November 2017.

The data collection tool was adapted from that used by Maharaj who tested the same hypothesis in emergency care staff working in a subset of public and private Cape Town EC's.⁽⁷⁾ The survey provides a series of multiple-choice questions, as well as questions rating the confidence to provide or initiate care, using a 10-point scale. Confidence in recognising cardiac arrest, securing an airway, providing rescue breaths and initiating cardiac compressions were the main variables tested this way. Participants were also asked to indicate the areas of BLS where they felt the least confident, and to suggest the interventions that would make them feel more confident. The demographic data of participants (position in department, experience), details of study site, details on BLS training and previous exposure to cardiac arrest were captured. The survey was anonymised, and personal identifying information was not captured. The survey is available as a data supplement (Appendix 1).

The survey was disseminated via e-mail using the institutional SurveyMonkey (San Mateo, United States) account of the Division of Emergency Medicine, University of Cape Town. In addition, hard

copy surveys were also distributed. These were manually entered into the SurveyMonkey database by the study team.

After completing the data collection, the SurveyMonkey database was downloaded for analysis. The data are presented using flowcharts, tables and figures. Also provided is a breakdown of the various participant staff groups that responded, their experience, as well as the proportions of study sites that contributed to the study. Answers to the multiple-choice survey questions are also given and analysed using proportional breakdowns. Confidence levels of participants are presented using the mean and standard deviation. The data were not considered sufficiently powered to cater for any inferential statistics

Ethical approval for this study was obtained prior to data collection from the Human Research Ethics Committee of the University of Cape Town (668/2017). Hospital permission was also obtained from the various site CEO's.

Results

A total of 200 questionnaires were disseminated via the online survey tool and hand-delivered hard-copies. A total of 74 participants responded over the study period giving an overall response rate of 37%. All returned surveys were completed in full and there were no invalid forms. Figure 1 provides a breakdown of the data collection from the various participants and study sites. Of the study participants, 69 (93%) worked exclusively in public sector hospitals and 5 (7%) worked in both public and private sector hospitals.

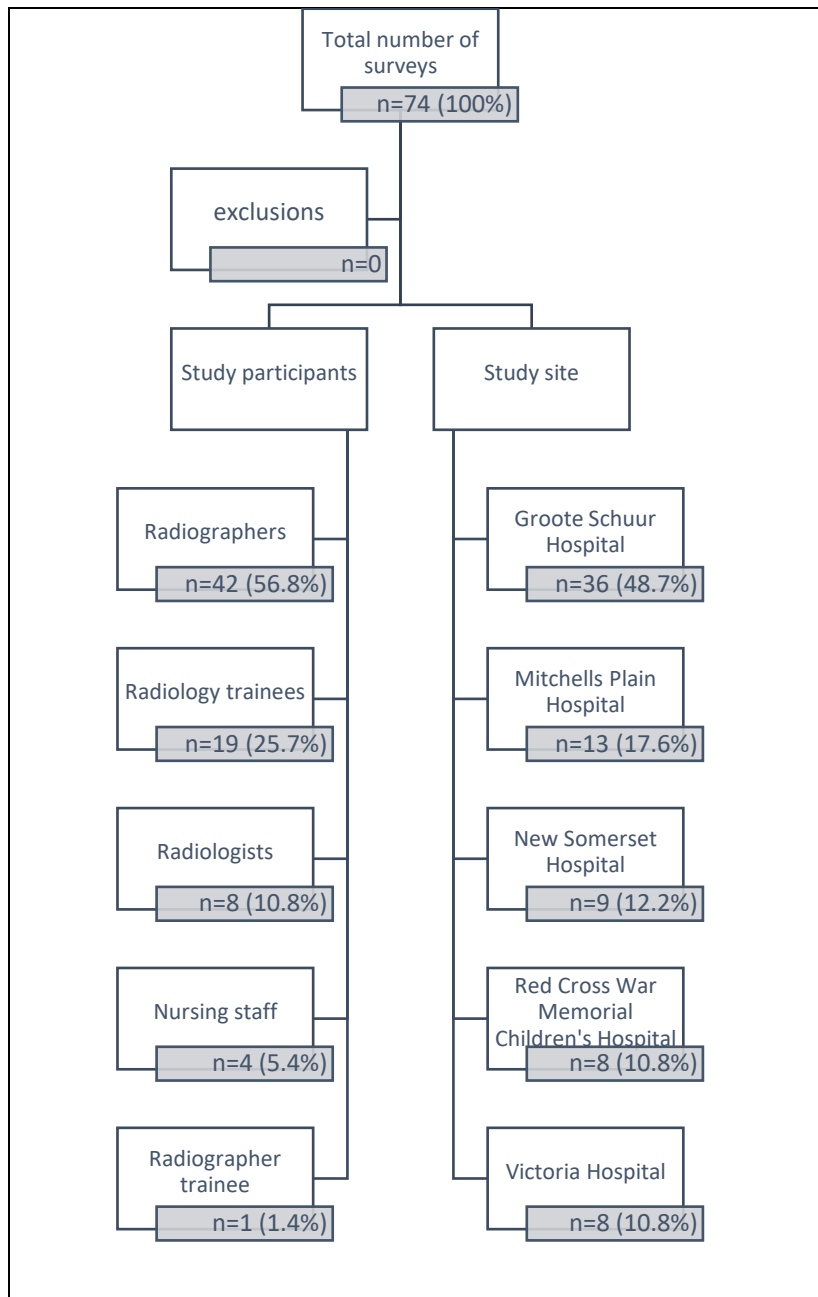


Figure 1: Breakdown of responder demographics

Of the participants, 35 (47%) had 0-5 years' radiology experience, 19 (26%) had 5-10 years' experience and 20 (27%) had more than 10 years' experience in their respective roles. The different groups' experience is broken down in Table 1.

