A NEEDS ASSESSMENT FOR CONTINUOUS PROFESSIONAL DEVELOPMENT FOR SOUTH AFRICAN ADVANCED LIFE SUPPORT PROVIDERS

A dissertation submitted in fulfilment of the requirements for the degree of Master of Technology: Emergency Medical Care in the Faculty of Health Sciences at the Durban University of Technology

BERNARD CHRISTOPHER PILLAY

December 2011

Durban University of Technology

Supervisor: _____
R. Naidoo (MSc)

Co-Supervisor: _____
P. Reddy (PhD)

DECLARATION OF ORIGINALITY

This is to certify that the work is entirely my own and not of any other person, unless explicitly acknowledged (including citation of published and unpublished sources). The work has not previously been submitted in any form to the Durban University of Technology or to any other institution for assessment or for any other purpose.

Signed: _____

Date: _____

Ethical clearance number: FHSEC 053/09

FOREWORD

A cursory read of the title of this dissertation suggests that the object of the study is, quite simply, a ‘needs assessment’. A narrow examination of the topic might have done, just that. Mr. Bernard Pillay, true to his pursuit of excellence, has taken the road less travelled. He has, through this study, painstakingly considered a wide and uncompromised approach to understanding continuous professional development (CPD) amongst advanced life support (ALS) emergency care providers in South Africa.

For the researcher, this effort has been less about a singular accent up the NQF ladder, but more about strengthening the theory, practice and clinical praxis of ALS. What would motivate any student to do this? Well, if the student has over two decades of experience in emergency care provision and education, the motive is likely to be toward an unrelenting search for contextual relevance, application of research findings, and of course- justice. The need under study, not surprisingly, relates to patient safety, practitioner proficiency, regulatory inadequacies and system imperatives. What is remarkable about this study is that it cogently and coherently addresses the fundamental assumptions of CPD and its implementation. To date, this dissertation may claim to be the most in-depth perspective on CPD implementation for emergency care providers in the developing world context. The shallow discourse presented is about ALS skills. A deeper

analysis goes to the absence of clinical mentorship and the vicarious learning this would bring, consideration for strengthening CPD theory, CPD implementation and clinical praxis. This study is about the limitations of undergraduate medical study as much as it is about graduate attributes. It challenges notions of independent practice, from pretending to know, to productive stupidity, self-reflection and self-efficacy. There is no doubt that this study has the potential to reshape the CPD implementation architecture for the HPCSA and CPD providers alike.

Whilst the researcher, in true positivist form, assumes the role of the disinterested scientist (in the interest of objectivity) by foregrounding all the variables of the study to the betterment of a young naïve profession, he deserves acknowledgement for epistemological coherence, methodological precision, and a significant contribution to the science of implementation and professionalism- and by default-patient safety. What a noble contribution. Congratulations Mr. Pillay and thank you!

Navindhra Naidoo (N Dip AEC, B Tech EMC, HDE, MPH)

Senior Lecturer: Department of Emergency Medical Sciences

Cape Peninsula University of Technology, Cape Town, South Africa

Member of the Executive Committee, Professional Board Emergency Medical Care, Health Professions Council of South Africa

ABSTRACT

Introduction

South African Advanced Life Support (ALS) providers follow an autonomous practice model of care. This advanced role profile is characterized by clinical skill competence and autonomous decision making whilst demonstrating a high level of awareness of their own ethical attitudes, values and beliefs. It is through a professional commitment that ALS providers deliver an advanced evidence based practice that should be maintained constantly within a dynamic environment. Continuous Professional Development (CPD) is seen as an instrument for this. CPD should also serve as a means to acquire professional excellence and going beyond the boundaries of meeting the base level standard with the aim of providing the finest quality of care in the interest of patient safety.

Purpose of the research

The purpose of this research is to identify gaps in the professional development of out-of-hospital ALS providers trained in South Africa by assessing frequency of performance of ALS clinical skills, by determining perceived level of competence and predictors of confidence, and by sourcing information on attendance of CPD activities and training needs.

Methodology

This study used a quantitative non-experimental design. Data was attained from an e-mail based descriptive survey that was limited to a precise and concise questionnaire. The data from 140 (N) ALS providers was subjected to a descriptive statistical analysis using the PASW statistics version 18.0 to systematically show patterns and trends. Frequency distributions were generated to describe data categories. Bivariate analysis was conducted using Chi-square and Pearson correlation tests.

