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The resuscitation skills profile of registrars in four major disciplines

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, in partial fulfilment of the requirements for the Degree of
Master of Medicine in Anaesthesia

Johannesburg, 2015

Declaration

I, Nadav Binyamin Ravid, declare that this research report is my own work. It is being submitted for the Degree of Master of Medicine at the University of the Witwatersrand, Johannesburg, It has not been submitted before for any degree or examination at this or any other university.

Signed



At Parktown, Johannesburg on this date 21 May 2015

Abstract

The aim of this study was to describe the resuscitation skills profile and self-perceived adequacy of resuscitation skills of registrars in four major disciplines in the Faculty of Health Sciences at Wits: anaesthesiology, general surgery, orthopaedic surgery and obstetrics and gynaecology. The study focused mainly on the popular BLS, ACLS and ATLS resuscitation courses.

A prospective, contextual, descriptive study design was used.

An anonymous questionnaire was distributed to registrars. Information collected included demographics, resuscitation course qualifications, self-perceived adequacy of resuscitation skills, and any impediments to completing a resuscitation course.

One hundred and ninety (n=190) participants were entered into the study. BLS, ACLS and ATLS courses were completed by 161, 133 and 106 participants respectively. There was a high inter-disciplinary difference in completion rates.

Of participants who had completed BLS, ACLS and ATLS courses, 25.55%, 34.59%, 68.88% were current in their certification respectively.

Registrars cited a lack of time (59.47%), cost (36.32%) and inability to take leave (28.42%) as the main impediments to completion of a resuscitation course.

The majority of participants (65,79%, n=125) felt that their resuscitation skills were adequate. Registrars were less confident in managing anaphylaxis and dysrhythmia than inserting a CVP, or managing shock or airway.

Registrars who had previously completed either ACLS or ATLS were more confident inserting a CVP (p=0.0024), managing dysrhythmia (p=0.0008) and managing an airway (p=0.0166) than those who had not completed any courses at all.

While a high level of completion of BLS, ACLS and ATLS courses was found in the surveyed registrars, the rate of current certification was low. There was a high overall reported level of confidence in resuscitation skill. A number of impediments exist for registrars to complete resuscitation courses. More certification and re-certification in resuscitation courses is required.

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List of abbreviations and acronyms

ACLS	Advanced Cardiac Life Support
AED	Automated External Defibrillator
AHA	American Heart Association
ANZCOR	Australian and New Zealand Committee on Resuscitation
ATLS	Advanced Trauma Life Support
CMACE	Centre for Maternal and Child Enquiries (UK)
CME	Continuing Medical Education
CPR	Cardiopulmonary resuscitation
EMS	Emergency Medical Services
ERC	European Resuscitation Council
HSFC	Heart and Stroke Foundation of Canada
IAHF	Inter-American Heart Foundation
ILCOR	International Liaison Committee on Resuscitation
MMR	Maternal Mortality Ratio
NCCEMD	National Committee on Confidential Enquiries in Maternal Deaths (South Africa)
RCA	Resuscitation Council of Asia
RCSA	Resuscitation Council of South Africa
SASA	South African Society of Anaesthesiologists
WHO	World Health Organisation
Wits	University of the Witwatersrand (Johannesburg, South Africa)

Chapter 1: Overview of the study

1.1 Introduction

In this chapter an overview of the study is given and includes the background to the research problem, problem statement, aim and objectives, research assumptions, ethical considerations, research methodology, significance of the study, validity and reliability and an overview of the research report.

1.2 Background

Cardiopulmonary resuscitation (CPR) is a vital skill for a health professional to possess. From its inception in the United States in the 1950s, CPR has been developed by the International Liaison Committee on Resuscitation (ILCOR) into today's cogent, evidence-based, internationalised solution to saving lives in the event of cardio-respiratory arrest (1, 2).

CPR teaching has been divided into two distinct but interrelated levels. Basic Life Support (BLS) intends to teach CPR to anyone from a layperson bystander to a medical professional and requires no specialised equipment or invasive techniques (1). Conversely, Advanced Cardiac Life Support (ACLS) and Advanced Trauma Life Support (ATLS) are intended for use by health care professionals only (3, 4). Both ACLS and ATLS build on the foundation of good quality BLS but add specialised equipment, drugs and invasive techniques to the resuscitation protocols.

In recent years, the quality of health professionals' resuscitation skills and knowledge has been called into question (5-8). Improvement in the resuscitation skills of health professionals was a key recommendation in both the World Health Organisation's (WHO) "Maternal Mortality in 2005" (9) and their "Safe Surgery Saves Lives" reports (10). The UK's Saving Mothers' Lives reports of 2005 and 2011 (11, 12) and South Africa's National Committee on Confidential Enquiries in Maternal Deaths (NCCEMD) (13) called for improvement in doctors' resuscitation skills. The South African Society of Anaesthesiologists (SASA) Practice Guidelines of 2012 (14) recommend basic and advanced life support skills training for any doctor potentially administering anaesthesia.

Literature shows that ACLS and ATLS are of benefit to patient outcome (15-17), although this evidence is limited (18) and sometimes contradictory (19). Evidence for ATLS and ACLS courses improving resuscitation skills (with an implied potential improvement in patient outcome) is more widespread (20-26), whilst experience alone, without or independent of formal BLS, ACLS or ATLS instruction, does not appear to improve resuscitation skill (5, 20, 22, 23). Additionally, like most learned skills (27), resuscitation skills deteriorate over time (5, 6, 20, 28-31), necessitating periodic knowledge and skills refreshment. There is also evidence to suggest that completing a resuscitation course subjectively increases doctors' perception of their level of skill and confidence (32).

1.3 Problem statement

Shock, cardiac arrest and respiratory arrest are important, potentially fatal, conditions in all patient population groups. Established, verified guidelines exist for the management of these life-threatening scenarios. With correct, expeditious management, by properly trained health-care professionals, these conditions are potentially reversible and may have excellent outcomes.

Junior doctors in all hospitals may be faced with patients who are haemodynamically unstable or present with cardio-respiratory arrest. However, these doctors, even in an academic setting, may be poorly supervised and reliant on a sometimes non-specific, non-standardised knowledge base dating from undergraduate training. Formalised advanced resuscitation training is not currently a requirement for medical students, interns, community service officers or medical officers, and is only required in certain disciplines for registrars in specialist training and then only as pre-requisites for entry into their more advanced exams. Resuscitation training is not a requirement for acceptance into a registrar post in any discipline at the University of the Witwatersrand (Wits) Health Sciences Faculty.

There is a perception within the Department of Anaesthesiology at the Wits that the resuscitation skills of junior doctors are inadequate. This impacts directly on the practice of anaesthesia, as some patients may present to theatre for surgery in a compromised and under-resuscitated state and may be placed in a higher intraoperative risk category as a direct consequence of their inadequate preoperative preparation. In addition,

anaesthesiologists are often required to assist with patient resuscitation procedures in the wards or in casualty, and this places further strain on the already compromised theatre services at the hospitals affiliated to Wits.

1.4 Aim and objectives

Aim

The aim of this study is to describe the resuscitation skills profile and self-perceived adequacy of resuscitation skills of the registrars amongst four major surgically related disciplines at Wits, namely, anaesthesiology, general surgery, orthopaedic surgery and obstetrics and gynaecology.

Objectives

The objectives of this study will be to:

- determine the number of registrars who have completed BLS, ACLS and/or ATLS courses
- determine the number of registrars whose BLS, ACLS and/or ATLS courses are current
- describe the reasons that prevent registrars from completing resuscitation courses
- determine the self-perceived levels of confidence of registrars in managing five different resuscitation procedures.

1.5 Research assumptions

The following definitions will be used in the study.

Registrar: a medical doctor registered with the Health Professions Council of South Africa training to specialise in a particular medical discipline (also referred to as specialty) or subspecialty, as recognised by the Colleges of Medicine of South Africa.

Basic Life Support (BLS): is a standardised, internationally directed and approved course that teaches CPR. According to MeSH (33), CPR is administered during respiratory or cardiac arrest, requires no specialised equipment and consists of two main components: artificial resuscitation (e.g. bag-valve-mask or mouth-to-mouth) and closed-chest cardiac massage (chest compressions)

Advanced Cardiac Life Support (ACLS): is a standardised, internationally directed and approved course offered by a number of accredited providers in South Africa and overseen by the Resuscitation Council of Southern Africa (34). ACLS is designed to be administered by health care professionals and requires specialist skills and equipment.

Advanced Trauma Life Support (ATLS): is a standardised, internationally directed and approved advanced trauma life support course offered by the Trauma Society of South Africa. (34) ATLS is designed to be administered by health care professionals and requires specialist skills and equipment.

Advanced Life Support (ALS): In the instance of this study, a combined term for Advanced Cardiac Life Support and Advanced Trauma Life Support.

Currently certified: A registrar who is considered to be within the certification period of the resuscitation course completed, that is, within two years of completion of BLS or ACLS course and within 4 years of completion of an ATLS course.

1.6 Demarcation of study field

The research will be carried out within the Departments of Anaesthesiology, General Surgery, Orthopaedic Surgery and Obstetrics and Gynaecology affiliated to the Faculty of Health Sciences, Wits in Johannesburg, South Africa.

Respectively, as of October 2014, these departments employ 107, 61, 52 and 57 registrars who are distributed unequally between Chris Hani Baragwanath Academic Hospital, Charlotte Maxeke Johannesburg Academic Hospital, and Helen Joseph Hospital, Rahima Moosa Mother and Child Hospital and Wits Donald Gordon Medical Centre.

1.7 Ethical considerations

Permission to conduct the study was obtained from the relevant authorities. The study used a questionnaire. Submission of a completed questionnaire was considered to imply consent on behalf of the participant. Anonymity and confidentiality were maintained in the study. This study was conducted in accordance with the principles of the Declaration of Helsinki (35) and the South African Good Clinical Practice Guidelines (36).

1.8 Research methodology

1.8.1 Research design

A prospective, contextual, descriptive design was used in this study.

1.8.2 Study population

All registrars rotating in the Wits Departments of Anaesthesiology, General Surgery, Orthopaedic Surgery and Obstetrics and Gynaecology during the period of data collection formed the study population.

1.8.3 Study sample

Sampling method

A convenience sample method was used in this study, as appropriate to a descriptive study.

Sample size

Sample size was realised by the response rate. A response rate of 60% was considered acceptable but a response of 80% was targeted.

Inclusion and exclusion criteria

All registrars rotating in the Wits Departments of Anaesthesiology, General Surgery, Orthopaedic Surgery and Obstetrics and Gynaecology during the study period were eligible to take part.

Exclusion criteria of the study were:

- registrars on annual, special or sick leave at the time of data collection
- those registrars who did not consent to take part.

1.8.4 Data collection method

The researcher reviewed published literature on the topic and developed a questionnaire (Appendix B) that was validated by experts in the fields of Anaesthesiology and Emergency Medicine.

The anonymous questionnaire was distributed to registrars at the start of a scheduled academic meeting of each department. At the close of the meeting, questionnaires were collected in a sealed box.

The collected data collected were entered in a Microsoft Excel spread sheet for review and analysis.

1.8.5 Data analysis

Data were analysed using descriptive and inferential statistics.

1.9 Significance

Resuscitation occurs daily and, delivered efficiently, can save lives. Worldwide, BLS, ACLS and ATLS courses are accepted as standardised methods of teaching resuscitation skills.

Resuscitation skills have been identified internationally as a crucial area for improvement by such bodies as WHO and SASA as well as in prominent reports such as the UK's "Saving Mothers' Lives" from the Centre for Maternal and Child Enquiries (CMACE) and South Africa's NCCEMD. In some countries and disciplines, completion of these courses may be compulsory for entry into specialist examinations.

Inadequate resuscitation skills on the part of registrars from anaesthesiology and the various surgical disciplines will impact directly on the practice of anaesthesia, as some patients may present to theatre for surgery in a compromised state and may be placed in a higher intraoperative risk category as a direct consequence of their inadequate preoperative preparation. In addition, anaesthesiologists are often required to assist with patient resuscitation procedures in the wards or in casualty, and this places further strain on the already compromised theatre services at the Wits academic hospitals.

The results from this study will present the Faculty of Health Sciences with a profile of its formal registrar resuscitation training. This may lead to an initiative for registrars to obtain and maintain resuscitation qualifications and this may impact on the quality of patient care.