Table 1: Level of working experience in the imaging department of various study participant groups

Experience level	Radiology Trainee (n=19)	Radiologist (n=8)	Radiographer Trainee (n=1)	Radiographer (n=42)	Nurse (n=4)	Total (n=74)
0 - 5 years	19 (100%)	1 (12.5%)	1 (100%)	12 (28.5%)	2 (50.0%)	35 (47.0%)
5 - 10 years	0	4 (50.0%)	0	14 (33.3%)	1 (25.0%)	19 (26.0%)
More than 10 years	0	3 (37.5%)	0	16 (38.1%)	1 (25.0%)	20 (27.0%)

Of the 74 study participants, 41 (55%) reported that there was no formal basic life support training at their place of employment. A total of 63 (85%) participants indicated that they had taken part in a BLS course at some time: 2 (2.7%) had taken part in a BLS course within the past year and 61 (82.4%) had taken part in a BLS course more than a year ago. The remaining 11 (14.8%) reported never having taken part in a BLS or equivalent course. Of the total 74 responses gathered, eleven (14.9%) responders reported having completed a trauma course, 6 (8.1%) a critical care course, 22 (29.7%) advanced life support course and 28 (37.8%) study participants reported never having completed a trauma, critical care or similar advanced life support course.

A total of 72 (97.0%) reported that they were involved in resuscitating a cardiac arrest between 0 and 5 times per month. No further details were collected on the specifics on these events. No participants reported involvement in more than 5 cardiac arrests per month other than for 2 (2.7%) participants, who reported exposure to more than 10 cardiac arrests per month - both reported by radiographers, one based at Red Cross War Memorial and the other based at Groote Schuur Hospital. Table 2 describes the average confidence levels of each group in terms of recognising cardiac arrest, managing the airway and initiating CPR or chest compressions.

Table 2: Mean (and standard deviation) self-reported confidence levels of participants out of a score of ten (where ten was very confident and zero, no confidence)

Confidence variable	Radiology Trainee (n=19)	Radiologist (n=8)	Radiographer Trainee (n=1)	Radiographer (n=42)	Nurse (n=4)	Total (n=74)
Recognising cardiac arrest	8.95 (±1.4)	7.75 (±1.5)	4.0 (±0)	5.12 (±2.3)	6.50 (±3.4)	6.45 (±2.7)
Managing an airway	7.63 (±1.4)	4.88 (±2.4)	3.0 (±0)	3.48 (±2.5)	6.75 (±3.5)	4.86 (±2.9)
Providing rescue breaths and initiating cardiac compressions	8.74 (±0.9)	6.38 (±1.6)	4.0 (±0)	4.79 (±2.9)	8.0 (±1.2)	6.14 (±2.9)

Of the 74 study participants, 18 (24%) reported that they were confident in performing all three of the core components of BLS. However, 31 (42%) of participants reported that basic airway management was the component of BLS that they felt least confident with. This was followed by basic circulation support (providing chest compressions) where 26 (35%) of participants reported poor confidence. This was followed by basic breathing assistance and support with 24 (32%) of participants reporting poor confidence. There were 55 (74.32%) participants who stated that they would feel more confident in performing BLS if there were an emergency centre doctor or nurse present. Figure 2 describes the self-reported factors that would increase their confidence in recognising and managing cardiac arrest.

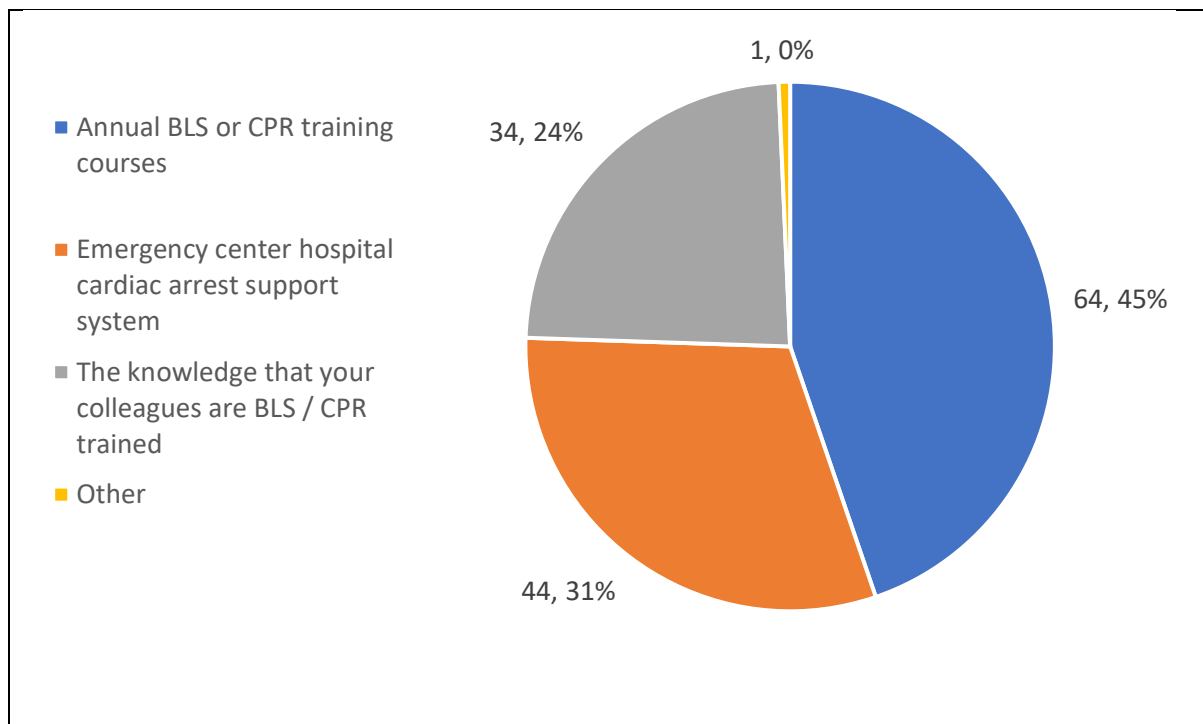


Figure 2 Factors considered to increase confidence of basic life support initiation

Discussion

There was a clear deficiency overall in participant confidence for recognising cardiac arrest, managing an airway, providing rescue breaths and initiating cardiac compressions during cardiac arrest. Although radiologists and radiology trainees reported amongst the greatest confidence in recognising cardiac arrest, the confidence levels of radiographers, their trainees and nurses to recognising cardiac arrest were low. This was concerning, particularly as the latter group is most likely to be amongst first responders in a cardiac arrest. Radiology trainees' confidence was fairly robust concerning managing an airway, providing rescue breaths and initiating cardiac compressions although nurses reported better confidence in providing rescue breaths and initiating cardiac compressions.