Results

Results indicated that ALS providers performed clinical skills infrequently. Of the total number of respondents 140 (N), the average ALS clinical skills performance was 6 (4.8%) daily. In the 2-6 times a week category 8 (6.4%) ALS clinical skills were performed. ALS clinical skills performance in the once a week category showed an average of 7 (5.6%) and the once a month category, an average of 17 (13.7%) ALS skills were performed. An average of 31 (25%) ALS skills were performed in the once in six months category whilst an average of 54 (43.5%) were performed in the greater than six months category. CPD activities that are appropriate to ensuring the maintenance of competence for these clinical skills were not adequately undertaken. Medical updates were mostly attended by ALS providers, 52 (42.9%) whilst CPD events that addressed clinical skills, was mostly limited

to the ACLS course 42 (34.7%). The needs assessment for CPD showed that 56 (53%) of respondents expressed a need for paediatric and obstetric simulated skill sessions, whilst 43 (40.9%) requested clinical skills workshops and 39 (37.1%) expressed a need for clinical practice in theatre and coronary care units.

Conclusions and recommendations

This study shows that ALS clinical skill competence is maintained by frequent practice and appropriateness of CPD activities. The infrequent performance of ALS skills coupled with the lack of appropriate and diverse CPD activity attendance results in poor maintenance of competence. The loss of competence can be related to poor reported levels of confidence which consequently places patient safety at risk. To safeguard against medical error and ensure patient safety, it is strongly recommended that CPD audits be undertaken on all ALS providers for appropriate CPD compliance related to clinical skills performance. In addition to a clinical skills audit, it is recommended that a national clinical skills registry be established with the intention of facilitating clinical skill surveillance, to determine a notifiable, high risk skill set. To safeguard against knowledge and clinical skill attrition and loss of competence, the delivery of CPD activities should be assessed for effectiveness and appropriateness.

DEDICATION

I would like to dedicate this research:

1. To my late mother Shirley, whose untimely death during my youth has led me along the path of becoming an advanced life support provider and lecturer who has had the opportunity to serve the national and international community.
2. To my late father Gerald, who provided a dual role, supported my decisions and guided me with love and encouragement.
3. To Nithu, my wife and son Bjorn, for their love and support.
4. To every emergency care provider who shares the same passion as me and dedicates their lives to serve others.

ACKNOWLEDGEMENTS

I would like to express my eternal gratitude to the Almighty God, the Father, for his guidance through this quest for knowledge and providing me with the strength to persevere amidst constant challenges and obstacles.

I am also grateful to the following kind people without whose assistance; this endeavour may not have been realized.

1. My wife Nithu, and son Bjorn, for their support and tolerance.

2. Raveen Naidoo for his constant support, guidance and expert supervision.

3. Poovie Reddy for her guidance and expert supervision.

4. Sageshin Naguran for his constant support, guidance and grounding.

5. Yugan Pillay for his guidance and assistance in compiling the research tool.

6. Leigh Meyers for her assistance with data capturing.

7. Navin Naidoo for his expertise, constant support and guidance.

8. All the Advanced Life Support Providers who graciously contributed to this research.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

ALS : Advanced Life Support

ACLS : Advanced Cardiac Life Support

AHCP : Aviation Health Care provider

ATLS : Advanced Trauma Life Support

BLS : Basic Life Support

CPD : Continuous Professional Development

CPR : Cardiopulmonary resuscitation

HDHET : Higher Diploma in Education and Training

HEMS : Helicopter emergency Medical Services

HPCSA : Health Professions Council of South Africa

IO : Intraossoeus

ITLS : International Trauma Life Support

ILS : Intermediate Life Support

MIMMS : Major Incident Medical Management and Support

M & M : Mortality and Morbidity

PALS : Paediatric Advanced Life Support

PBEC : Professional Board of Emergency Care

PHTLS : Prehospital Trauma Life Support

RSI : Rapid Sequence Intubation

TCP : Transcutaneous pacing

UV : Umbilical vein

WHO : World Health Organization

GLOSSARY OF TERMS

Advanced life support (ALS):

An advanced level of emergency medical care. ALS includes invasive techniques such as: endotracheal intubation, surgical cricothyrotomy, TCP, IO cannulation, UV cannulation, obstructed labour management and medication administration for sustaining life.

Beneficience:

The health care provider must act in way that benefits the patient.

Clinical governance:

A systematic approach to maintaining and improving the quality of patient care within health sector.

Continuous professional development (CPD):

An avenue for undertaking learning activities, by which members of professional associations maintain, improve and broaden their knowledge, skills and ethical attitudes.

Health Professions Council of South Africa (HPCSA):

A statutory regulated body established in terms of the Health Professions Act 1976 (Act No. 56 of 1974) who are mandated to provide guidance to

registered healthcare practitioners through aspects of education and CPD, professional conduct, ethical behaviour and registration.

Holistic education:

Teaching and learning that encourages growth and development through highly effective learning environments incorporating, clinical judgement, decision making, and formulation of diagnoses and structured principles of professional health care.

Naturalization of skill:

The ability to perform clinical skills as routine in real life situations without referring to a procedure guide and without error.