1.10 Validity and reliability

Measures were taken to ensure validity and reliability of the study.

1.11 Outline of the research report

The outline of the research report is presented as follows.

Chapter 1 Overview of the study

Chapter 2 Literature review

Chapter 3 Research methodology

Chapter 4 Results and discussion

Chapter 5 Summary, limitations, recommendations and conclusions

1.12 Summary

In this chapter an overview of the study was given and included the background to the research problem, problem statement, aim and objectives, research assumptions, ethical considerations, research methodology, significance of the study, validity and reliability and an overview of the research report.

Chapter 2: Literature review

2.1 Introduction

ATLS and ACLS are widely accepted courses for the management of shock and cardio-respiratory arrest. While the protocols themselves are freely available, certification in these skills is only possible by completing a formalised course, involving didactic and practical teaching, accompanied by pre-reading of a text component. Such formalised training is available, at a cost, from a certified training provider or the employing institution.

In this chapter, literature regarding the following will be discussed: resuscitation courses and their content, the need for and efficacy of ALS courses, the need for recertification and the relationship between resuscitation confidence and knowledge.

2.2 The need for Advanced Life Support, international consensus

The current lack of suitable skill levels and the importance of basic and advanced life support training have been frequently highlighted in both international and national literature. Much of this literature stems from obstetric concerns over peri-partum maternal mortality.

In 2000, The WHO Millennium Summit adopted eight Millennium Development Goals. Millennium Development Goal number five (MDG5) was the improvement of maternal health, with a commitment to a 75% reduction in maternal mortality ratio (MMR) between 1990 and 2015. The resultant document, Maternal Mortality in 2005, refers specifically to a reduction in MMR through "…provision of high-quality pregnancy and delivery care, including emergency obstetric care."(9)

Similarly, improvement of basic, immediate and advanced life support formed part of the Top 10 Recommendations of the "Saving Mothers' Lives" reports of 2007 and 2011 by the UK's CMACE (12, 37).

The NCCEMD in South Africa found avoidable factors, substandard care and missed opportunities leading to clearly avoidable deaths in 38.4% of maternal deaths in 2005-2007. Of those cases, 20% had documented problems with resuscitation by a health care

worker. The top five problems with resuscitation included: airway not secure (16.0%), circulation not corrected (56.5%), inappropriate drugs given (1.6%), incompletely investigated (8.2%) and not appropriately monitored (1.7%). (13)

The NCCEMD 10 Key Recommendations for 2005-2007 included a call for protocols on management of important conditions causing maternal death and stated, "All…doctors must be trained on the use of these protocols." Maternal and neonatal resuscitation were specifically identified as conditions requiring introduction, training and utilisation of standardised management protocols. (13)

The WHO Patient Safety Alliance, launched in 2005, was formed "to facilitate patient safety policy and practice," and "reduce the adverse consequences of unsafe health care." The WHO Patient Safety Alliance subsequently launched the Safe Surgery Saves Lives initiative, represented by the WHO Guidelines For Safe Surgery 2009 report. This document intends to supply interpretable safety guidelines for all surgical practice, in line with the goals of WHO Patient Safety. The guidelines draw extensively on the ATLS protocol and include the following statements as part of the "…10 basic, essential objectives in any surgical case:

- The team will recognise and effectively prepare for life-threatening loss of airway or respiratory function.
- The team will recognise and effectively prepare for risk of high blood loss". (10)

SASA's Practice Guidelines 2012 Revision also recommend that any doctor proposing to administer anaesthesia must be able to perform basic life support and advanced life support and resuscitation (14).

Wits registrars presenting for Intermediate examinations in both College of Surgeons (38) and College of Orthopaedic Surgeons (39) are required to have ATLS certification, (or at the minimum, have registered for an ATLS course.) No such requirement exists for any of the examinations in the College of Obstetrics and Gynaecology or the College of Anaesthetists (40, 41).

Neither BLS nor ACLS certification are currently an entry requirement for examinations in any of the four disciplines at the College of Medicine of South Africa.

2.3 Life support courses

Although numerous variations and alternatives exist, this study aimed to focus on three, widely accepted, widely practiced resuscitation protocols: BLS, ACLS and ATLS, as supported by ILCOR, the American College of Surgeons and the American Heart Association (AHA). These courses will be discussed in more detail.

2.3.1 Basic Life Support

History

The birth of modern cardiopulmonary resuscitation (CPR) began over 50 years ago in the United States. Prior to CPR's development, options were limited for managing a patient who had stopped breathing or a patient whose heart had stopped beating suddenly. As an example, thoracotomy with open-chest heart massage was one of the only options available to clinicians for managing cardiac arrest - an approach that requires considerable access, equipment, experience and skill, and one with limited success. (1)

Zoll described the termination of ventricular fibrillation with externally applied electricity as early as 1956 and in so doing, paved the way for the defibrillator to become a practical solution to cardiac arrest (1).

In 1958, Elam and colleagues described both the physiology of expired air resuscitation and the mouth-to-mouth method of resuscitation for respiratory arrest (2). Safar and colleagues confirmed the effectiveness of Elam and colleagues' technique, that same year (1).

Kouwenhoven in 1960, observed that chest compressions resulted in palpable arterial pulses and, therefore, that compressions could sustain life temporarily. Kouwenhoven and Safar began to collaborate on the idea of combined "mouth-to-mouth" and "external chest compressions" for resuscitation. Safar later confirmed the effectiveness of what he now called "basic CPR". By 1966, the First Conference on CPR recommended training medical, allied health, and other professional personnel in external chest compressions, according to AHA standards. (1)

With simplicity as the key to its success and the equipment needed being only the

provider's two hands, basic CPR (or BLS) has since been widely dispersed and accepted internationally. Its main strength is that it can be administered by anyone from layperson by-standers to medical personnel, if they have completed a CPR course. It is chiefly intended for, but by no means limited to, the out-of hospital setting. This is in contrast to methods of Advanced Life Support (ALS), which require invasive procedures, special equipment and a medically trained provider. ALS courses require BLS certification for entry, although BLS may be integrated with an ALS course on the same occasion. (3, 4, 42)

The increasingly evidence-based guidelines for CPR are currently moderated by ILCOR, an international collaboration consisting of representatives from the AHA, ERC, Australia, Latin America, South Africa and Canada, amongst others (43).

BLS certification involves a 3-4 hour course administered by an authorised BLS instructor or institution, which may or may not include passing a written and or skills test (44). In South Africa in 2011, the Resuscitation Council of Southern Africa oversaw over 100 certified BLS providers (45). BLS requires re-accreditation every two years, but may also be completed as part of an Advanced Life Support course.

Content

A BLS course involves practical skill sessions covering CPR and choking in adults, children and infants. Use of AED and barrier devices and activation of emergency services is also covered. Participant knowledge is supplemented by a print manual, quick reference cards and a data CD containing video demonstrations, for reference both before and after the course. Course content can be modified slightly depending on the profile of the participant group - safety in the workplace or school, paediatric resuscitation and first-aid skills can all be emphasised over and above the basic course content. (46)

2.3.2 Advanced Cardiac Life Support

History

The AHA released the first guidelines for treatment and resuscitation of cardiac arrest and other life-threatening medical emergencies in 1974. The sixth revision (47) was published in 2010 by the multi-party ILCOR, comprising the AHA, the ERC, the Heart and Stroke

Foundation of Canada (HSFC), the Australian and New Zealand Committee on Resuscitation (ANZCOR), Resuscitation Council of Southern Africa (RCSA), the Inter-American Heart Foundation (IAHF), and the Resuscitation Council of Asia (RCA). (48)

ILCOR now meets in a 5-yearly cycle with the express mission "to identify and review international science and knowledge relevant to CPR and emergency cardiovascular care and when there is consensus, to offer treatment recommendations." The purpose of the recommendations is to encourage a fast and structured approach to CPR and thereby reduce morbidity and mortality associated with premature cardiac arrest and other common medical emergencies; with these guidelines now founded on a strongly evidence-based data-set. (48)

Content

The ILCOR guidelines comprise multiple chapters, with a broad coverage of CPR science, including Adult Basic Life Support (BLS), Paediatric Basic and Advanced Life Support, stroke management, post-arrest care and others. Chapter 8 focuses on Advanced Cardiac Life Support (ACLS) skills in adults (42) and therefore forms the basis for the major content of the ACLS provider course.

ACLS certification is gained by completing an AHA approved provider course. A course begins with an approximately 200-page provider manual, sent to the participant 4 to 6 weeks prior to the course. Pre-reading is expected and a pass mark of 80% in an entry MCQ examination is a course requirement. A pre-course ethics questionnaire around the topic of CPR and patient death is a formality. A current BLS certification is also a requirement. The course itself comprises 2 to 3 days of didactic teaching, small group instruction on equipment and skills, as well as individual and team problem-based resuscitation scenarios. A practical exit exam is mandatory for certification where proficiency in the algorithm based management protocols must be demonstrated with a passing mark of 80%. (30) ACLS provider status is valid for two years, after which re-certification is required (23).

ACLS course content is covered broadly in Appendix E (4)

2.3.3 Advanced Trauma Life Support

History

The ATLS program was introduced in Nebraska in 1978 and nationalised in the United States by the American College of Surgeons in 1980 (49). An orthopaedic surgeon from Nebraska, Dr Jim K. Steyner, conceived the program following a personal tragedy. The light aircraft which he was piloting crashed, resulting in the death of his wife and severe injury to three of his children. As an experienced surgeon, Dr Steyner was dismayed at the poor quality of medical assistance he and his family subsequently received at a health facility in rural Nebraska. Dr Steyner consequently resolved to improve trauma and resuscitation management offered at medical facilities in Nebraska. Influenced heavily by the antecedent ACLS course structure, his program won widespread acceptance and is now available in more than 60 countries, with over one million course graduates as of 2011. Teaching techniques, and scientific content are periodically revised such that the 9th edition of the ATLS course (2013) is now claimed to be international, contemporary, evidence-based and multidisciplinary in its approach. (50)

Content

ATLS aims to teach a fast, standardised approach to initial assessment and management of trauma patients. It focuses on the "golden hour" after a serious injury and centres on the approach to initial assessment, lifesaving intervention, re-evaluation, stabilisation and potential transfer (51). The ATLS methodology revolves around the "ABCDE" mnemonic for serial assessment of Airway, Breathing, Circulation, Disability and Exposure/Environment, with life-saving interventions applied immediately, before moving on to the next stage (as opposed to the traditional method of patient evaluation using a full history and examination prior to intervention) (52). ATLS purposes to teach health care professionals one safe, reliable way to manage a critically injured patient (49) with the knowledge potentially extendible to non-trauma situations, such as shock and hypovolaemia in a gynaecological or orthopaedic setting.

The ATLS course starts with an approximately 400-page manual given to the participant 4 to 6 weeks prior to the course. Pre-reading is expected, and an entry multiple-choice questionnaire with an 80% pass mark is submitted prior to commencing the course. The

course itself involves a 3 to 4 day long structured timetable revolving around larger group didactic lectures, smaller group (high instructor to student ratio) practical skills stations and problem-based resuscitation scenarios. The course ends with a practical exit examination. Certification is valid for four years, after which the participant must be re-certified to remain accredited as an ATLS provider. Re-certification involves a one day refresher course only, if attended within six months of the original certification expiring. (52)

ATLS course content is covered broadly in Appendix F (3)

2.4 Efficacy of advanced life support training courses

Whilst ACLS and ATLS are internationally recognised and accepted, evidence for their efficacy based directly on patient outcome is limited, both in an in-hospital or pre-hospital setting (1, 51). More evidence exists for their benefit on resuscitation skill, knowledge and confidence, as follows.

2.4.1 Advanced Cardiac Life Support (ACLS)

Influence on patient outcome

In the USA in 1986, Lowenstein et al (17) retrospectively compared in-hospital survival rates after cardio-respiratory arrest, before and after a compulsory BLS/ACLS training program for doctors. Short-term survival, denoted by return of spontaneous circulation and survival to discharge, was measured in two six-month periods, before and after the training. Short-term survival improved from 32.4% to 60.4% after BLS/ACLS training. Survival to discharge improved from 13.5% to 22.6% after BLS/ACLS training, but this was not statistically significant due to the low overall number of cases surviving to discharge post-arrest. Undesirably, a higher proportion of patients were discharged to chronic-care facilities from the post-training case group compared to the pre-training group (where all surviving patients returned home), possibly indicating a higher level of post-arrest morbidity in the group treated using the ACLS protocol. Predictive clinical variables were controlled for statistically, with age, APACHE index score and underlying conditions, amongst others, being considered in the comparison. The authors concluded that ACLS trained CPR teams yielded a significantly improved patient survival after in-hospital arrest,

and recommended ACLS training as a requirement for all physicians who may be involved in CPR.