The reasons for these discrepancies were not tested, but may stem from less exposure to actual arrests, as well as prior and current medical training and experience. Radiology trainees are more likely than any of the groups to have been recently exposed to advanced life support training. Low confidence levels in the radiography cohort may result in delays in initiating BLS which may lead for poorer patient outcomes.(16)

Of course, this study only reports confidence levels and not actual performance which can both be better or worse than the reported confidence would suggest. Numerous international studies have shown lack of confidence in initiating basic life support when confronted with cardiac arrest not only

amongst general nurses, students or non-surgical disciplines, but also within emergency care staff.(16-19) Maharaj concluded that emergency care staff working in both public and private settings in South Africa were not sufficiently confident to initiate BLS. As in our study, they showed that the presence of an appropriately trained clinician leading resuscitation boosted confidence in performing BLS.(7)

The lack of regular exposure to cardiac arrest may result either to a degree of complacency or excessive insecurity, leaving staff unprepared to deal with the situation adequately. However, this could potentially be mitigated by ensuring regular BLS refresher courses, together with simulation training.(18) Only 2.7% of participants in our study had taken part in BLS updates and training over the previous year. This is a far lower proportion than reported in the local study by Maharaj, where 42% of participants indicated that they had participated in a BLS course within the past year and yet they still reported low confidence.(7) Also locally, Mabasa suggested that regular advanced life support skills training and the implementation of better support systems would contribute greatly to the positive outcomes of cardiac arrest patients.(6) Still local, Keegan concluded that even nursing staff who attended single BLS training sessions retained limited amounts of knowledge and emphasised that repetitive refresher training is of utmost importance.(10)

Less than half of our study participants were aware of how to obtain BLS training within their setting. Although not specifically determined, the actual availability of training may conceivably be considered a hindrance by removing staff from busy workplaces as well. Maharaj demonstrated the discrepancy between private and public service provision and training, where there was less access to courses in the public sector (which is also where our study took place).(7) In addition, it is unlikely considering limited resources that imaging staff would be prioritized for training.

The option of having the ability to rapidly summon an emergency response team was also popular amongst 34 (45.9%) our study participants. As has been shown, an emergency response team has a significant positive impact on patient care and in-hospital survival outcomes.(21) Our study did not collect information regarding the emergency response teams or protocols for any of the sampled institutions. Nonetheless BLS still needs to be initiated by the first responder irrespective of the clinical setting while awaiting an experienced team to take over life support interventions.

This study provides an interesting perspective on the challenges in achieving a confident team in the radiology department. There were limitations to this study. It included only a proportion of Cape Town hospitals and excluded the private sector. It was also small and the response rate, despite effort from the study team, was lower than anticipated. Data collection was challenging due to the various work patterns and different work areas of staff. It was anticipated that staff may be reluctant to participate, given their expected low confidence levels in managing cardiac arrest.

As such it was not possible to analyse groups in more detail or compare groups statistically. It was therefore difficult to generalise the findings beyond this sample. Despite the study being limited by its size, the findings echo what is already known elsewhere about the subject. Participant replies were consistent with those from other research. It is believed unlikely that a larger sample would yield a markedly different result.

Although the survey prompted participants to explain their choice whenever 'Other' was selected as an answer option, this was not done by any participant. It is unclear why this was the case but may relate to the survey design.

Due to these limitations the findings of this study cannot be generalised or offer definitive direction on the BLS confidence of radiology staff in public sector hospitals in Cape Town.

Conclusion

Although small, this study showed that many radiology staff and their medically trained support staff within a subset of public hospitals in Cape Town, South Africa felt insufficiently confident in recognising cardiac arrest, managing the airway, and initiating cardiac compressions. It further highlighted the lack of uptake or awareness of regular and refresher BLS training within this cohort. It would seem reasonable that advertising and access to BLS training, including use of simulation for imaging staff should be re-evaluated as a patient safety initiative. This would require validation and balancing against the other resources used to manage the burden of acute illness and death within public hospitals. The survey tool used for this study could be used to review the retention of core BLS knowledge and skills post-training interventions. Similarly, opportunities to improve emergency response teams as well as exposure to cardiac arrest scenarios could be explored in partnership with local emergency centres, training departments or medical emergency teams. Future exploration by means of a larger study cohort to allow subgroup analysis, specifically considering how prior experience and current training and exposure affect confidence is recommended.

ACKNOWLEDGEMENTS, COMPETING INTERESTS AND FUNDING

I would like to acknowledge the Divisions of Radiology and Emergency Medicine of the University of Cape Town. I would also like to acknowledge all the participants of this study. I have no competing interests to declare. No formal funding was required or accepted in completing this study.

REFERENCES

1. Sasson C, Rogers MA, Dahl J, et al. Predictors of survival from out-of-hospital cardiac arrest: a systematic review and meta-analysis. *Circulation: Cardiovascular Quality and Outcomes*. 2010 Jan;3(1):63-81.
2. Hazinski MF, et al. 2010 International consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. *Circulation AHA*.2010 Oct;(122): S250-S275.
3. Gräsner JT, Herlitz J, Koster RW, et al. Quality management in resuscitation—towards a European cardiac arrest registry (EuReCa). *Resuscitation*. 2011 Aug 1;82(8):989-94.
4. Perkins GD, Cooke MW. Variability in cardiac arrest survival: the NHS ambulance service quality indicators. *Emergency Medicine Journal: EMJ*.2012;29(1):3-5.
5. Peberdy MA, Kaye W, Ornato JP, et al. Cardiopulmonary resuscitation of adults in the hospital: a report of 14 720 cardiac arrests from the National Registry of Cardiopulmonary Resuscitation. *Resuscitation*. 2003 Sep 1;58(3):297-308.
6. Mabasa TE. A prospective study on the outcomes on adult cardiopulmonary resuscitation in Cape Town. MMed thesis. University of Cape Town; 2012.
7. Maharaj S. A survey to determine whether emergency centre nurses are confident in initiating BLS across emergency centres in the Western Cape metropole. MMed thesis. Stellenbosch University; 2013.
8. Nyman J, Sihovonen M. Cardiopulmonary resuscitation skills in nurses and nursing students. *Resuscitation*. 2000 May; (47): 179-184.
9. Mäkinen M, Niemi-Murola L, Kaila M, et al. Nurses' attitudes towards resuscitation and national resuscitation guidelines-Nurses hesitate to start CPR-D. *Resuscitation* 2009; (80): 1399-1404.
10. Keenan M, Lamacraft G, Joubert G. A survey of nurses' basic life support knowledge and training at a tertiary hospital. *AJHPE*.2009 December; (Vol. 1 No.1): 3-7.
11. Dwyer T, Mosel Williams L. Nurses' behaviour regarding CPR and the theories of reasoned action and planned behaviour. *Resuscitation*. 2002 ;(52): 85-90.
12. Whelan Y. Cardiac arrest: the skills of the Emergency Nurse Practitioner. *Accident and Emergency Nursing* .1997;107-110
13. Terzi A. Nurses' role in the modern resuscitation era. *Hospital Chronicles*. 2008; Supplement (16D1)