Needs Assessment:

A study designed to describe the needs of a group, community or an organization usually as a guide to policy planning, and resource allocation.

Non- maleficence:

A health care provider should not harm the patient.

Out-of-hospital:

Providing medical care outside of a hospital.

Professional Board of Emergency Care (PBEC):

Professional boards serve as a co-ordinating body within the HPCSA. The PBEC is the professional board for all emergency care providers that are registered with them.

Qualified:

Having completed the necessary training or passed an examination, having the knowledge and skills in order to enter a particular profession.

Scope of practice:

A list of capabilities and approved medications that are authorised for use for practitioners whose names appear in the corresponding register of the HPCSA.

World Health Organization (WHO):

WHO is the directing and co-ordinating authority to health within the United Nations system and is responsible for providing leadership on global health matters.

OPERATIONAL DEFINITIONS

For the purpose of this study the following operational definitions are provided:

1. ALS providers:

Out-of-hospital emergency care personnel that provide ALS, e.g.: Critical Care Assistants; National Diploma: Emergency Medical Care; Bachelor's Degree of Technology: Emergency Medical Care and Master's Degree of Technology: These providers, provide the highest level of emergency care in the out-of -hospital emergency care setting.

2. Clinical skills:

A lifesaving procedure undertaken on a patient to improve his or her clinical condition e.g. intravenous catheter insertion, defibrillation, endotracheal intubation and all other clinical skills in the ALS provider's scope of practice.

3. Clinical skills frequency:

Frequency of clinical skill performance is defined as ALS skills that were performed on a frequent or infrequent basis. Frequent skill performance is performance of an ALS skill, within the time periods daily to once a month, whilst infrequent skill performance is performance of an ALS skill within the time periods once in six months and the category "other". The category

“other” is any time period beyond six months and includes clinical skills that have never been performed (Tables: 4, 5 and 6.).

4. Competency of clinical skill:

The student can undertake a skill without error but still lacks the speed and flexibility of the proficient learner and does not yet have enough experience to recognize a situation in terms of an overall picture.

5. **Proficiency of skill:**

Skillfulness in the command of fundamentals deriving from practice and familiarity; practice is intended greatly to improve beyond competency to proficiency.

LIST OF TABLES

LIST OF FIGURES

LIST OF ANNEXURES

CHAPTER ONE

OVERVIEW OF THE STUDY

1. Introduction

This introductory chapter will provide the background followed by the purpose, the objectives and the rationale of the study. In this chapter, the researcher will also describe his interest in such research and finally conclude the chapter with the assumptions and delimitations of the study.

1.1 Study background

South African ALS providers as defined in the operational definitions section are health care workers that provide the highest level of medical care in the out-of-hospital environment. According to Macfarlane, Van Loggerenberg, and Kloek (2005) they are regarded amongst the best in the world due to their extensive knowledge and clinical skill capabilities. An ALS qualification may be obtained from a University of Technology (UoT) or a College of Emergency Care (COEC) within South Africa. The UoT programme is a dedicated 3-year full-time training programme in emergency medical care with the qualification “National Diploma in Emergency Medical Care” (NDip) and can be obtained from one of four UoTs, Durban University of Technology

(DUT), University of Johannesburg (UJ), Cape Peninsula University of Technology (CPUT) and Central University of Technology (CUT) (Macfarlane, Van Loggerenberg, and Kloek, 2005).

The National Diploma in Emergency Medical Care graduates can further their academic qualification by completing a Bachelor of Technology degree (BTech) in Emergency Medical Care and thereafter pursue a Master of Technology degree (MTech). The “Critical Care Assistant” (CCA) certificate qualification is a (9-12) month full time programme and can be obtained at a provincial or private COEC (HPCSA, 2008).

The CCA, NDip, BTech and Mtech qualified individuals are titled ALS providers as they all practice an advanced autonomous model of care that permits them to render care using their own clinical judgement, which includes diagnoses and making split second treatment decisions in medical, trauma, obstetric and paediatric related emergencies (Gosling, 2005; Al-Shaqsi, 2010). But, in a world where knowledge evolves rapidly and clinical evidence changes frequently, new methods of treatment and technology are discovered regularly, thus constantly changing the diagnosis and therapeutic approach (Gosling, 2005). The general public therefore, expect that all health care providers are dynamic and are continually aspiring to provide the finest quality of care by maintaining their competence and assuming the

responsibility of being at the leading edge of applying new evidence-based medicine.