In 2007, Woodall et al (16) examined patient survival after out-of-hospital cardio-respiratory arrest with and without the presence of ACLS-trained paramedics. All cases of cardiac arrest in Queensland, Australia presenting to Emergency Medical Services (EMS) over a period of 3 years (n=2975), were retrospectively analysed to determine the effect on survival to hospital discharge by the presence of an ACLS trained paramedic at first response. Cases in which an ACLS trained paramedic was present, where patients had a pulse at hospital arrival, totalled 21.2% compared to 8.5% with non-ACLS trained EMS. Survival to hospital discharge was 6.70% versus 4.66% for ACLS versus non-ACLS trained EMS, a statistically significant difference ($p=0.03$). Of the arrest cases attended to by ACLS-trained EMS, 93.3% died against a 95.3% death rate amongst the group attended to by non-ACLS paramedics; again, a statistically significant difference in outcome ($p=0.01$). Although Woodall and colleagues admit a number of unavoidable study limitations; ACLS-skilled paramedics do have a positive effect on survival post cardiac arrest.

ACLS knowledge levels

There is evidence to suggest that knowledge of ACLS amongst health care providers is generally low.

In 2009, Kiyan et al (20) administered a standardised test to 101 residents in anaesthesiology, emergency medicine, internal medicine and cardiology at a Turkish university hospital. ACLS certification was not mandatory for the surveyed residents, in contrast to their American counterparts. The questions were designed to assess knowledge of subjects included in standard ACLS course content. Overall scores were a relatively low 66.3%, although this number's use is limited as no pass mark was established. Notably, subjects that had received postgraduate ACLS training had a significantly increased knowledge level (74.5% average score versus 58.2%, $p=0.0001$). A positive correlation was also found between resuscitation frequency and knowledge levels. The authors consequently argued for the introduction of a standardised, systematic postgraduate ACLS training program for residents.

In a separate Turkish study in 2006, Kimaz et al (21) obtained a low mean score of 45.4% on a questionnaire when they surveyed BLS and ACLS knowledge amongst Turkish paramedics. They found a positive correlation between knowledge and experience and again recommended institution of in-service training in ACLS as a potential solution to the prevailingly low knowledge level. Unfortunately, the English translation of the article does not include details on whether the questionnaire tested specifically theoretical or practical knowledge, nor whether ACLS-trained respondents improved scoring.

Cohen et al (6) surveyed ACLS knowledge in anaesthetic, emergency medicine and obstetric residents at a California hospital in 2008. Only 15% of subjects scored higher than 80% (the AHA ACLS pass mark), with particularly poor performance in questions related to the pregnancy-specific ACLS protocol. Recommendations of this study include a call for specialised certification for all three specialties in ACLS, with additional emphasis on ACLS in pregnancy.

With particular reference to perioperative cardiac arrest in theatre, in 1999 Porayko and Butler (7) surveyed a random sample of 200 Canadian anaesthesiologists. Of the 124 responding anaesthesiologists, 90 were ACLS trained but a deficiency in ACLS protocol knowledge was demonstrated. Of the respondents, 56.3% chose at least one option that was considered a “lethal error” and only 13.7% of subjects achieved the minimum score of 70% (similar to AHA ACLS pass mark of 80%) as well as avoided a “lethal error”. No correlation was demonstrated between elapsed time since certification in ACLS and survey score. More than 99% of respondents indicated that continuing medical education in ACLS would be useful.

2.4.2 Advanced Trauma Life Support (ATLS)

Influence on patient outcome

Van Olden et al (15) prospectively analysed patient outcome pre- and post-ATLS protocol introduction at two Dutch hospitals in 2004. Over a three-year period, 63 major trauma cases were examined. There was a significant difference in first hour mortality in the post-ATLS group (0.0% vs. 24.2%, p=0.002), although there was no overall reduction in mortality. When a logistical regression was applied, patients were found to fare worse than predicted before the introduction of ATLS, whereas their predicted survival

improved post-ATLS to a level comparable with the average for their level of trauma (as defined by the Major Trauma Outcome Study).

In 2009 (18), and again in 2014 (53), The Cochrane Collaboration attempted to review literature evidence for presence or absence of in-hospital ATLS training compared to patient outcome (injury morbidity and mortality, both in- and out-of-hospital, between 72 hours and 30 days post injury). The authors highlight that ATLS is currently accepted worldwide in both high and low resource settings, but mention the paucity of evidence supporting this topic. No studies matching the inclusion criteria for the review were found– specifically, no randomised control, control or before-and-after studies were found in the selected articles. The authors note that "there is no evidence that ATLS or similar programs impact the outcome for victims of injury," but concede that evidence does exist to support the impression that ATLS training improves knowledge of hospital staff. The authors called for the further, future evaluation of ATLS in the health system using "more rigorous research design".

Before and after a system-wide roll-out of ATLS trained pre-hospital emergency medical services, Stiell et al (19) in 2008, measured survival to hospital discharge in a total of 2867 patients following major trauma injury. During the BLS-only phase 1373 patients were enrolled, whilst 1494 were enrolled in the subsequent phase where ALS-trained paramedics were permitted to perform endotracheal intubation and administer intravenous drugs and fluids. The groups were statistically comparable. Amongst 17 cities in Ontario, Canada and over a period of 36 months, no decrease in morbidity or mortality was noted in trauma patients after introduction of an ATLS protocol (81,1% vs. 81,8%). Additionally, patients with a Glasgow Coma Scale (GCS) scores less than nine had a greater mortality rate after introduction of ATLS (50,9% vs. 60%). This study was limited in that only pre-hospital protocol was assessed, and major differences in in-hospital course might have been overlooked.

Non outcome-based benefits of ATLS

Training in ATLS improves resuscitation knowledge, skill and confidence.

In a simulated major incident setting in the UK in 1997, Williams et al (24) found that medical staff that had received prior ATLS training managed trauma casualties more effectively (based on ATLS key treatment objectives) than those who had not. The authors admit that this was a low-powered study, (only 8 doctors of all grades) and limited to one specific hospital setting but cite the clear trend in the results as cause to recommend a larger sample size to confirm significance.

A review by Carmont (52) of current literature on ATLS in 2005, found multiple examples of perceived benefit to providers who have completed ATLS training, an observation reflected in the program's worldwide popularity. In separate studies, the majority of respondents found ATLS useful in preparation for specialty examinations, most found ATLS essential to practicing their chosen specialty and considered it an important advantage on their curriculum vitae. Furthermore, the author found that literature shows 94% of providers are of the opinion that ATLS saves lives.

In 2001, Kennedy and Gentleman (32) surveyed 228 Scottish ATLS providers, consisting of both surgeons and anaesthetists, with regard to their perceived impact of the course on their clinical competence. Results showed a distinct positive feeling toward ATLS, with doctors in both specialties finding it particularly useful. The results further showed that 96.6% of respondents felt that ATLS improved their clinical practice and 25% of respondents perceived a large improvement. Other results showed that 93.4% felt ATLS improved their teaching of trauma management, while 98.2% would recommend the course to a junior colleague. Regarding perceived skills degradation, 81.5% of respondents felt that ATLS refresher courses should be compulsory. The majority of respondents felt ATLS certification should be compulsory for specialist examinations (77% and 65% for Fellowship of the Royal College of Surgeons and the Fellowship of the Royal College of Anaesthetists examinations respectively).

Douglas et al (25) in 2010, compared the results of two geographically differing groups completing a standardised trauma management quiz. The first group comprised a cohort of non-ATLS trained medical officers from an emergency department in India (considered "developing" by the authors). This group fared significantly worse in the test compared to a similar group of emergency department medical officers from an Australian hospital

(considered “developed”), the majority of whom had completed ATLS training. Non-ATLS trained emergency department staff scored 20% in the quiz, compared to an 83% average score in the ATLS-trained Australian group, leading the authors to recommend the introduction of ATLS-type courses for the training of Indian emergency department medical officers.

In a study in 2009 comparing different trauma training courses in Swiss medical students (ATLS type) and junior army cadets (proprietary army course) Saxer et al (26), found a significant, comparable increase in post-training scores in both groups. Both programs were therefore found to be effective for training junior medical staff, with the authors noting that target standards for junior staff competency should be clearly redefined.

2.5 Recertification and the need to maintain currency

In spite of on-going improvements in teaching methods and course structure, resuscitation skill retention has continued to pose a problem. Evidence exists for a decline in both resuscitation skills and knowledge over time, whilst experience alone has not been shown to improve either resuscitation knowledge or skill. Furthermore, there is evidence to suggest that “current” may not mean “competent”; that continuing medical education (CME)/in-service training/post-graduate training might be beneficial; and that the renewal cycle for certification may be too long.

2.5.1 Recertification for training in resuscitation

Lipman et al (8) showed in the US in 2010 that even ACLS certified providers had marked deficits in knowledge and performance when asked to take part in a case-simulation with obstetric bias. Major deficits such as poor compressions (56% of the time) and poor ventilation (50% of the time) were noted, in spite of all 69 participants being current in their ACLS certification. Participants included fellows and residents from obstetrics and anaesthesiology as well as nursing staff. The results call into question the two-year recertification cycle for ACLS, with the authors recommending a possible revision in requirements for ACLS training in obstetric staff.

In 2000, Ragavan, Schneider and Kloeck (5) attempted to establish levels of knowledge and skill in BLS amongst medical practitioners in public practice in the Northern province

of South Africa. The BLS skills of the 152 participants, were found to be poor: only 4.6% attained the AHA passing score of 80% - representing insufficient data to analyse and alluding to the low prevailing levels of BLS knowledge. A surrogate differentiator (a score more than 50%) was used in order to make analysis possible. Only 24.3% of participants scored more than 50% in the evaluation. Positive correlation was shown between better scores and younger age, postgraduate BLS training and BLS training in the preceding 24 months. Greater experience alone did not correlate with improved test scores. The authors recommended that formal BLS training should be mandatory for medical practitioners at both undergraduate and postgraduate level, with refresher courses to be offered every two years.

De Lima et al (54) in 2009, looked at the effects of in-service BLS and ACLS training in nurses at a Brazilian tertiary level hospital. Skills and knowledge of 213 participants were assessed prior to and after an eight hour resuscitation course. Of the participants 66.4% had previous CPR training and 10.8% had a more advanced resuscitation qualification (not specified). Post-course scores showed an average 91.2% gain in performance compared to the pre-course average. The authors went on to recommend that structuring CME would be of significant benefit to the quality of patient resuscitation.

2.5.2 Resuscitation skills retention in health care professionals

The deterioration of skills and knowledge with time is an acknowledged problem. In their meta-analysis, Winfred et al (27) found substantial evidence for skills loss secondary to “non-practice” or “non-use” amongst the general population. Predictably, a similar trend toward skills loss has been noted in health care professionals. Skills loss in health care professionals is a particularly pertinent issue, considering the 2 to 4 year long recertification cycles of the major Advanced Life Support courses.

In the US, as early as 1984, Sternbach et al (28) proposed a review of the one to two-year recertification period for CPR training. Their review of literature available at the time showed poor CPR retention skills within the 24-month recertification period amongst all levels of health care providers. One reviewed study showed that just one year after ACLS training, only 39.4% and 47% of subjects could perform adequate ventilation and external cardiac compressions respectively. Another study showed a similar 40% decline in CPR

skills after one year, with the most rapid rate of decline occurring in the first few months after a CPR course.

In 1985 in a study of 33 medical residents in the US, Mancini and Kaye (31) compared skills, assessment and CPR sequence performance as well as knowledge in a standardised BLS test less than a year and more than a year after BLS training. Findings showed that BLS skills performance degraded one year after training, although assessment of the patient improved and sequence knowledge remained stable throughout the period analysed. Consequently, the authors argued that two-year recertification may not be sufficient and that annual skills refreshers should be considered.