14. Tygerberg 2016. Annual report 2016 available at https://www.westerncape.gov.za/dept/health/documents/annual_reports/2016 (Accessed 11 December 2017)
15. Jacobs DG, Pretorius EJ, Barnard MM. CT use. How does the Western Cape compare? CT utilisation in the Western Cape versus other international locations. Poster presented at: RSSA/BISSA Breast Imaging Congress 2014.
16. Cummins RO, Ornato JP, Thies WH, et al. Improving survival from sudden cardiac arrest: the “chain of survival” concept. *Circulation*. 1991 May 1;83(5):1832-47.
17. Filgueiras Filho NM, Bandeira AC, Delmondes T, et al. Assessment of the general knowledge of emergency physicians from the hospitals of the city of Salvador (Brazil) on the care of cardiac arrest patients. *Arquivos brasileiros de cardiologia*. 2006 Nov;87(5):634-40.
18. Kimaz S, Soysal S, Cimrin AH, et al. Assessment of physicians employed in emergency medical services about their level of knowledge on basic life support, advanced cardiac life support and medicolegal responsibilities. *Ulus Travma Acil Cerrahi Derg*. 2006; 12:59–67.
19. Howell P, Tennant I, Augier R, et al. Physicians’ knowledge of cardiopulmonary resuscitation guidelines and current certification status at the university hospital of the West Indies, Jamaica. *The West Indian Medical Journal*. 2014;63(7):739-743. doi:10.7727/wimj.2013.267.
20. Chandrasekaran S, Kumar S, Bhat SA. Awareness of basic life support among medical, dental, nursing students and doctors. *Indian Journal of Anaesthesia*. 2010 Mar;54(2):121.
21. Chan PS, Jain R, Nallmothu BK, et al. Rapid response teams: a systematic review and meta-analysis. *Archives of Internal medicine*. 2010 Jan 1;170(1):18-26.

PART C: ADDENDA

AUTHORS INSTRUCTIONS: SAJR

The guidance for authors of SAJR can be found at this link:

<https://sajr.org.za/index.php/sajr/pages/view/submission-guidelines>

Original Research Articles

An original article provides an overview of innovative research in a particular field within or related to the focus and scope of the journal, presented according to a clear and well-structured format.

Word limit	3000 words (excluding the structured abstract and references)
Structured abstract	250 words to cover a Background, Objectives, Method, Results and Conclusion
References	60 or less
Tables/Figures	No more than 10 Tables/Figure
Ethical statement	Should be included in the manuscript
Compulsory supplementary file	Ethical clearance letter/certificate

Original Research Article full structure

Title: The article's full title should contain a maximum of 95 characters (including spaces).

Abstract: The abstract, written in English, should be no longer than 250 words and must be written in the past tense. The abstract should give a succinct account of the objectives, methods, results and significance of the matter. The structured abstract for an Original Research article should consist of five paragraphs labelled Background, Objectives, Method, Results and Conclusion.

- **Background:** *Why do we care about the problem?* State the context and purpose of the study. (What practical, scientific or theoretical gap is your research filling?)
- **Objectives:** *What problem are you trying to solve?* What is the scope of your work (e.g. is it a generalised approach or for a specific situation)? Be careful not to use too much jargon.
- **Method:** *How did you go about solving or making progress on the problem?* State how the study was performed and which statistical tests were used. (What did you actually do to get the results?) Clearly express the basic design of the study; name or briefly describe the basic methodology used without going into excessive detail. Be sure to indicate the key techniques used.

- Results: *What is the answer?* Present the main findings (that is, as a result of completing the procedure or study, state what you have learnt, invented or created). Identify trends, relative change or differences on answers to questions.
- Conclusion: *What are the implications of your answer?* Briefly summarise any potential implications. (What are the larger implications of your findings, especially for the problem or gap identified in your motivation?)

Do not cite references and do not use abbreviations excessively in the abstract.

Introduction: The introduction must contain your argument for the social and scientific value of the study, as well as the aim and objectives:

- Social value: The first part of the introduction should make a clear and logical argument for the importance or relevance of the study. Your argument should be supported by use of evidence from the literature.
- Scientific value: The second part of the introduction should make a clear and logical argument for the originality of the study. This should include a summary of what is already known about the research question or specific topic, and should clarify the knowledge gap that this study will address. Your argument should be supported by use of evidence from the literature.
- Conceptual framework: In some research articles it will also be important to describe the underlying theoretical basis for the research and how these theories are linked together in a conceptual framework. The theoretical evidence used to construct the conceptual framework should be referenced from the literature.
- Aim and objectives: The introduction should conclude with a clear summary of the aim and objectives of this study.