With this in mind, the maintenance of competence of ALS providers is not only a matter of personal responsibility but also involves accountability to the community. Jacques (2003) states, however, that retention of one's cognitive knowledge, clinical skills as defined in the operational definitions section and also being at the leading edge of new evidence-based medicine may be a challenge for many health care providers due to a number of factors such as frequency of skill performance. According to Latman and Wooley (2005) and Miller, Issenberg, Petrusa, Gordon and Scott (2004), maintenance of competency is based on frequency of clinical skills performance and the application of these skills on real life patients. Latman and Wooley (2005) also stated that in the absence of frequent clinical skill performance, regular attendance of appropriate CPD activities has shown to not only enhance knowledge retention and growth but also maintains motor skills by practice in a realistic simulated environment.

CPD is thus seen as essential for effective practice and to an individual's development within a profession as it is linked to personal learning needs and is often associated with a way of "gap filling" (Schostak, 2009). CPD is the process by which health care professionals keep up to date to meet the needs of patients, the health service, and their own professional

development. It includes the continuous acquisition of new knowledge, skills, and attitudes to enable competent practice. The term CPD acknowledges not only the wide ranging competences needed to practice high quality emergency medicine but also the multidisciplinary context of patient care.

Essentially, the outcome of good CPD should be improved patient care and ALS competence. It is essential that any CPD activity improves competence within a defined scope of practice and as such, the activities need to focus on the individual's area of practice. Providing evidence of appropriate CPD activities is, therefore, important to satisfying the requirements of ALS providers and the Health Professions Council of South Africa (HPCSA): Professional Board of Emergency Care (PBEC). ALS providers may achieve this by assessing current competence, following a path to improvement, and recording what has been done. The HPCSA: PBEC was constituted in 2003; however, CPD for the field of emergency care was only formally introduced in 2007. Hence the, the concept of CPD is still in its developmental stage, and it is unclear if ALS providers are fulfilling the purpose of CPD.

1.2 Purpose of the study

The purpose of this research is to identify gaps in the professional development of out-of-hospital ALS providers trained in South Africa by assessing frequency of performance of ALS clinical skills, by determining perceived level of competence and predictors of confidence, and by sourcing

information on attendance of CPD activities and training needs. The findings from this study may guide the CPD committee and ultimately accredited CPD providers to formulate teaching and learning activities that meet individual needs and stimulates longevity of knowledge and skill. This may ensure that professional competence is continually updated throughout the ALS provider's career so that the public's interest will always be promoted and protected.

1.3 Objectives of the study

The objectives for this study were to determine:

1.3.1 The frequency of practice and the reasons of ALS clinical skills performed by South African ALS providers.

1.3.2 The type of CPD activities attended by ALS providers, type of institution offering the activity and the reasons for attendance.

1.3.3 The perceived appropriateness of the CPD for the maintenance of ALS competency.

1.3.4 The ALS provider's individual needs for specific CPD activities.

1.4 Rationale for the study

1.4.1 The need for continuous professional development

The World Health Organization (WHO) (2006), has described studies that reveal increased frequency of errors in health care as a leading cause of mortality and morbidity in the world. Therefore it is fundamentally important for ALS providers to maintain and develop knowledge, clinical skills and ethical attitudes through CPD to provide safe and updated evidence-based clinical practice and thus reduce mortality and morbidity.

1.4.2 The need for holistic professional development of ALS clinical skills

Frequent routine undertaking of clinical skills in real life situations is essential for the ALS provider to progress from competency to naturalization of these skills. Infrequency of practice and poor skill technique may hinder this process. As a result, holistic clinical skills teaching and learning activities may have to be repeatedly undertaken to regain competency and to attain naturalization.

1.4.3 The scarcity and appropriateness of CPD for ALS providers

The Health Professions Act, 1974 (Act No. 56 of 1974) endorses CPD as a means for maintaining and updating professional competence**.** All registered

persons have to comply with CPD requirements as from 1 January 2007 and will be required to accumulate 30 continuous education units (CEUs) per 12 month period (HPCSA, 2006). CPD however, has only been formally introduced into the field of emergency care in January 2007. As a result, CPD activities related to specific needs are in their development stages and not readily available.

Hence, there is scarcity and a lack of appropriate activities that ALS providers can undertake. They can, therefore, accumulate CEUs to maintain professional registration by attending CPD events that they perceive as appropriate, but they may not specifically address their actual requirements. The consequence of this inadequate implementation is that the intended purpose of CPD, which is to guide the professional, and thereby improve patient care, may not be realized.

1.4.4 Use of results to inform the CPD committee, Health Professions Council of South Africa

Findings from this study may guide the Professional Board for Emergency Care and ultimately accredited providers of continuous professional development. The findings may highlight the nature and applicability of academic activities required by ALS providers as well as guides the formulation of appropriate and sustainable teaching and learning activities for mainstream learning and CPD post qualification.