Smith et al (30) aimed to establish the ability to retain basic and advanced life support skills and knowledge in 133 nurses in the US. Each subject was tested three times – pre-course, post-course and finally at a random interval up to 12 months after the course. AHA 2000 ACLS and BLS guidelines were used for testing and the overall score included both skills and knowledge segments. The authors found that ACLS skills degraded faster than BLS skills. Three months after the course, only 30% of participants passed the ACLS retest, while only 14% of participants passed at the 12 month ACLS retest. Of the 33% BLS participants failed their re-test just three months after the initial training. The authors argued that their results point to a need for more frequent refresher training.

Contrastingly, in 2005 in the US, using a proprietary model for ACLS training of their medical residents (including a complex medical simulator, small group teaching and deliberate practice), Wayne et al, in multiple papers on a similar theme (23, 29) found no significant decay in skills up to 14 months after initial training. The authors concluded that given the recognised limitations of traditional ACLS training methods, such a modern approach to ACLS training could significantly improve skills retention.

Kiyan et al (20) administered a 20-question standardised test to 101 residents in four departments in a Turkish hospital, intending to assess ACLS knowledge. Questionnaire performance was compared to a number of independent variables. Statistically significant factors found to affect knowledge were completion of postgraduate ACLS training and reported frequency of resuscitation. Regarding retention and degradation, the authors found no statistically significant differences in ACLS knowledge levels in participants who

were trained less than 12 months prior to their survey compared to those trained more than 12 months prior. Skills retention (as opposed to knowledge retention) was not, however, specifically measured in this study – a significant limitation.

Cohen et al (6) assessed resuscitation knowledge and skill in a simulated obstetric emergency. Scores for participants who had had no ACLS training in the preceding five years were not statistically different to the scores of those participants who had received ACLS training between 2 and 5 years prior to the exercise. The authors concluded that better teaching methods and more frequent recertification were required to improve ACLS performance and retention.

Ragavan, Chneider and Kloeck (5) found a positive correlation (p=0.0003) between scores in a simulated BLS scenario and formal BLS teaching in the preceding two years, when they assessed resuscitation skills of doctors in public hospitals in South Africa. Their resulting recommendations included compulsory, regular BLS training for all medical practitioners, preferably every two years.

2.5.3 The influence of experience on CPR competency

There is evidence to suggest that experience is not a substitute for formal CPR training

In the US in 2005, Wayne et al (23) showed formalised ACLS teaching was significantly better than experience alone when assessing CPR skills. Thirty-eight second-year internal medicine residents were randomised and divided into two groups. One group would receive four supervised two-hour ACLS practice sessions, while the other would receive none. The same baseline test was given to both groups to assess starting knowledge and skills. Both groups were then reassessed simultaneously after a three month period, which included the first group's training sessions. The control group was then given the same opportunity for practice session and both groups were assessed for a third time after a further three month period. Results showed that while starting knowledge of both groups was similar, the intervention group showed a 38% improvement in ACLS skills over the control group after the second test and that the second group improved comparably after the third test. The authors argue that their study shows clear evidence for the need and usefulness of postgraduate training in ACLS.

In Germany in 2010, Ruesseler et al (22) examined the effect of formalised BLS and ACLS training on the skills and knowledge of a group of 44 undergraduate medical students. The control group were exposed to an older curriculum, where shifts in an emergency department represented the only opportunity for learning CPR skills. When assessed in a combined skills and knowledge OSCE, the intervention group was found to have significantly higher scores in all areas than the control group ($p<0.0001$ to $p<0.016$), prompting BLS and ACLS training to become standard in the department.

2.6 Confidence versus knowledge in the health care professional

In Bahrain in 2009, Marzooq and Lyneham distributed a CPR-related questionnaire to nurses in a public hospital (55). Results corroborated evidence that there is a low overall level of CPR knowledge and that the rate of CPR certification that is current amongst health care professionals is low. Additionally, the authors found that the majority of participants had false perceptions about their CPR-related clinical ability – whilst the overall knowledge level was low (with a 42% overall mark), 75.6% of respondents reported being confident in their ability to administer CPR and 63.4% were satisfied with their CPR performance. The authors note that respondents seemed to believe they were better at CPR than they actually were and that this false-confidence would make them less likely to be involved in further CPR training.

2.7 Summary

In this chapter, literature regarding the following was discussed: resuscitation courses and their content, the need for and efficacy of ALS courses, the need for recertification and the relationship between resuscitation confidence and knowledge.

Chapter 3: Research methodology

3.1 Introduction

In this chapter the problem statement, aims and objectives, ethical considerations, research methodology, validity and reliability will be discussed.

3.2 Problem statement

Shock, cardiac arrest and respiratory arrest are important, potentially fatal, conditions in all patient population group. Established, verified guidelines exist for the management of these life-threatening scenarios. With correct, expeditious management, by properly trained health-care professionals, these conditions are potentially reversible and may have excellent outcomes.

Junior doctors in all hospitals may be faced with patients who are haemodynamically unstable or present with cardio-respiratory arrest. However, these doctors, even in an academic setting, may be poorly supervised and reliant on a sometimes non-specific, non-standardised knowledge base dating from undergraduate training. Formalised advanced resuscitation training is not currently a requirement for medical students, interns, community service officers or medical officers, and is only required in certain disciplines for registrars in specialist training.

There is a perception within the Department of Anaesthesiology at the University of the Witwatersrand (Wits) that the resuscitation skills of junior doctors are inadequate. This impacts directly on the practice of anaesthesia, as patients present to theatre for surgery in a compromised and under-resuscitated state and may be placed in a higher intraoperative risk category as a direct consequence of their inadequate preoperative preparation. In addition, anaesthesiologists are often required to assist with patient resuscitation procedures in the wards or in casualty, and this places further strain on the already compromised theatre services at the Wits academic hospitals.

3.3 Aim and objectives

Aim

The aim of this study is to describe the resuscitation skills profile and self-perceived adequacy of resuscitation skills of the registrars amongst four major disciplines at Wits, namely, anaesthesiology, general surgery, orthopaedic surgery and obstetrics and gynaecology.

Objectives

The objectives of this study will be to:

- determine the number of registrars who have completed BLS, ACLS and/or ATLS courses
- determine the number of registrars whose BLS, ACLS and/or ATLS courses are current
- describe the reasons that prevent registrars from completing resuscitation courses
- determine the self-perceived levels of confidence of registrars in managing five different resuscitation procedures.

3.4 Ethical considerations

Approval to conduct the study was obtained from the Postgraduate Committee (Appendix D) and the Human Research Ethics Committee (Medical) of the University of the Witwatersrand (Appendix C). Verbal permission to conduct the study within the anaesthesiology, general surgery, orthopaedic surgery and obstetrics and gynaecology departments at Wits was obtained from the respective Heads of Department.

An information sheet preceded each questionnaire. This introduced the study topic, detailed the aims and ethical considerations of the study and invited the registrar to participate in the study. Submission of a completed questionnaire implied consent on behalf of the participant. Completed questionnaires were collected in a sealed box.

Names and other specific identifiers were not collected as part of the data, thereby assuring anonymity. The researcher and supervisors had exclusive access to the raw data, thereby ensuring participant confidentiality. Data will be stored for six years after completion of the study.

This study was conducted in accordance with the principles of the Declaration of Helsinki (35) and the South African Good Clinical Practice Guidelines (36).

3.5 Research methodology

3.5.1 Research design

A prospective, contextual, descriptive design was used in this study.

A prospective study is one in which data are collected during the course of the study. A population is identified and followed over time to determine outcomes. (56). This study is prospective in that a group of registrars was identified for study and the data collected from them prospectively during the course of the study.

A contextual study investigates variables in a limited area or field (57). This study was a contextual in design as it described data in a limited system - a specific group of registrars in a specific institution in Johannesburg.

A descriptive study aims to obtain complete and accurate information about a phenomenon through observation, description and classification. It provides new information on a phenomenon. A descriptive study design implies that study variables are defined and then described. (56) This study is descriptive in design in that it provided new information on the study variables defined in the objectives.

3.5.2 Study population

All registrars rotating in the Wits Departments of Anaesthesiology, General Surgery, Orthopaedic Surgery and Obstetrics and Gynaecology during the period of data collection formed the study population.

3.5.3 Study sample

Sampling method

According to Brink et al (57) convenience sampling is: “a non-probability sampling procedure that involves the selection of the most readily available people or objects for a study”.

A convenience sample method was used in this study, as appropriate to a descriptive study.

Sample size

Sample size was realised by the response rate. A response rate of 60% was considered acceptable but a response of 80% was targeted.

Inclusion and exclusion criteria

All registrars rotating in the Wits Departments of Anaesthesiology, General Surgery, Orthopaedic Surgery and Obstetrics and Gynaecology during the study period were eligible to take part.

Exclusion criteria of the study were:

- registrars on annual, special or sick leave at the time of data collection
- those who did not consent to take part.

3.5.4 Data collection

Questionnaire development

The researcher reviewed published literature on the topic and developed a questionnaire (Appendix A), thereby ensuring content validity. Face validity was ensured in that the questionnaire was reviewed by five experts in the fields of anaesthesiology and emergency medicine. Minor changes were suggested by the experts and were incorporated.

The questionnaire consists of the following four sections.

- **Demographics:** information requested will include gender, enrolled discipline, year of registrar training, discipline-specific exams.
- **Resuscitation qualifications:** information on BLS, ATLS and ACLS qualifications, and date of last certification in each qualification.
- **Resuscitation qualifications - impediments:** information will be sought about reasons for not completing or renewing resuscitation qualifications.
- **Self-perceived confidence:** brief information on the participant's self-perceived adequacy of selected resuscitation skills.

Data collection method

The study population was delineated with the assistance of the relevant departments. Up to date lists of the total number of registrars were obtained from the relevant departments prior to data collection. Data was collected during the time-period February to October 2014.

The researcher approached the convenor of the academic meetings for permission to address the meeting. An anonymous questionnaire (Appendix B), designed by the researcher, was distributed to registrars at the start of a scheduled combined academic meeting of each department. Attendants were addressed at the start of the meeting, given information and were invited to take part in the study. An information letter (Appendix A) was distributed along with the questionnaire. Completion of a questionnaire took approximately five minutes. The researcher remained available to answer possible queries. At the close of the meeting, questionnaires were collected in a sealed box.

Not all registrars were present at the initial meetings and several follow-up visits to the departments were required.

Data collected were entered in a Microsoft Excel spread sheet for review and analysis.

3.5.5 Data analysis

Data were analysed using descriptive and inferential statistics. Data analysis was performed using Microsoft Excel and GraphPad InStat. Frequencies and percentages were used to summarise the data. A biostatistician was consulted.

A Likert scale was used to assess the level of confidence for five skills. The analysis used for this will be described with the presented data in Chapter 4. This included a Friedman test, Dunns multiple comparisons, a Mann-Whitney test and a correlation using a Spearman rank order test.

A p-value of <0.005 is considered statistically significant.

3.6 Validity and reliability

Bothma et al (58) refers to validity of a study as: "the degree to which a measurement represents a true value" and reliability as: "the consistency of the measure achieved".

Validity and reliability in this study were ensured by the following:

- an appropriate research design was used in the study
- development of the questionnaire followed an extensive literature review, ensuring content validity
- face validity of the questionnaire was ensured as it was reviewed by five experts in the field
- data entry was checked every tenth entry for accuracy
- data analysis was done in consultation with a biostatistician

3.7 Summary

In this chapter the problem statement, aims and objectives, ethical considerations, research methodology, validity and reliability were discussed.

Chapter 4: Results and discussion

4.1 Introduction

In this chapter the results of this study and a discussion thereof are presented. The results are presented according to the research objectives.

The objectives of this study were to

- determine the number of registrars who have completed BLS, ACLS and/or ATLS courses
- determine the number of registrars whose BLS, ACLS and/or ATLS courses are current
- describe the reasons that prevent registrars from completing resuscitation courses
- determine the self-perceived levels of confidence of registrars in managing five different resuscitation procedures.

4.2 Results

Data collection for this study took place between February and October 2014. Two hundred questionnaires were distributed at academic meetings at the Wits affiliated hospitals namely, CHBAH, CMJAH, HJH, and RMMCH.

Should participants have not completed a question, this will be indicated and they will be excluded from that particular analysis. Where participants could select more than one option, numbers add up to more than the number of participants included in the study and percentages come to more than 100%. Numbers are rounded to two decimal places.

4.2.1 Sample realisation

Of the 200 questionnaires distributed, 192 (96%) were returned. Two returned questionnaires were discarded, having been submitted almost entirely incomplete and thus unusable for data capture, leaving 190 for entry into the study. The response rate per discipline is shown in Table 4.1. Three participants did not indicate their discipline on the questionnaire.