Research methods and design: This must address the following:

- Study design: An outline of the type of study design.
- Setting: A description of the setting for the study; for example, the type of community from which the participants came or the nature of the health system and services in which the study is conducted.
- Study population and sampling strategy: Describe the study population and any inclusion or exclusion criteria. Describe the intended sample size and your sample size calculation or justification. Describe the sampling strategy used. Describe in practical terms how this was implemented.
- Intervention (if appropriate): If there were intervention and comparison groups, describe the intervention in detail and what happened to the comparison groups.
- Data collection: Define the data collection tools that were used and their validity. Describe in practical terms how data were collected and any key issues involved, e.g. language barriers.
- Data analysis: Describe how data were captured, checked and cleaned. Describe the analysis process, for example, the statistical tests used or steps followed in qualitative data analysis.
- Ethical considerations: Approval must have been obtained for all studies from the author's institution or other relevant ethics committee and the institution's name and permit numbers should be stated here.

Results: Present the results of your study in a logical sequence that addresses the aim and objectives of your study. Use tables and figures as required to present your findings. Use quotations as required to establish your interpretation of qualitative data. All units should conform to the **SI convention** and be abbreviated accordingly. Metric units and their

international symbols are used throughout, as is the decimal point (not the decimal comma).

Discussion: The discussion section should address the following four elements:

- Key findings: Summarise the key findings without reiterating details of the results.
- Discussion of key findings: Explain how the key findings relate to previous research or to existing knowledge, practice or policy.
- Strengths and limitations: Describe the strengths and limitations of your methods and what the reader should take into account when interpreting your results.
- Implications or recommendations: State the implications of your study or recommendations for future research (questions that remain unanswered), policy or practice. Make sure that the recommendations flow directly from your findings.

Conclusion: Provide a brief conclusion that summarises the results and their meaning or significance in relation to each objective of the study.

Acknowledgements: Those who contributed to the work but do not meet our authorship criteria should be listed in the Acknowledgments with a description of the contribution.

Authors are responsible for ensuring that anyone named in the Acknowledgments agrees to be named. Also provide the following, each under their own heading:

- Competing interests: This section should list specific competing interests associated with any of the authors. If authors declare that no competing interests exist, the article will include a statement to this effect: *The authors declare that they have no financial or personal relationship(s) that may have inappropriately influenced them in writing this article.* Read our [policy on competing interests](#).
- Author contributions: All authors must meet the criteria for authorship as outlined in the [authorship](#) policy and [author contribution](#) statement policies.
- Funding: Provide information on funding if relevant
- Disclaimer: A statement that the views expressed in the submitted article are his or her own and not an official position of the institution or funder.

References: Authors should provide direct references to original research sources whenever possible. References should not be used by authors, editors, or peer reviewers to promote self-interests. Refer to the journal referencing style downloadable on our [Formatting Requirements](#) page.

File format

The document uploaded during Step 2 of the submission process:

- **Microsoft Word (.doc/.docx):** We can accept Word 2003 DOC files and Word 2007 DOCX files.
- **Rich Text Format (RTF):** Users of other word processing packages should save or convert their files to RTF before uploading. Many free tools are available that will make this process easier.

The AOSIS house style

The manuscript must adhere to the **AOSIS house style guide**.

Referencing style guide

The manuscript must adhere to the **Vancouver referencing style**.

Language

Manuscripts must be written in British English, according to the Oxford English Dictionary [avoid Americanisms (e.g. use 's' and not 'z' spellings), set your version of Microsoft Word to UK English]. Refer to the AOSIS house style guide for more information.

Page and line numbers

Include page numbers and line numbers in the manuscript file.

Font type

Use a standard font size in any standard font family.

Special characters

Refer to our AOSIS house style guide on math and Unicode font guidelines.

Line spacing

1.5

Headings

Ensure that formatting for headings is consistent in the manuscript. Limit manuscript sections and sub-sections to four heading levels. Make sure heading levels are clearly indicated in the manuscript text. Do not number headings

QUESTIONNAIRE/ DATA CAPTURE INSTRUMENT

Helpful hints for completing this questionnaire
--

Only radiology staff (radiology trainees, qualified radiologists, radiography trainees, qualified radiographers and radiology nursing staff) may complete the questionnaire.

If you have completed this questionnaire already, please DO NOT complete a second questionnaire.

Please read each question carefully and tick a box / circle to indicate your answer.

In most cases you will only have to tick one box.

Answer the next question unless asked otherwise.

Once you have completed the survey, please take a minute to check you have answered all the questions that you should have answered.

The survey consists of 2 pages and should take no longer than 5 minutes to complete.

If you have any queries about the questionnaire, please do not hesitate to contact Dr Isak Vorster (Contact Number: 0824322424 / #77415).

Once you have completed the questionnaire please return to Dr Isak Vorster.

QUESTIONNAIRE

1. What is your current position?

Radiology Trainee	Radiography Trainee	Nursing Trainee
Qualified Radiologist	Qualified Radiographer	Qualified Nurse

2. How long have you worked / been training as a radiologist / radiographer / radiology support staff member?

0 – 5 years	5 – 10 years	More than 10 years
-------------	--------------	--------------------

3. Do you work in?

Public sector	Private sector	Both
---------------	----------------	------

4. If you work in the public sector, do you work in?

District hospital	Regional hospital	Tertiary hospital
-------------------	-------------------	-------------------

5. Which hospital do you work at the majority of time, if at more than one?

Groote Schuur	New Somerset	Mitchells Plain
Red Cross Children's	Victoria Hospital	

6. How confident are you to recognize a cardiac arrest? (1= no confidence / 10 = very confident)

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

7. How confident are you to manage an airway during a cardiac arrest? (1= no confidence / 10 = very confident)

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

8. How confident are you to commence CPR? (1= no confidence / 10 = very confident)

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

9. If an emergency unit doctor / nurse is present, do you feel more confident to perform BLS i.e. manage the airway & start CPR?

Yes	No
-----	----

10. Is there any form of formal BLS/CPR training in your centre?

Yes	No
-----	----

11. When was the last time you completed a BLS course?

Less than 1 year ago	More than 1 year ago	Never done a BLS course
----------------------	----------------------	-------------------------

12. How often are you exposed to cardiac arrest in 1 month?

0 - 5 per month	5 – 10 per month	>10 per month
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13. Have you completed any of the following?

Trauma course	Critical care course	Other	Never done any course
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14. What area / factor do you feel least comfortable / confident with during initiation and continuation of BLS?