1.5 Researcher's interest in the study

The researcher currently lectures to final year students for the programme National Diploma: Emergency Care at the Durban University of Technology. For many years lecturers dedicated their efforts and continue to focus their efforts at creating a culture amongst students to develop the correct attitude, attain knowledge through research and acquire the ability to apply knowledge and clinical skill. The end result is to educate the community, impart knowledge to junior emergency care providers, and utilize their clinical skills appropriately, effectively and efficiently to save lives.

With reference to their clinical skills, the student will acquire the ability to perform many clinical skills throughout their time spent at the Universities or Colleges. By the end of their learning programme they would have had to demonstrate their competency in over forty five diverse clinical skills and are, therefore, ready to apply their trade. Their competency is assessed through an objective skill competency evaluation and application of those clinical skills in a realistic simulated environment. They are also assessed through a clinical practice portfolio where they provide authentic evidence that these clinical skills were performed on real life patients under direct supervision of a senior qualified health care provider in the hospital and out-of-hospital environment.

Upon completion of their learning programmme, it is encouraged that the newly qualified ALS providers will maintain their competencies and also attains proficiency so to ultimately reach naturalization of all his or her clinical skills. Both frequent performance of skills and CPD are required to remain competent and with recurring good practice may lead to proficiency and naturalization. Conversely, the infrequent performance of skills may contribute to a loss of competence. This will be discussed further in the literature review.

In this research, the researcher aimed to identify through a structured survey how frequent ALS providers were performing specific clinical skills and what their level of confidence was in relation to each skill. The researcher also aimed to identify what specific CPD needs ALS providers have, to fill the gaps in their professional development. Based on the results, the researcher will make recommendations to provide highly effective, appropriate CPD activities. These activities must be designed to address all ALS providers' needs so that they may maintain their knowledge and clinical skill for which they worked so hard and so, to remain true to their commitment of providing the finest quality of care, to the people that they have pledged to serve.

1.6 Assumptions and delimitations of the study

1.6.1 Assumptions

The following assumptions were made:

1.6.1.1 All final year ALS students are competent in all their clinical skills upon completion of their qualification.

1.6.1.2 Infrequent usage of skill may lead to degradation of skill and incompetency and may place the patient at risk.

1.6.2 Delimitations of the study

The delimitations of this study are as follows.

1.6.2.1 Only the ALS population was assessed. The Basic Life Support (BLS) and Intermediate Life Support (ILS) population were not assessed.

1.6.2.2 Competence of ALS skills was not measured post qualification.

1.6.2.3 The study assessed frequency of skills only and not whether the skills were performed successfully.

1.7 Structure of the dissertation

The following will provide a brief overview of the remaining chapters of the dissertation.

Chapter Two presents the contextual environment which describes three aspects, firstly the ALS provider as an individual in terms of characteristics of the work environment and their roles and responsibilities. Secondly, clinical skill education, which describes the skill developmental process from novice to expert and thirdly an overview of CPD.

Chapter Three provides the literature review which focuses on evidence specifically on CPD and clinical skill performance.

Chapter Four discusses the research design and method of the study which includes sampling, data collection and the data analysis.

Chapter Five presents the comprehensive descriptive and inferential results of the study as tables and figures following the data analysis.

Chapter Six discusses the emergent findings of the study consistent with the study objectives.

Chapter Seven presents the conclusions and recommendations of the study.

CHAPTER 2

CONTEXTUAL ENVIRONMENT OF THE STUDY

2. Introduction

This chapter presents the contextual environment which describes the ALS provider as the central figure, encompassed by clinical skill practice and CPD.

ALS providers, once qualified, are committed to ensuring that they meet the expectations of the public and although they are not required to take the Hippocratic Oath like doctors do, they are bound by the standards of practice mandated by the HPCSA and medical ethics. Medical ethics underpins the practice of ALS providers and practice is underpinned by competence, confidence, capability, responsibility and development (HPCSA, 2007). To provide a clearer understanding of this statement, the researcher will discuss the ALS provider, clinical skills development and CPD with reference to various educational theories and models to highlight the importance and need for appropriate, holistic highly effective CPD activities to ensure that ALS providers are always competent, compassionate and confident so that the people they serve can benefit from the finest holistic quality of care. In other words they can think, feel and do.

2.1 Understanding the Advanced Life Support Provider

The ALS provider is central to the care of life threatening emergencies in the out-of-hospital environment. They provide the highest level of care available anywhere, anytime, in the harshest weather conditions, terrains and often in mentally and physically demanding situations. The following provides information on the ALS provider, characteristics, work environment, standards of practice, their professionalism, practice and conduct to which they must abide to. Information on the models of International Emergency Medical Service (EMS) systems: Autonomous model of care is also provided.

2.1.1 ALS provider characteristics and work environment

According to Barron (2010), ALS providers must function independently at an optimum level and carry a great degree of responsibility. He or she has to be confident to face constant challenges in a dynamic environment. The societies that the ALS provider supports are multicultural and have high expectations, so the ability to communicate effectively and be culturally sensitive is mandatory to professional practice.