Table 4.1 Response rate per discipline

Discipline	Registrars in department (n)	Questionnaires answered (n)	Response rate (%)
Anaesthesiology	107	85	79.44
Orthopaedics	52	28	53.85
O&G	57	49	85.49
Surgery	61	25	40.98
Total	**277**	**190**	**68.59**

4.2.2 Demographics

Gender

Of the 190 participants in this study 98 (51.57%) were males and 90 (47.37%) were females. Two participants did not indicate their gender.

Discipline

Of the 190 participants, 85 (44.74%) were from anaesthesiology, 28 (14.74%) were from orthopaedic surgery, 49 (25.79%) were from obstetrics and gynaecology, 25 (13.16%) were from general surgery and 3 (1.58%) did not indicate their discipline.

Registrar time completed

The registrar time completed by the participants is indicated in Table 4.2. Two participants omitted this question.

Table 4.2: Registrar time completed by participants

Registrar time completed	Number of participants (n)	Percentage of participants (%)
<1 year	63	33.51
1 year	33	17.55
2 years	34	18.09
3 years	32	17.02
4 years	22	11.70
5 years	3	1.60
6 years	1	0.53

Exams completed

The participants were requested to indicate what exams specific to their speciality they had completed. This is shown in Table 4.3. anaesthesiology and obstetrics and gynaecology registrars do not write an intermediate exam. Participants could select all the relevant options when answering this question. All 190 participants completed this question.

Table 4.3: Exams completed by registrars

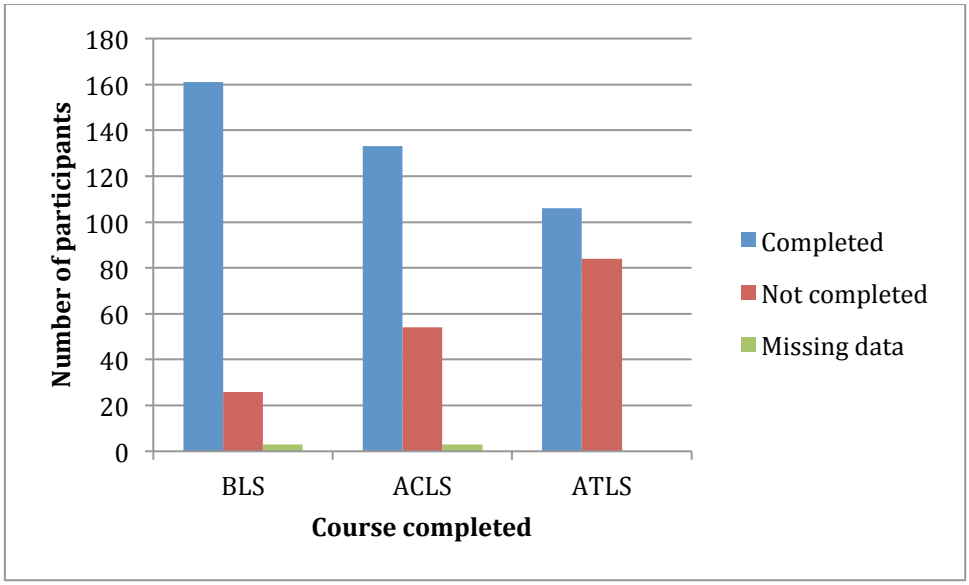
Exams completed	No (n)	No (%)	Yes (n)	Yes (%)
Diploma	67	35.26	123	64.74
Part 1	183	96.32	7	3.68
Intermediate	154	81.05	36	18.95
Part 2	183	96.32	7	3.68
MMed	182	95.79	8	4.21
None	172	90.53	18	9.47

4.2.3 Resuscitation questionnaire

Objective 1: determine the number of registrars who have completed BLS, ACLS and/or ATLS courses.

Of the 190 participants, 161 had completed a BLS course, 133 had completed an ACLS course and 106 had completed an ATLS course. Three participants did not complete the questions requesting information regarding completion the BLS and ACLS courses. This is shown in Figure 4.1.

Figure 4.1: Completion of resuscitation courses by participants

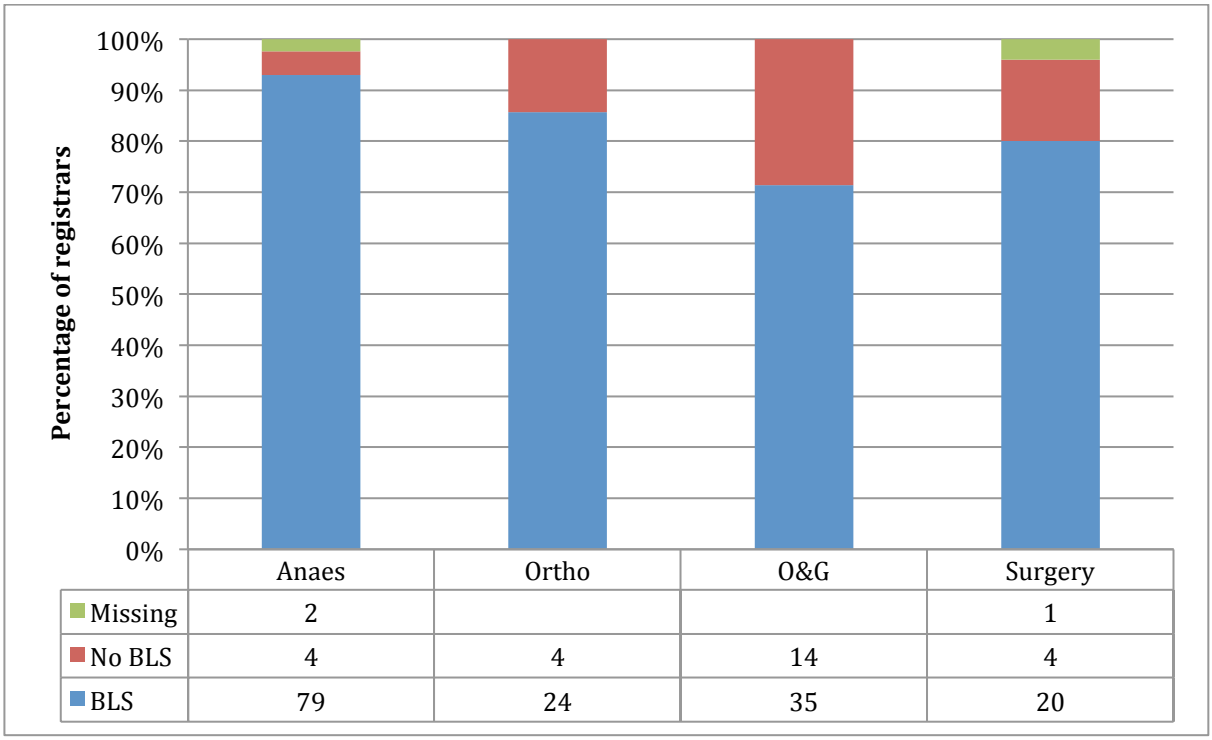


The resuscitation courses completed were further broken down by discipline of the registrars. Three registrars did not indicate their discipline on the questionnaire.

BLS course

The percentage and numbers of registrars who completed a BLS course, per discipline are shown in Figure 4.2. The three participants that did not indicate their discipline were excluded from the analysis. The bar graph shows the percentages of participants from each discipline who had completed, not completed or failed to answer the question regarding BLS training. The actual number of participants in each category is shown in the table below the graph.

Figure 4.2: Percentages and numbers of registrars per discipline who completed a BLS course

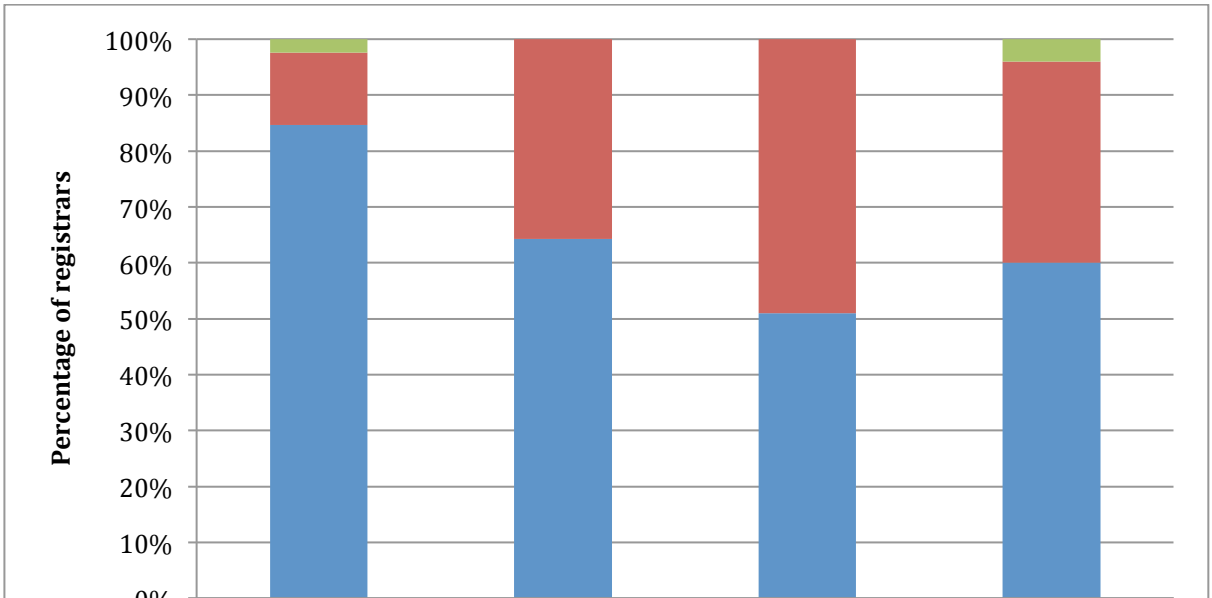


	Anaes	Ortho	O&G	Surgery
Missing	2			1
No BLS	4	4	14	4
BLS	79	24	35	20

ACLS

The percentage and numbers of registrars who completed an ACLS course, per discipline are shown in Figure 4.3. The three participants that did not indicate their discipline were excluded from the analysis. The bar graph shows the percentages of participants from each discipline who had completed, not completed or failed to answer the question regarding ACLS training. The actual number of participants in each category is shown in the table below the graph.

Figure 4.3: Percentages and numbers of registrars per discipline who completed an ACLS course

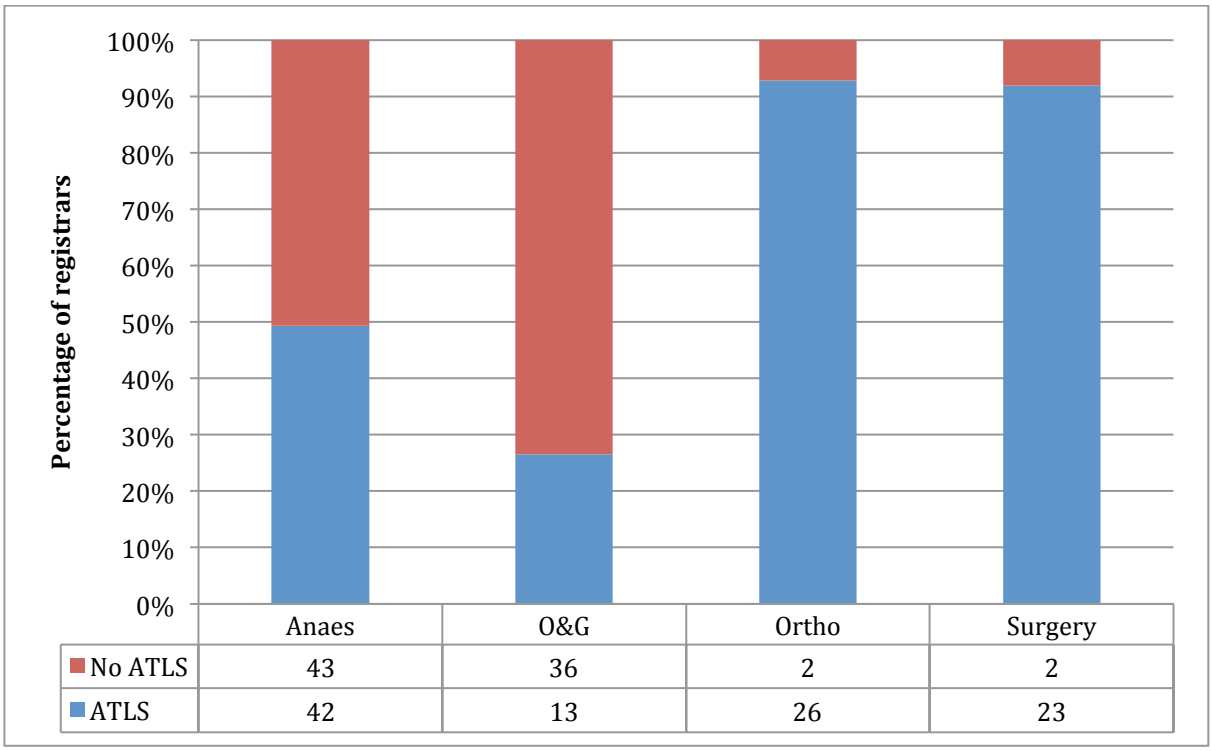


	Anaes	Ortho	O&G	Surgery
Missing	2			1
No ACLS	11	10	24	9
ACLS	72	18	25	15

ATLS

The percentage and numbers of registrars who completed an ATLS course, per discipline are shown in Figure 4.4. The three participants that did not indicate their discipline were excluded from the analysis. The bar graph shows the percentages of participants from each discipline who had completed or not completed ATLS training. The actual number of participants in each category is shown in the table below the graph.