Airway maintenance/support	
Breathing assistance/support	
Circulation support	
Other: (please complete)	

15. Which of the following will boost your confidence in BLS initiation? (more than one may be ticked)

Annual BLS/CPR training courses	
The knowledge that your fellow colleagues are BLS/CPR trained and skilled	
Emergency unit "CODE BLUE CRASH" support system	
Other: (please complete)	

THANK YOU

PARTICIPANT INFORMATION SHEETS FOR HARD COPY QUESTIONNAIRES

Evaluation of self-reported confidence amongst radiology staff in initiating basic life support across hospitals in the Cape Town West metropole

Reference number: 668/2017

Lead investigator: Isak D. Vorster

Address: Department of Diagnostic Radiology
University of Cape Town
Groote Schuur Hospital

Contact number: 082 432 2424

Dear Colleague

My name is Isak Vorster and I am a Radiology Registrar. I would like to invite you to participate in a research project that aims to investigate how confident we as radiology staff are to initiate Basic Life Support.

Why is this study being done?

Cardiac arrest is the most urgent emergency in any radiology department. Usually, radiology staff are the first personnel to respond to a cardiac arrest in such instance. This survey aims to find out how confident radiology staff are at both recognising a patient who needs BLS and to initiate BLS. This will be done using an anonymous questionnaire for you to complete. Your privacy is important to us. We will not collect any personal information. Secure data management practices are in place to ensure that the data you do provide remain safely protected; only the research team will have access to the research data.

Why are you being asked to take part?

You form part of the radiology team that is actively involved with patients in the unit. At many times and in many situations, you will be the first responder to any situation – and it is important to establish if you have been exposed to BLS training and if you are at ease with initiating it if the situation requires.

How many people will take part in the study?

The aim is to acquire a statistically relevant number of participants to ensure that an accurate assessment can be made. The study aims at distributing roughly 300 questionnaires.

How long will the study last?

The distribution and collection period will last 2 months. The data analysis and processing of results and finalization of the analysis will take another 2 months.

What do we do to decide if you are eligible to be take part?

Very simple selection criteria exist for inclusion into the study group – if you work at one of the included hospitals, and if you are form part of the radiology department team (whether qualified or in training) you are eligible for participation.

What will happen if you decide to take part in the study?

You will be supplied with the consent form as well as the anonymous study questionnaire that you may fill in at your leisure. On return of the questionnaire a random study number will be assigned to your questionnaire and it will be submitted to the batch for analysis.

What are the risks and discomforts of this study?

There are no physical risks to this study and it is 100% voluntary.

Are there any benefits to you for being in the study?

The personal benefits include self-assessment and analysis on your own part. The proposed benefits of the study are to finally increase patient care.

What will happen when the study is over?

Results of the study will be made public by means of publication in a local peer reviewed journal.

Will the results of the research be shared with you?

The results will be freely available to the public once published.

Will you receive any reward (money or food vouchers) for taking part in this study?

No, you will not.

Who will see the information which is collected about you during the study?

Only the study team will be privy to the information that is collected initially prior to data analysis, write up and submission of the study. Thereafter the study results will be publically available – however, again we emphasize that the questionnaires are anonymous, and no single person involved in the study or otherwise will be able to link you to your questionnaire.

Who do I speak to (or contact) if I have any questions about the study?

Please contact me if you require further explanation or clarification of any aspect of the study. Please note that your participation is voluntary, and you are free to decline to participate. If you decline to participate, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the Health Research Ethics Committee (HREC) at the University of Cape Town and will be conducted according to accepted and applicable National and International ethical guidelines and principles, including those of the international Declaration of Helsinki October 2013.

The HREC at the University of Cape Town may be contacted at the following address:

E53 Room 46,

Old Main Building,

Groote Schuur Hospital

Cape Town

021 4066626

By completing and submitting this survey you declare that:

- You have read the information provided above and that it is written in a language with which you are fluent and comfortable.
- You have had a chance to ask questions and all your questions have been adequately answered.
- You understand that taking part in this study is voluntary and you have not been unduly influenced to take part.

- You may choose to leave the study at any time and will not be penalised or prejudiced in any way.

Yours sincerely



Dr Isak D. Vorster
MBChB, CIME

Dr Isak D. Vorster on behalf of the research team (Prof SJ Beningfield (Lead investigator), Dr SC Bruijns)

RESEARCH PROTOCOL

1. Introduction

1.1 Background

Cardiac arrest is among the most serious and life-threatening emergencies in any hospital setting. The chances of survival following cardiac arrest are greatly improved by administering prompt and effective Cardio-Pulmonary Resuscitation (CPR) as a first line intervention.(1) Early detection and implementation of resuscitation has been found to optimize a patient's chance of survival.(2) Over 80% of sudden death cases worldwide have cardiovascular causes as a causative agent.(3) The median survival rate of in-hospital cardiac arrest, as opposed to out-of-hospital cardiac arrest, is higher.(4) Many in-hospital cardiac arrests occur in patients in the imaging department when left alone or in the care of radiology staff.(5) The primary responder to a cardiac arrest scene ideally should be competent and confident in initiating BLS, especially in the in-hospital setting where the chances of successful resuscitation are amplified.

Various studies focusing on nurses' basic life support (BLS) knowledge and training conducted in the last two decades concluded that both knowledge and training were inadequate.(6-11) Another local study demonstrated that overall BLS CPR competence of South African emergency medical services personnel was poor.(12) The best predictor of adequate airway

opening manoeuvres was self-confidence and the best predictor for adequate ventilation was recent resuscitation training within the last 6 months.(6) A 2009 follow-up study, scrutinizing nursing staff attitudes towards resuscitation established that intensive education led to a rise in self-confidence in initiating and performing CPR.(7)

Limited studies evaluating BLS skills only focused on nursing staff. The most recent study was performed at Universitas Hospital in the Free State 2009. This study determined that nurses' knowledge and practical BLS skills were inadequate. It was also found that there was reduction in attendees at recent BLS training courses.(7)

No South African studies focusing on radiology staff have been performed. There is a void in the literature regarding BLS competence, knowledge and confidence in South African radiology department staff.