The ALS provider must be able to provide the finest quality of care in emergency care situations which can often become overwhelming. A calm disposition and staying focused whilst assuming the leadership role is therefore vital to carrying out their role. Advanced knowledge and clinical

skills encompassed by good clinical judgement are essential in directing team members and members of support services. Added to this, the ALS provider needs to concurrently cope with high stress and take on the personal responsibility for the legal ramifications of precise documentation and the knowledge and skills required in real life threatening emergency situations (Barron, 2010). It further necessitates the ability to manage adverse and sometimes dangerous situations, which include responding to cases in areas known for crime and high mortality rates. A tolerance for high stress levels, solid emotional stability and the ability to meet the cognitive, intellectual and physical demands is required constantly in an increasingly dynamic environment (Barron, 2010; MacFarlane, Van Loggerenberg and Kloeck, 2005).

The ALS provider is responsible ethically, morally and legally for their knowledge and skills base and must ensure that it remains current to changes and trends. The use of appropriate medication is one such example. Here the knowledge, application and administration of medication will include the contra-indications, adverse effects and constitutional make-up. ALS providers must also be cognisant of the effect of medications on new-borns and paediatrics in terms of weight and size and hence requires a good application of the basic principles of mathematics; to calculate dosages for bolus and maintenance infusions (Barron, 2010).

2.1.2 Principle features of medical ethics:

Professionalism, Competence, Practice and Conduct

The standards of practice considered acceptable by the HPCSA are the standards of Professionalism, Competence, Care and Conduct.

Fricker, Kiley, Townsend and Trevitt (2011), expresses that professionalism means being the very best you can be by having an awareness of conduct, practice, the code of ethics and qualities defining a given profession. According to O'Meara (2009), the evolving professionalism of ALS providers must be confirmed through professional behaviours and performances that incorporate adherence to professional codes of conduct, reflective practice and a commitment to continuing professional development. Standards of competence are reached by specialized training which ensures that knowledge and skills are of the desired level before entry into practice (Beachamp, 2002). When competence is not met, technical mistakes are made, as the level of skill practice does not meet the outcomes of the task required (Bosk, 2003). When considering mistakes, the principle of beneficence is the act of undertaking the skill to benefit the patient and non-maleficence is to never harm the patient (Bosk, 2003; Richman, Mason, Mason-Whitehead, Mcintosh and Mercer 2009).

Standards of care has been defined by Claassen and Vershoor (1992) as a diagnostic and treatment process that a clinician should follow for a certain

type of patient, illness, or clinical circumstance. Included with standards of care are the standards of competence and the rules of professionalism with the ability to apply good clinical judgement. The HPCSA (2007) states that being registered under the Health Professions Act, 1976 (Act No. 56 of 1974) gives health care practitioners certain rights and privileges, but in return they must meet the specific standards of competence, care and conduct. In order for a health care provider to practice, a mutual trust between patients and health care providers must exist. A lifelong commitment and an overriding dedication is required for the best interest of their fellow human and to achieve professionalism in practice, competency, care and conduct of the highest standards must be maintained with an honourable status (HPCSA, 2008).

2.1.3 Models of International Medical Service (EMS) systems: Autonomous model of care

The focus of EMS is to provide timely care to victims of sudden life threatening conditions or injuries in order to prevent long term morbidity or mortality. The WHO (2006) regards EMS systems as an integral part of any effective and functional health care system. It is the first point of contact for the majority of people to receiving health care services during emergencies and is a mechanism to accessing secondary and tertiary care.

Since the 1970s, the model of health care delivery in the out-of-hospital environment evolved around the Franco-German Model (FGM) and the

Anglo-American model (AAM). Fundamentally the philosophy of the FGM is based on “stay and stabilize” as the idea is to bring the hospital to the patient. It is a model widely used in Europe and run by physicians with an extensive scope of practice and the latest advanced technology. ALS providers play a supportive role to the physicians. In contrast, the AAM is based on “scoop and run” where the patient is rapidly transported to the nearest hospital with minimal intervention. This model is used in the United States, New-Zealand, Canada and Australia where ALS providers usually run this type of model but with clinical supervision from doctors (Al-Shaqsi, 2010).

The South African advanced life support provider, however, has evolved into a newer model of care known as an autonomous practice of care. Simply, this means that the individual provider renders care by making their own diagnoses, clinical judgements and treatment decisions at their own discretion (Dick, 2003). This shifts substantial accountability to the ALS provider. According to Al-Shaqsi (2010) the United Kingdom National Health Scheme defines the ALS provider as an allied health care professional who works within a model of care with the attitude, skills and knowledge base to deliver holistic care and treatment, with a broadly defined level of autonomy. Autonomous care is also known as independent practice which is a term more commonly used in South Africa. Christopher (2007) defines independent practice as a practice where a registered health profession is conducted by a health practitioner without supervision of another health

practitioner. Christopher (2007) also declares that since 2001, all ALS providers registered with the HPCSA are declared independent practitioners.