Figure 4.4: Percentages and numbers of registrars per discipline who completed an ATLS course



A summary of the percentage and number of registrars in each discipline who had completed each type of course is presented in Table 4.4 below. Participants who omitted this information were not included in the figures.

Table 4.4: Completion of BLS, ACLS and ATLS courses by discipline

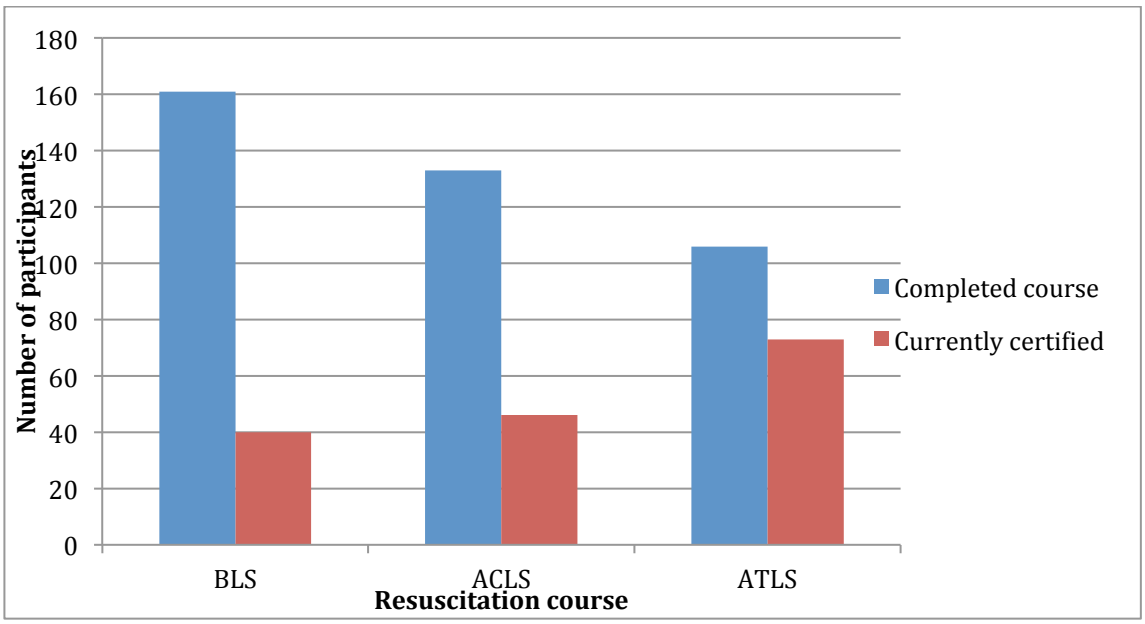
	BLS n(%)	ACLS n(%)	ATLS n(%)
Anaesth	72 (95.29)	72 (87.06)	42 (49.41)
Ortho	24 (85.71)	18 (64.83)	26 (92.86)
O&G	35 (71.43)	25 (51.02)	13 (26,53)
Surgery	20 (84.00)	15 (64.00)	23 (92.00)

Objective 2: determine the number of registrars whose BLS, ACLS and/or ATLS courses are current.

Of the 161 participants who indicated that they had completed a BLS course, 40 (25.55%) were currently certified. Of the 133 participants that indicated having done the ACLS

course, 46 (34.59%) were currently certified and of the 106 participants who had done an ATLS course, 73 (68.88%) were still currently certified. This is shown in Figure 4.5.

Figure 4.5: Number of participants who have completed resuscitation courses and those who are currently certified

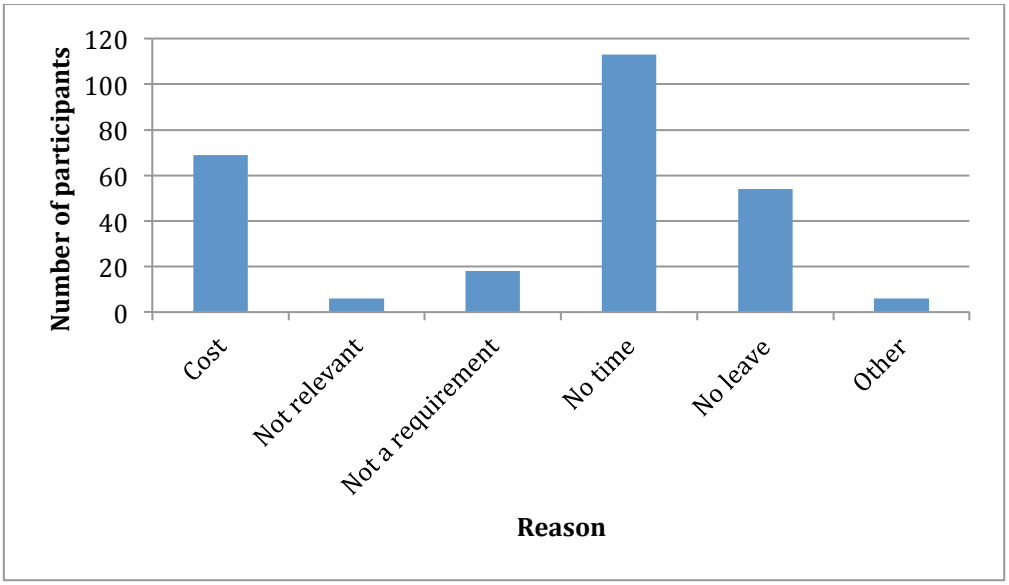


Objective 3: to describe the reasons that prevent registrars from completing resuscitation courses.

Registrars could select more than one reason as to why they did not complete resuscitation courses, therefore percentages do not add up to 100%.

"No time/too busy" was selected as a reason by 113 (59.47%) participants, "cost to yourself" by 69 (36.32%) participants, "leave not possible" by 54 (28.42%) participants, "not a speciality requirement" by 18 (9.47%) participants and 6 (3.16%) participants selected "course not relevant" as the reason for not completing their resuscitation courses. The "other" category was selected by 6 (3.16%) participants and included responses such as procrastination, studying for exams, courses fully booked and don't have a reason. The number of participants selecting each reason is shown in Figure 4.6.

Figure 4.6: Reasons for not completing resuscitation courses



Objective 4: to determine the self-perceived levels of confidence of registrars in managing five different resuscitation procedures.

The participants were asked whether they felt their resuscitation skills were adequate. Of the 190 participants in the study, 125 (65.79%) felt that their resuscitation skills were adequate. Fifty four (28.42%) participants did not think that their skills were adequate and 11 (5.79%) did not answer the question.

Five different resuscitation skills/procedures were presented to the participants and they were asked to indicate their perceived level of confidence in managing each one using a Likert scale. Within the total group of participants, the confidence levels for each of the different skills/procedures were then compared with each other

A Friedman test, for paired, non-parametric data was used to compare the level of confidence of the total group of participants for the five different procedures. Subgroup analysis was done using Dunns multiple comparisons.

A statistically significant difference in level of confidence was found between the five different procedures, p=<0.0001. The subgroup analysis is shown in Table 4.4.

Table 4.4: Subgroup analysis for the level of confidence in managing the five different procedures

	Median	Shock	Dysrhythmia	Anaphylaxis	Airway
CVP	5	>0.05	**<0.001**	**<0.001**	>0.05
Shock	5		**<0.001**	**<0.001**	>0.05
Dysrhythmia	4			**<0.001**	**<0.001**
Anaphylaxis	4				**<0.001**
Airway	4				

As can be seen in Table 4.4, the level of confidence for dysrhythmia and anaphylaxis management was significantly lower than for CVP, shock and airway management. The level of confidence for managing dysrhythmias was significantly lower than for anaphylaxis management (p=<0.001), and cannot be seen from the medians as they are both 4. This difference can be seen from the sum of ranks in Table 4.5, where the sum of ranks for confidence in managing dysrhythmias is 316 versus 509 for confidence in managing anaphylaxis.

The difference between CVP and shock management and dysrhythmia and anaphylaxis management can be seen from the medians (5 versus 4). The difference between airway management and dysrhythmia and anaphylaxis management cannot be seen from the medians as they are the same (both 4), but from the sum of ranks (Table 4.5) the confidence for airway management was higher than for dysrhythmia and anaphylaxis management (641 versus 361 and 509).

Table 4.5: Sum of ranks for the level of confidence in managing the five different procedures

Procedure	Sum of ranks
CVP	652
Shock	685
Dysrhythmia	361
Anaphylaxis	509
Airway	641

From Table 4.5 showing the sum of ranks for the level of confidence in managing the five different procedures as well as the significance levels in Table 4.4 it can be seen that

participants were most confident in managing shock (sum of ranks, 685), insertion of a CVP line (sum of ranks, 652) and airway management (sum of ranks, 641) with no significant difference between levels of confidence for these three procedures. Confidence in anaphylaxis management (sum of ranks, 509) was lower than for CVP, shock and airway management. Finally, participants were least confident in the management of dysrhythmias (sum of ranks, 361). These differences were statistically significant.

An analysis was done to compare level of confidence in managing the five different procedures between the participants who had never done any life support training and those who had done advanced life support training (ACLS/ATLS), whether or not their certification was still current. Due to the low number of participants with BLS certification alone, it was elected to exclude these 4 participants from this analysis.

Due to the large difference between the number of participants in the advanced life support training group (n=152) versus those with no life support training (n=19) the data was skewed. Therefore a comparison between these two groups was done using the Mann-Whitney test for unpaired, non-parametric data.

Statistically significant differences were found between the level of confidence for the two groups for insertion of CVP line (p=0.0024), Dysrhythmia management (p=0.0008) and airway management (p=0.0166) with participants with no life support training being significantly less confident than participants with advanced life support training. The level of confidence for the two groups for the five different procedures is shown in Table 4.6.

Table 4.6: Level of confidence for the five different procedures for the two groups

Procedure	No life support training (n=19) Median	Advanced life support training (n=152) Median	p value
CVP	4	5	**0.0024**
Shock	4	5	0.1958
Dysrhythmia	3	4	**0.0008**
Anaphylaxis	4	4	0.2866
Airway	4	4	**0.0166**

A correlation was done between level of confidence in managing the five different procedures for the participants who had done advanced life support (ACLS/ATLS) and the years since training was completed.

Spearman's rank-order non-parametric coefficient was used to measure the correlation between level of confidence in managing the five different procedures for the participants who had done advanced life support training and the years since training was completed.

There was no significant correlation between the level of confidence in managing the five different procedures and the years since training in advanced life support was completed. This can be seen in Table 4.7, where all p values are greater than 0.05.