1.2. Motivation

The motivation for this study comes from the principal investigator's personal and professional experience the there was a poor level of BLS confidence amongst radiology staff in the workplace. The aim is therefore to investigate whether there is truly a lack of confidence amongst radiology staff in initiating BLS. The research will focus specifically on radiology staff, i.e. radiographers, radiologists (registrars in training, as well as qualified consultants) and support nursing staff working in the radiology department. This is opposed to other studies that have looked at general nursing or emergency centre personnel.(13-15) This is considered an important group to focus upon on, as these staff members are often alone with the patient whilst imaging, and therefore they should be confident to properly initiate life-saving measures such as BLS.

The study results produce evidence of the state of BLS confidence and indirectly, training, amongst South African radiology staff. It may support the need for regular BLS training of radiology staff, improving radiology staff BLS confidence and knowledge would have a positive impact on the greater South African community.

1.3. Research question

How confident are radiology staff to initiate BLS without the presence of an experienced BLS practitioner such as an emergency or critical care provider?

1.4. Study hypothesis

Radiology staff are confident to initiate BLS.

1.5. Aim

The aim of this study is to determine whether radiology staff and support staff are confident in identifying cardiac arrest and initiating BLS defined as 1) recognizing a cardiac arrest; 2) opening the airway, 3) giving rescue breaths and 4) initiating cardiac compressions in Radiology Departments within the Cape Town's Metropole's West public hospitals.

1.6. Objectives

To determine:

- If there is general confidence in identifying cardiac arrest and
- initiating BLS among the study population
- The areas of uncertainty in conducting BLS in the study setting
- (sub-objective) Whether there is a difference in confidence between specific groups within the study population
- (sub-objective) If the level of experience affects self-reported confidence in initiating BLS
- (sub-objective) What would contribute to increasing levels of confidence and competence in initiating and performing BLS

2. Methodology

2.1. Study Design

A prospective, multi-centre, cross-sectional survey will be conducted using an anonymous peer-validated questionnaire.

2.2. Study Setting

Public sector hospital radiology departments in the West Metropole which includes two tertiary centres: Groote Schuur and Red Cross Children's Hospital and three secondary centres: New Somerset, Mitchells Plain and Victoria Hospitals. Due to resource constraints, radiology departments at community health centres will not be included.

2.3. Study Population

2.3.1. Subject Selection

The study population includes all radiographers, radiology registrars, radiology consultants and radiology department nursing staff working in Cape Town metropole's public hospital radiology departments.

Inclusion Criteria:

All radiographers, radiology registrars, radiology consultants and radiology department nursing staff working on a full-time or part-time basis.

Exclusion Criteria:

Non-radiology staff, such as visiting staff (staff from other departments escorting patients), security staff and cleaning staff.

Those unwilling to participate

2.3.2. Sampling

The sample area will take place in the Cape Town West metropole public hospitals as listed above. A convenience sample will be used where the number of staff members within each group will determine how large the sample within each hospital would be. Sampling will be done during office hours, as well as during the change of shifts to include both day and night time staff. The main function of this study will be descriptive and qualitative in nature. A sample size of 150 will provide proportional estimates with an acceptable degree of accuracy as discussed with the study statistician. Responses above 150 would improve the accuracy of the estimates by a negligible margin. For comparison groups this sample size should be able to detect 20% difference between the groups at 80% power. The aim of distributing roughly 300 questionnaires will be implemented to mitigate non-responders.

2.4. Data Collection and Management

The survey will be paper-based. Surveys will be delivered to the various Cape Town West Metropole hospitals with the help of second year medical students as part of their Special Study Module (an application has been made to the Special Study Module convener). Radiology department staff members will be asked to complete these questionnaires which will again be collected by the research team. Each questionnaire will be assigned a unique code to preventing mishandling and erroneous duplication of data.

The following variables will be collected for inclusion:

- Facility based at currently
- Work experience (in years) of radiographer, radiologists & nursing staff in the selected radiology departments
- Level of training
- Completion of any previous trauma or critical care course
- Whether a BLS course has been completed, and when
- Confidence level in initiating BLS, using a Likert scale rated from 0-10
- Areas of BLS provision where staff do not feel confident
- Selection of pre-defined suggestions for improving confidence levels
- Frequency of cardiac arrests exposures

2.5. Statistical Analysis

Summary statistics will be calculated using frequency tables, histograms, means and standard deviations with the help of a statistician. For comparison between different level hospitals, cross tabulations with the Chi-square or Fisher Exact test will be conducted. If there are ordinal variables to be compared, ANOVA or the Mann-Whitney U test will be done depending on the nature of the data.

2.6. Time Schedule

This study will commence once the Health and Research Ethical Committee (HREC) and institutional approvals has been obtained. The goal is to complete the data collection by the end of August 2017, prepare the dissertation from August to October 2017 and submit at the end of 2017.

3. Ethical and Legal Considerations

3.1 Risk & Benefits

The foreseen benefits of this undertaking are in identifying areas of patient care where improvements may lead to improved survival outcomes. By potentially identifying a lack of confidence in basic BLS skills, this firstly provides an opportunity to improve this vital care provision in a vulnerable area, and secondly the opportunity for further research into risk management in this setting. Risks exist in identifying weaknesses that could affect service

delivery given resource implications. Identifying participants or individual centres is unlikely given the design but may expose the service as vulnerable. This is already the anecdotal perception of providers; keen on improving all aspects of care in their environment, including basic life support. Despite this minimal risk this study poses a great opportunity to improve the service, a step likely to be welcomed by providers.

3.2 Consent process

Facility approval as per Western Cape guidance will be sought from all the public institutions before the research survey commences. Simple consent will be included in the survey. This will provide information about the study as per the Human Research Ethics Committee guidance. Approval for inclusion of Special Study Module students will be made through the standard application process with a separate HREC application as per postgraduate research guidance.

3.3 Data management

Questionnaires will not require any personal identifying information. All data will be collected from the questionnaires by the research team. Each will be linked to a unique study code and content will be transcribed into a password-protected file on an access-controlled computer. The hard copy surveys will be safely kept in a locked cupboard in an access-controlled office to which only the research team has access.

3.4 Reimbursement

There will be no reimbursement of study participants or study assistants, other than for travel costs. The study will be conducted on a voluntary participation basis only.