2.2 Understanding clinical skill education

Whilst it was important to determine frequency of ALS skills as per assumption in section 1.6.1.1. and 1.6.1.2., it was also important to identify proficiency of clinical skill. This chapter describes the cognitive and psychomotor domains of the clinical skill development process to highlight attaining skill competency, skill proficiency and skill naturalization and that infrequency of skill may lead to loss of clinical skill competence.

A primary aim of clinical skill education is for students to practice skills in a safe environment, before refining them in the real world. A successful clinical outcome depends on a well performed technical procedure. Hence, a technique that has been successful in the American College of Surgeon's Advanced Trauma Life Support will be described here. This technique is the five-step method for teaching psychomotor skills. Grantcharov and Reznick (2008) describe the following:

2.2.1 The creation of the five-step method

The five step method is based on the following seven principles:

1. **Conceptualization:** The student must grasp the cognitive elements of the skill which involves, why, when, when not to and the precautions involved including the tools used to perform the skill.

2. **Visualization:** Here the student must see the skill being performed in its entirety so as to have a model of expected performance. This enables the student to imitate/copy expected performance.

3. **Verbalization:** A second demonstration with narration is undertaken. This is followed by the student narrating the skill before actual performance of the skill. If the student can successfully narrate the skill there is a greater chance that he/she will be able to demonstrate the skill correctly.

4. **Practice:** After the student has seen the skill, heard the narration and repeated the narration, the student will now practice the skill. To be effective, the skill may be broken down into discreet units of practice. This will lead to precision practice and eventual articulation.

4.1 Sub-component practice: The student will practice only a small component of the skill.

4.2. Linkage practice: Practice small components of the skill and link them together.

4.3. Contiguous practice: Practice the entire skill repetitively.

5. **Correction and reinforcement:** It is important to correct skill errors immediately. Positive reinforcement will aid in cementing correct performance.

6. **Skill mastery:** The student must demonstrate the ability to perform the skill regularly without error. This leads to student articulation.

7. **Skill autonomy*:*** The ability of the student to perform the skills as routine in a real life situation without error. This leads to student naturalization.

2.2.2 The five-step method

The following form the five-step method:

1. **Step one:** For the student to be motivated to learn a skill, he/she must understand why the skills are needed and how it is used in the delivery of care.

2. **Step two:** the skill must be demonstrated exactly as it should be done without narration. The silent demonstration gives students a mental picture of what the skill looks like when it is done correctly. This image is important as students will use this to self-evaluate their own performance when practicing the skill.

3. **Step three:** The demonstration must now be repeated with a detailed description of each step. This will help students see how each step in the

process fits into the optimal sequence. Students must ask questions or seek clarification of a step or procedure.

4. **Step four*:*** Students talk through the skill. This will help them to understand and commit the process to memory so they can recall each step in the sequence.

5. **Step five*:*** The student is now ready to perform the actual skill for the first time. This is observed by the preceptor who provides coaching and feedback as needed. If successful at the first attempt, they continue practicing until the desired level of proficiency is reached.

Grantcharov and Reznick (2008) further describe the five-step approach as a tool that can be used to teach any type of skill regardless of its level of difficulty. If there is a performance deficit the preceptor must be able to identify the following six reasons.

1. **Student trait ability:** The student may not possess the fine motor co-ordination or fine motor skill necessary to perform the skill.

2. **Inadequate/inappropriate task description and/or demonstration:** Students may not have paid particular attention to the demonstration or there was too much of time between the demonstration and the first attempt to perform the skill.

3. **Imprinting the previous incorrect or obsolete performance:** Students may be repeating previous mistakes. There was no feedback or there was inappropriate feedback and no corrective action.

4. **Improper correction/reinforcement:** Incorrect feedback may have been given indicating the performance was correct when it was not.

5. **Affective factors:** These include, fear, intimidation, distraction, embarrassment, lack of belief in the value of the skill and performance anxiety.

6. **Inaccurate student perception of performance:** The student may not be able to recall what was done correctly or incorrectly.