Table 4.7: Correlation between the level of confidence for participants who had done advanced life support and the years since training was completed

Procedure	r values	p values
CVP	0.1283	0.1350
Shock	0.1501	0.0800
Dysrhythmia	-0.0998	0.2456
Anaphylaxis	0.0600	0.4858
Airway	0.0518	0.5472

4.3 Discussion

Whilst the four surveyed departments are not represented equally (44% of the participants were from anaesthesiology), the data distribution probably reflects a relatively accurate cross-section of the sample registrar population as there is a large relative size difference between specialist departments at Wits

In contrast to a local study by Ragavan et al (5) in 2000, a high overall number of participants had completed a resuscitation course. Of the participants, 84.74% had completed a BLS course and 55,79% had completed either ACLS or ATLS. Ragavan et al (5) had surveyed doctors in non-academic hospitals (up to district level) in the Northern Province of South Africa and in their sample, only 48.45% of participants had completed a BLS course whilst only 6.87% had completed some form of advanced life support training.

The large discrepancy can potentially be explained in a number of ways. This study was carried out in academic hospitals in a large metropolitan area. Factors such as greater access, convenience, affordability and awareness of resuscitation courses in Johannesburg might have contributed to the large discrepancy in their uptake, in comparison to the non-academic setting in the Northern Province. More generally, both nationally and world-wide, since 2000 an additional 14 years of exposure to these courses, along with the increasing weight of marketing, literature and certified colleagues behind them, may have contributed to an increase in their uptake - registrars are perhaps more likely to seek and gain certification now than in the year 2000.

In the US, most hospitals require personnel to be certified in BLS every two years (30). In contrast, completion of a BLS, ACLS or ATLS course is not mandatory for employment or entry to examination in either the Departments of Obstetrics and Gynaecology or Anaesthesiology at Wits (40, 41). By discipline, Obstetrics and Gynaecology consistently showed the lowest completion rates of BLS, ACLS and ATLS: 71,43%, 51,02% and 26,53% respectively. Despite similar departmental requirements, the Department of Anaesthesia had significantly higher completion rates, 95.29%, 87.06% and 49,41% for BLS, ACLS and ATLS respectively. Additionally, it is important to note that Anaesthesiology had the highest completion rate of BLS and ACLS amongst all the surveyed disciplines. Such inter-disciplinary differences in uptake are not unprecedented (20). Given the similar inter-departmental requirements, it was not within the scope of this study to elucidate the existence of a specific motivation or impediment that could account for the different rates of certification between anaesthesiology and obstetrics and gynaecology.

In contrast to BLS and ACLS, ATLS is a requirement for entry into Intermediate specialty examinations for Surgical and Orthopaedic registrars (38, 39). This likely accounts for the high rate of completion of ATLS for registrars in the Departments of Orthopaedic Surgery and General Surgery: 92,86% and 92% respectively.

The deterioration over time of both skills and knowledge related to resuscitation and the consequent need for re-certification, is well documented (5, 6, 8, 28, 30, 31, 52, 54). There are arguments that based on the rate of deterioration, current course guidelines

for re-certification are inadequate and that recertification should be even more frequent (8, 28, 30).

It was disappointing, therefore, to note the low overall rate of current certification amongst study participants who had completed resuscitation courses (25.55%, 34.59% and 68.88% were current for BLS, ACLS and ATLS respectively). This implies a concomitant deficit in skills and knowledge. The low rate of recertification is likely due to similar reasons preventing registrars attending courses for the first time, something this study attempted to clarify in a later objective, discussed below.

Of note, the rate of ATLS currency was significantly higher than BLS or ACLS. This is most likely explained by the 4-year renewal cycle of ATLS (versus the 2-year cycle of BLS or ACLS) and by its requirement for examination entry for two of the surveyed disciplines. Another contributing factor may be the ATLS course's base at Wits, potentially translating into greater word of mouth promotion and convenience for Wits-based registrars. Additionally, the two-day ACLS refresher course may discourage repetition compared to the single-day ATLS refresher course. The possibility that the ATLS course is perceived as more attractive, useful or relevant to potential repeat candidates cannot be discounted within the scope of this study.

There is evidence to suggest that ATLS (15) and ACLS (16, 17) do positively affect patient outcome, although this evidence is not exhaustive (53) and sometimes contradicted (19). More evidence exists for the benefit of ATLS and ACLS on the resuscitation skill and knowledge of the provider (5, 20, 22, 24-26, 29, 54), with an implied downstream benefit to the patient. Therefore, with substantial evidence to support their use, it was interesting to elucidate reasons for participants not taking advantage of the availability of these courses for their own professional growth.

Despite the low level of current certification, the majority of participants (65.79%) felt their resuscitation skills were adequate. Indeed, when questioned in more detail, the majority of participants felt either "confident" or "very confident" in their ability to manage certain ALS-specific procedures and conditions. These registrars are therefore perhaps less likely to seek out, add to or improve their resuscitation skills (55). This is especially true if the courses are neither mandatory nor incentivised.

However, a substantial percentage (28.42%) of participants perceived their resuscitation skills to be inadequate. Presumably, it is this subgroup that would be more likely to seek and take advantage of the opportunity to improve their skills.

In spite of the majority of participants reporting good overall confidence in their management of ALS-specific procedures, statistically significant differences in confidence between those procedures were demonstrated. Participants were significantly less confident in managing dysrhythmias and anaphylaxis than they were in insertion of a CVP, management of an airway or management of shock. Participants were least confident in their management of dysrhythmias.

Anaphylaxis and dysrhythmia are, by definition, emergency conditions only and may therefore occur more infrequently in comparison to insertion of CVP and management of an airway, which may occur both electively and as an emergency. Management of dysrhythmia and anaphylaxis are topics covered specifically in ACLS. The lower confidence level might reflect the lower overall rate of currency of ACLS certification amongst participants (34.59% vs. 68.88% for ATLS). Alternatively, the lower confidence in management of dysrhythmia and anaphylaxis may be a reflection on the quality of the ACLS course itself. A self-perceived skills deficit does exist and, by implication, creates room for personal improvement via further training.

The high burden of trauma in South Africa, secondary to violent crime and pedestrian and motor vehicle accidents, could mean that participating registrars were more likely to have had experience with airway management, haemodynamic shock and insertion of a central venous catheter during earlier working years, such as in internship and community service. In contrast, they might have had far less experience with the management anaphylaxis and arrhythmia, which were clinical emergencies perhaps more likely to be managed by a senior colleague. This disparity in experience, conceivably typical to the South African setting, could account for the higher levels of confidence reported for the management of shock, airway and insertion of central venous catheters as well as for the for the lower levels of confidence reported for the management of anaphylaxis and arrhythmia.

In this study, not all participants had completed all surveyed resuscitation courses, the level of course currency was low, a substantial portion of participants perceived their level of resuscitation skills to be inadequate and participants were less confident in their ability to manage certain procedures than others. These findings of the current resuscitation profile of registrars at Wits seem to be in juxtaposition with the fact that there is a good body of evidence for completion of resuscitation courses. Hence, it was necessary to delineate those factors, which may have previously or might in future impede registrars from attending a formal resuscitation course.

No time (59.47%), cost (36.32%) and no leave (28.42%) were the three most common reasons cited by registrars for not completing resuscitation courses. Currently, registrars may be required to fund the course themselves as well as sacrifice annual leave in order to attend. Registrars who perceive themselves as being too busy between daily work, after-hours work, study and personal commitments, might tend to deprioritise those things that are not central or essential to their progress through their specialty, resuscitation courses being one such potential example.

Furthermore, a portion of participants (9.47%) cited “not a specialty requirement” as a deterrent to completing a resuscitation course. Since the course may not be a requirement, little incentive exists for the busy registrar to sacrifice their personal finances or their time. Using ATLS as an example, the rate of current certification seems to rise markedly when a course becomes a specialty requirement.

This study cannot claim to correlate confidence directly with skill or knowledge in resuscitation, nor can it associate a greater confidence with a greater success rate. However, there is value in the self-perceived confidence of registrars when confronted with an emergency resuscitation situation – a more confident registrar may recognise the need for and implement an intervention earlier than one with a lower level of confidence, who may need more time to call for assistance or identify appropriate equipment. Indeed, completion of an ATLS course has been shown to increase confidence in clinical skills in both anaesthesiologists and surgeons (32). Similarly, having completed an advanced life support course did improve participants’ confidence in the insertion of a central venous catheter, their management of shock and their management of an airway.

Over-confidence, however, may also be detrimental. Marzooq et al (55) in 2009 showed that health care professionals tend to over-estimate their resuscitation skills and that their perceived confidence exceeds their tested knowledge levels

Our study failed to show any correlation between confidence and the elapsed interval since completion of a resuscitation course. Good evidence exists for a decline in both resuscitation skills and knowledge over time, whilst experience alone has not been shown to improve either resuscitation knowledge (5, 7, 20, 22) or skill (5, 22, 23, 31). The majority of participants felt their resuscitation skills were adequate and were confident in their abilities to manage common ALS tasks, in spite of the low overall rate of course currency. The implication of all the above is that a lack of insight may be hiding a real resuscitation knowledge and skills deficit. There is likely a gulf of false confidence between the participants' perception of their abilities and their actual knowledge and skills, a concern which has been established previously (55).

Chapter 5: Summary, limitations, recommendations and conclusions

5.1 Introduction

In this chapter, the aim, objectives, study design and results of the study will be briefly reviewed. The limitations of the study will be addressed, recommendations made and a conclusion presented.

5.2 Summary of the study

5.2.1 Aim

The aim of this study was to describe the resuscitation skills profile and self-perceived adequacy of resuscitation skills of the registrars in four major disciplines in the Faculty of Health Sciences at Wits, namely, anaesthesiology, general surgery, orthopaedic surgery and obstetrics and gynaecology.

5.2.2 Objectives

The objectives of this study were to:

- determine the number of registrars who have completed BLS, ACLS and/or ATLS courses
- determine the number of registrars whose BLS, ACLS and/or ATLS courses are current
- describe the reasons that prevent registrars from completing resuscitation courses
- determine the self-perceived levels of confidence of registrars in managing five different resuscitation procedures.

5.2.3 Methodology

A prospective, contextual, descriptive study design was used. All registrars rotating in the Wits Departments of Anaesthesiology, General Surgery, Orthopaedic Surgery and Obstetrics and Gynaecology during the period of data collection formed the study population.

An anonymous questionnaire was designed by the reseracher in consultation with experts in the field. This was distributed to registrars at the start of scheduled academic meetings

of each department during February to October 2014. At the close of the meeting, questionnaires were collected in a sealed box. Two-hundred questionnaires were distributed.

Information collected included demographics of the participant, their resuscitation course qualifications to date, self-perceived adequacy of their resuscitation skills, self-perceived confidence in managing five common emergencies and any impediments to completing a resuscitation course.

Results were entered and analysed in a Microsoft Excel spreadsheet and, with assistance from a biostatistician, descriptive and inferential statistics applied to the data.

5.2.4 Results

190 participants were entered into the study, 85 from Anaesthesiology, 28 from Orthopaedic surgery, 49 from Obstetrics and Gynaecology and 25 from General Surgery.

Of the 190 participants, 161 had completed a BLS course, 133 had completed an ACLS course and 106 had completed an ATLS course.

Obsterics & Gynaecology had the lowest rate of completion of resuscitation courses, 28.57% of registrars had not completed a BLS course, 48.98% had not completed ACLS and 73.47% had not completed ATLS. Only 4,71% of Anaesthetic registrars had not completed a BLS course, while only 7,14% and 8,00% of Orthopaedic Surgery and General Surgery registrars respectively had not completed ATLS.

Of the 161 participants who indicated that they had completed a BLS course, 40 (25.55%) were currently certified. Of the 133 participants that indicated having done the ACLS course, 46 (34.59%) were currently certified and of the 106 participants who had done an ATLS course, 73 (68.88%) were still currently certified.

When requested to stipulate reasons for not completing with their resuscitation courses, 59.47% (n=113) of registrars cited “no time/too busy” as a reason, “cost to yourself” by 36.32% (n=69) of registrars, “leave not possible” by 28.42% (n=54), “not a speciality requirement” by 9.47% and 3.16% of participants selected “course not relevant”.

Of the 190 participants in the study, 125 (65.79%) felt that their resuscitation skills were adequate, whilst 54 (28.42%) participants did not think that their skills were adequate.

The level of confidence for dysrhythmia and anaphylaxis management was significantly lower than for CVP, shock and airway management. The level of confidence for managing dysrhythmias was significantly lower than for anaphylaxis management ($p=<0.001$). Registrars were least confident in managing dysrhythmias.