4. Strengths and Limitations

This survey is geographically limited to the West Metropole. Methodologically, the target sample population may opt to complete the questionnaire in a less than truthful manner due to the misconception that their jobs may be at risk, which may cause erroneous information to be collected. Prior to survey completion we will assure participants that their questionnaires will remain anonymous. Bias may exist between sampling predominantly night-duty nurses and day-duty nurses. This will be minimised by distributing questionnaires

at change of shift where both groups will be present. Potential bias between these two groups in answering may come about after completion of long shifts, thereby causing participants to not carefully consider their responses. Emphasis will be placed on the fact that the survey is entirely voluntary – thereby hopefully diminishing the bias. Strengths include liaising with radiology and radiography heads of the hospitals that will be sampled who may encourage participation by their staff in completing the questionnaire. Consultation with radiology and radiography will be undertaken to create an easily comprehensible questionnaire and to minimise the number of questions that are not correctly understood and answered. Community health centres will be excluded, which may bias the sample. That said, community health centres tend to see a much lower risk patient population than the tertiary and secondary hospitals. The real benefit would be in their higher risk populations as the focus of our study.

5. Reporting and Implementation of Results

It is anticipated that the study's results will be published in a peer-reviewed journal on completion of the dissertation. The outcomes will also be available to the head of the public hospital radiology/radiography units to motivate for regular training and updating of BLS skills amongst staff and nursing staff.

6. Resources

6.1. Available resources

This study will be self-funded.

6.2. Study budget and motivation

The budget for this study is R4 000. A detailed budget is available (Appendix 1)

7. References

1. Sasson C, Rogers MA, Dahl J, et al. Predictors of survival from out-of-hospital cardiac arrest: a systematic review and meta-analysis. *Circulation Cardiovascular Quality and Outcomes*. 2010;3(1):63-81.

2. Hazinski Mf, et al. 2010 International consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations. *Circulation* AHA.2010 Oct;(122): S250-S275
3. Grasner JT, Herlitz J, Koster RW, et al. Quality management in resuscitation towards a European cardiac arrest registry (EuReCa). *Resuscitation*. 2011;82(8):989-94.
4. Perkins GD, Cooke MW. Variability in cardiac arrest survival: the NHS Ambulance Service Quality Indicators. *Emergency Medicine Journal : EMJ*.2012;29(1):3-5.
5. Hope W, Von der Embse K, Mostafa G. Cardiopulmonary arrest occurring in the radiology department: patient characteristics, incidences and outcomes. *Am Surg*. 2011; 3:273-276.
6. Nyman J, Sihovonen M. Cardiopulmonary resuscitation skills in nurses and nursing students. *Resuscitation*. 2000 May; (47): 179-184
7. Makinen M. et al. Nurses' attitudes towards resuscitation and national resuscitation guidelines-Nurses hesitate to start CPR-D. *Resuscitation* 2009; (80): 1399-1404
8. Keenan M et al. A survey of nurses' basic life support knowledge and training at a tertiary hospital. *AJHPE*.2009 December; (Vol. 1 No.1): 3-7
9. Dwyer,T et al. Nurses' behaviour regarding CPR and the theories of reasoned action and planned behaviour. *Resuscitation*. 2002 ;(52): 85-90
10. Whelan Y. Cardiac arrest: the skills of the emergency nurse practitioner. *Accident and Emergency Nursing* .1997;107-110
11. Terzi A. Nurses' role in the modern resuscitation era. *Hospital chronicles*. 2008; Supplement (16D1)
12. Veronese JPT. An assessment of theoretical knowledge and psychomotor skills of basic life support cardio-pulmonary resuscitation provision by emergency medical services in a province in South Africa. *UCT*;2015
13. Nyman J, Sihvonen M. Cardiopulmonary resuscitation skills in nurses and nursing students. *Resuscitation*. 2000 Oct 1;47(2):179-84.
14. Hamilton R. Nurses' knowledge and skill retention following cardiopulmonary resuscitation training: a review of the literature. *Journal of Advanced Nursing* 2005 Aug;51(3):288-97.
15. Sangamesh NC, Vidya KC, Pathi J, Singh A. Awareness, attitude, and knowledge of basic life support among medical, dental, and nursing faculties and students in the university hospital. *Journal of International Society of Preventive & Community Dentistry*. 2017 Jul;7(4):161.

APPENDIX 1

BUDGET

PERSONNEL COMPENSATION

Principal investigator	0
Data Typist	0

CONSULTING SERVICES

Statistical services	R1,000
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TRAVEL

Travel to emergency centres (Drop off questionnaires – 100km; Pick up questionnaires – 100km) (±200km x 2 day trips = 400km) (800km @ AA Tariffs of R4.61 per km)	R2 ,000
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EQUIPMENT AND STATIONARY

Telephone and fax	R500
Internet	R200
Office supplies	R100

Ethics committee fee	0
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Incidental expenses	R200
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Total Expenditure	R4 ,000
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HEALTH RESEARCH ETHICAL COMMITTEE STUDY PROTOCOL APPROVAL LETTER



UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee



Room E53-46 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6626
Email: shuretta.thomas@uct.ac.za

Website: www.health.uct.ac.za/fhs/research/humanethics/forms

27 September 2017

HREC REF: 668/2017

Dr SR Bruijns
Emergency Medicine
F51, OMB

Dear Dr Bruijns

PROJECT TITLE: EVALUATION OF SELF REPORTED CONFIDENCE AMONGST RADIOLOGY STAFF IN INITIATING BASIC LIFE SUPPORT ACROSS HOSPITALS IN THE CAPE TOWN WEST METROPOLE (MMed-candidate-Dr I Vorster)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study subject to the following:

1. Please update the informed consent form to reflect the Helsinki Declaration 2013; or explain why it has not been referenced and why the 2008 has been referenced?
2. Please add the UCT HREC contact details to the Informed consent form.
3. Please obtain permission from Ms Miriam Hoosain, the Executive Director of Human Resources, when including UCT staff as research participants.

Approval is granted for one year until the 30 September 2018.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate Institutional approval, where necessary, before the research may occur.

The HREC acknowledge that the student, Dr Isak Vorster will also be involved in this study.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637.

Institutional Review Board (IRB) number: IRB00001938

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Convention on Harmonisation Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2006), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines.

The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.



HREC 668/2017