Statistically significant differences were found between the level of confidence of registrars who had completed an ALS course versus those who had not completed any resuscitation training. Differences between the two groups were found for insertion of CVP line ($p=0.0024$), dysrhythmia management ($p=0.0008$) and airway management ($p=0.0166$) with participants with no life support training being significantly less confident than participants with advanced life support training.

There was no significant correlation between the level of confidence in managing common resuscitation scenarios and the years since training in advanced life support was completed. Candidates were not less confident in their ability to manage these events if a longer period of time had elapsed from course completion.

5.3 Limitations

Results from this study should be examined in light of certain limitations.

This study is contextual in nature and included a sample of a group of registrars in one university and one geographical location, the results of which may not be generalised or extrapolated to other departments or locations. Not all disciplines were included in the study. However, the results are still of value within the sampled departments and Wits, and have the potential to influence future decision-making.

The study used a convenience sample and did not achieve a 100% response rate. Although the majority of eligible registrars were sampled, a sample bias cannot be excluded.

Participation in the study was voluntary. The researcher had presented the questionnaire to the potential participants, which gave registrars the opportunity to decline to

participate. Registrars with a good resuscitation knowledge or confidence may have been more likely to participate than those whose impression of their knowledge was poor.

Not all questionnaires included in the study had been fully completed, with certain questions omitted by participants in no discernable pattern. This information was therefore left out of the analysis and could result in over- or under-estimation of certain variables.

In the case of the questionnaire itself, there is a possibility that there was some confusion regarding BLS. If the term “BLS course”, as used on the questionnaire, was not perceived as interchangeable with “CPR course”, it is possible that course attendance was underreported.

The study assessed perceived skill or confidence in resuscitation only, not actual skill or knowledge. It is worth repeating the point that there could be a discrepancy between perceived and actual skills.

5.4 Recommendations

Recommendations for clinical practice

Better BLS, ACLS and ATLS knowledge and skill has been shown to benefit the ability and confidence to resuscitate patients and improve their outcome.

To this end, and in line with international trend, all health-care professionals who are in contact with patients should be encouraged to attend these courses, as appropriate, and attain and maintain certification.

Specifically in the existing context, where resuscitation courses are not a universal requirement, registrars need to be made aware of the benefit of attending a resuscitation course. Attaining and then maintaining their certification should be encouraged and facilitated. Any impediment towards attending should be removed.

- Registrars should be entitled to take special leave instead of annual leave for the purpose of attending a resuscitation course.
- Assistance with payment (either partially or entirely) should be offered to registrars attending a resuscitation course.

- Departments should ensure that responsibilities such as ward rounds, research, meetings and after-hours work should be flexible enough to allow registrars to take the requisite time off to attend resuscitation courses.

Alternatively, certification in resuscitation could be made compulsory. There is international precedent for this. This would ensure a uniformly high level of certification and service provision amongst the registrar body. Whether this would be best implemented at department, faculty, hospital, provincial or national level is a matter open to debate.

Indeed, provision should be made for all employees of a department or hospital, doctors, nurses, secretaries, cleaners and support staff alike, to become accredited in BLS at the very least.

Registrars who have completed resuscitation courses should be either encouraged or mandated to gain re-certification as appropriate and without delay. Refresher courses are often shorter than those courses for first-time attendees, making the logistics of attending potentially more manageable for both the attendee and their department.

A once-off or regularly repeated assessment would establish current levels of resuscitation skills and/or knowledge and create a baseline from which to gauge improvement due to any policy change. This is particularly important in the face of the probable over-confidence in resuscitation reported by the study participants.

Recommendations for future research

Similar studies in other disciplines and other institutions may add valuable data.

Future follow up studies could assess actual competence rather than perceived resuscitation skill and knowledge.

5.5 Conclusion

A high overall percentage of registrars in four major specialties/disciplines at Wits have completed a resuscitation course, but a low percentage are currently certified. A high inter-departmental difference in completion rate exists. The majority of registrars felt their resuscitation skills were adequate and felt confident in managing certain specific

resuscitation scenarios. There was a lower sense of confidence in managing dysrhythmia and anaphylaxis. Having completed an ALS course increased confidence significantly. Multiple reasons currently prevent registrars from completing resuscitation courses.

More certification and re-certification in resuscitation is required and there is room for the employing institutions to facilitate this.

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Appendix A – Information letter

Good day colleague and hello,

My name is Nadav Ravid and I am an Anaesthesiology registrar on the Wits Anaesthesiology registrar circuit.

I would like to invite you to participate in a research study, "The resuscitation skills profile of registrars in four major surgical disciplines", which will be handed in to the Wits University Department of Health Sciences as part of my MMed degree.

The study wishes to survey the resuscitation qualification profile of registrars in different Wits specialties. There is currently no standardisation of resuscitation qualification requirements between Wits specialties.

The study, therefore, intends to assess registars'

- uptake of BLS, ACLS and ATLS qualifications
- currency of BLS, ACLS and ATLS qualifications
- self-perceived adequacy of resuscitation skills
- perceived barriers toward attaining and renewing resuscitation qualifications.

The study has been approved by the Human Research Ethics Committee (HREC) (Medical) *(M120110)* and Postgraduate Committee of the University of the Witwatersrand. Permission to conduct the study has been attained from each department involved.

Your participation in this study is entirely voluntary. There is no possible penalty or repercussion if you do not participate. You are free to withdraw from the study at any time, without having to provide a reason.

Your participation in this study is entirely anonymous. Your questionnaire will in no way identify you and no identifying information will be collected. Results published will have no identifying data and will be made available to participants.

This questionnaire should only take approximately 5 minutes to complete. Once completed, your questionnaire will be placed in a sealed box. The content of the questionnaire will only be viewed by my research supervisors and myself

The study offers no benefit to participants but may result in positive changes for the future.

By completing this questionnaire your consent to take part in this study is implied. Please ensure that you have read and understood all the above information before completing it.

You should only complete this questionnaire once. If you have completed it before, kindly inform the researcher who handed you this document.

Thank you for taking the time to read this letter. If you have any questions or concerns with regard to the study, you may contact the following people with your queries:

- Professor Cleaton-Jones (chairperson of the HREC): 011 717 1234
- Nadav Ravid (researcher): 083 556 5608.

Yours sincerely, Nadav Ravid (Researcher)

Appendix B – Questionnaire

Registrar Questionnaire

kindly complete ALL questions

1. Gender — M | F

2. What specialty are you completing? — Anaesthetics | Orthopaedics | O&G | Surgery

3. How many full years of registrar time have you completed?

<1	1	2	3	4	5	6

4. What exams specific to your specialty have you completed? YOU MAY SELECT MORE THAN ONE OPTION

Diploma	MMed
Part 1/Primary	Intermediate
Part 2/Final	None yet

5.1 Have you completed a BLS course? — Y | N
If so, when last did you complete it? — YYYY | MM

5.2 Have you completed an ACLS course? — Y | N
If so, when last did you complete it? — YYYY | MM

5.3 Have you completed an ATLS course? — Y | N
If so, when last did you comeplete it? — YYYY | MM

6.1 Do you feel that your resuscitation skills are adequate? — Y | N

6.2 I feel confident that I can…

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Insert a central venous line					
Manage hypovolaemic shock					
Manage dysrhythmia					
Manage anaphylaxis					
Manage an airway					

---

7. What reasons may prevent you from completing a resuscitation course? YOU MAY SELECT MORE THAN ONE OPTION

Cost to yourself	Course not relevant	Not a specialty requirement
No time/too busy	Leave not possible	
Other	Please specify: _____	

Thank you for your participation!

Appendix C – Ethics approval

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Dr Nadav Ravid

CLEARANCE CERTIFICATE	**M120110**
PROJECT	The Resuscitation Skilla of Registrars in Four Major Surgical Disciplines
INVESTIGATORS	Dr Nadav Ravid.
DEPARTMENT	Department of Anaesthesiology
DATE CONSIDERED	27/01/2012
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 27/01/2012 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable
cc: Supervisor : Mrs Juan Scribante

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10004, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES...

Appendix D – Postgraduate committee approval

Faculty of Health Sciences
Medical School, 7 York Road, Parktown, 2193
Fax: (011) 717-2119
Tel: (011)717-2075/6

Reference: Ms Salamina Segole
E-mail: Salamina.segole@wits.ac.za
12 Jun 2012
Person No: 0103841E
PAG

Dr NB Ravid
20 The Avenue
Orchards
Johannesburg
2192

South Africa

Dear Dr Ravid

Master of Medicine (in the specialty Anaesthesia): Approval of Title

We have pleasure in advising that your proposal entitled "*The resuscitation skills profile of registrars in four major surgical disciplines"* has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

Appendix E – ACLS course content

The systematic approach	• BLS Primary Survey "ABCD" • ACLS Secondary Survey "ABCD"
Resuscitation team	• Role of team leader and team members • Team Dynamics
ACLS core cases	• Respiratory arrest • Ventricular fibrillation + CPR + AED • Ventricular fibrillation/pulseless ventricular tachycardia • Pulseless electrical activity (PEA) H's & T's • Asystole • Acute Coronary Syndrome • Bradycardia • Unstable tachycardia • Stable tachycardia • Acute stroke
Equipment and skills	• Airway, including o Manual manipulation – head tilt, chin lift o Bag-mask ventilation o Oro- and naso- pharyngeal airway o Combitube o LMA o Endotracheal intubation • Defibrillator • AED • Chest compression • ECG interpretation • IV /IO access • Monitors
Core drugs	Vasopressors Antiarrhythmics

Appendix F – ATLS course content

Initial assessment and management	• Triage • Primary survey "ABCDE" • Resuscitation • Adjuncts and monitoring • Transfer • Secondary Survey

Airway and ventilatory management	• Airway problem recognition and management
	• Ventilation problem recongnition and management
	• Indications for definitive airway
	• Skills
	  ○ Oropharyngeal airway
	  ○ Bag-Valve0Mask ventilation
	  ○ Adult intubation
	  ○ Pulse oximetry and end tidal CO2
	  ○ cricothyroidotomy

Shock	• Recognition and assessment
	• Management
	• Fluid resuscitation
	• Blood replacement
	• Skills
	  ○ Venipuncture
	  ▪ Peripheral
	  ▪ Central
	  ○ Intraosseous access

Thoracic Trauma	• Primary Survey
	• Thoracotomy
	• Secondary Survey and Life threatening chest injuries
	• Skills
	  ○ Chest X-ray
	  ○ Thoracocentesis
	  ○ Chest drain

	○ Pericardiocentesis
Abdominal Trauma	• Anatomy • Blunt vs. penetrating trauma • Assessment • Laparotomy • Pelvic fractures • DPL • FAST
Head Trauma	• Anatomy • Physiology – intracranial pressure, CBF • Management of head injury ○ mild/moderate/severe ○ medical/surgical
Spine and Spinal Cord Trauma	• Anatomy and physiology • Classification of spinal cord injuries • Specific spinal cord injuries • Skills ○ C-spine immobilisation and log rolling ○ X-ray interpretation
Musculoskeletal Trauma	• Primary and Secondary Survey • Fracture immobilisation • Life-threatening extremity injuries • Limb-threatening extremity injuries • Pelvic fractures • Arterial injury
Injuries due to burns and cold	• Immediate life saving measures • Assesing burns • Stabilising • Special burns – chemical/electrical • Cold injury – local/hypothermia
Paediatric trauma	
Trauma in women	• Alterations in anatomy and physiology in

	pregnancy • Blunt vs. penetrating injury
Transfer to definitive care	• Need for transfer • Responsibilities • Protocol

Appendix G – Turnitin report

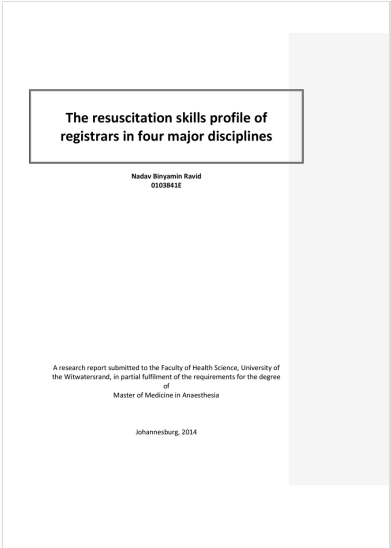
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The resuscitation skills profile of registrars in four major disciplines

Nadav Binyamin Ravid
0103841E

A research report submitted to the Faculty of Health Science, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of
Master of Medicine in Anaesthesia

Johannesburg, 2014

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