The researcher would hereon link the Dreyfus and Dreyfus model, (Dreyfus and Dreyfus 1986) of skill acquisition with the five step method so that the reader may conceptualize the skill development of the student. Furthermore, understand how maintenance of competency and progression into skill naturalization can be achieved. In acquiring a skill by means of instruction and experience, the student according to the Dreyfus and Dreyfus model (1986), normally passes through five developmental stages which they stated are, novice, advanced beginner, competent, proficient and expert. Dreyfus and Dreyfus (1986) argued, based on analysis of careful descriptions of skill acquisition, that as the student becomes skilled, he or she depends less on abstract principles and more on concrete experience. The authors illustrate

the progressive stages in a performer's way of seeing his or her task environment and state that any skill-training procedure must be based on some model of skill acquisition. This model can address each stage of training and the appropriate issues involved in facilitating advancement. In a more recent study, Dreyfus (2009) on a modern perspective on creative cognition reiterates the development stages of skill acquisition.

The development stages are as follows: (Dreyfus and Dreyfus 1986)

Stage 1: Novice

Beginners have had no experience of the situations in which they are expected to perform.

Stage 2: Advanced Beginner

Advanced beginners are those who can demonstrate marginally acceptable performance.

Stage 3: Competent

The student begins to see his or her actions in terms of long-range goals or plans of which he or she is consciously aware. The conscious, deliberate planning that is characteristic of this skill level helps achieve efficiency and organization. The student still lacks the speed and flexibility of the proficient learner but does have a feeling of mastery. The competent person does not yet have enough experience to recognize a situation in terms of an overall picture.

Stage 4: Proficient

The proficient performer now perceives situations as a whole rather than in segments. The proficient student learns from experience what typical events to expect in a given situation and how plans need to be modified in response to these events. He or she can now recognize when the expected normal picture does not materialize. This holistic understanding improves the student's decision making; it becomes less laboured because they now know which of the many existing attributes in the present situation are the important ones are.

Stage 5: Expert

The expert performer no longer relies on an analytic principle such as rules or guidelines to connect his/her understanding of the situation to an appropriate action. The expert, with an enormous background of experience, now has an intuitive grasp of each situation and zeroes in on the accurate region of the problem without consideration of a large range of the "building blocks" that got them to this position of expert. The expert operates from a deep understanding of the total situation.

In summary, the Dreyfus and Dreyfus model (1986) serves as a theoretical framework for the acquisition and development of skills. The theoretical framework is supported by Bloom's taxonomy, the social learning theory and the theory of motivation and self-determination. Bloom's taxonomy applies

three types of learning, cognitive learning where knowledge and intellectual skills are developed. The second aspect is affective learning which includes awareness, active participation, internalization of specified values and dealing with things emotionally such as enthusiasms, motivation and attitudes. The third type of learning involves the psychomotor aspect which develops motor skills such as physical movement and coordination (Krathwohl, 2002). The social learning theory adds a social element where people can learn by watching other people. Individuals learn to model themselves through attention, retention, reproduction and motivation (Bandura, 1977). The motivation and self-determination theory enhances intrinsic motivation through three psychological needs. Achieving competence, where this can be acquired through optimal levels of challenge and effective feedback. Autonomy is achieved or increased through opportunities of self-direction and the freedom to determine one's own behaviour and relatedness as this provides a sense of security and belonging. (Ryan, 2000).

2.3 Understanding Continuous Professional Development

The History of the HPCSA: dates back to the 19th century, 1928. In accordance with Act 13 of 1928, the South African Medical and Dental Council (SAMDC) were appointed. This act made provision for two statutory bodies: The South African Medical Council (SAMC) and The South African Pharmacist Commission (SAPC). The SAMC was also responsible for

registering nurses until they established their own South African Nursing Council (SANC) in 1994. In 1947 the first register of medical deputies was established. Thereafter attempts were made to make paramedical and supplementary health services compulsory (HPCSA, 2011).

In 1974, the Health Professions Act 56 of 1974 replaced Act 13 of 1928 which lead to the SAMDC being replaced by the HPCSA. This Act, 1974 (Act No. 56 of 1974) (as amended) endorsed CPD as the means for maintaining and updating professional competence for all heath care professionals at the time. After a variety of draft bills Act 13 of 1928 was amended in 1971 to make provisions for Chiropody, Occupational therapy, Audiology and since then, it was only in 2003 that the Professional Board for Emergency Care Practitioners (PBEC) was established. The board was constituted in terms of the Regulations relating to the Constitution of the PBEC contained in Regulation No. R 588 of 2 May 2003. Professional boards serve as a co-ordinating body for all health care practitioners that are registered with them. The respective boards that are established for a specific profession deal with any matters relating to a specific profession. The Health Professions Act was amended in 2007, which embarked on a new era in the history of health regulation promising a brighter future in health care for all. It was only in January 2007 that CPD was formally introduced into the field of emergency care (HPCSA, 2011). The CPD Guidelines for health care professionals, describes the intended purpose of CPD as, a means of offering assistance for health care professionals to acquire new and updated levels of

knowledge, skills and ethical attitudes that will benefit professional practice and promote personal integrity which will ultimately benefit the patient HPCSA (2009). A series of CPD activities must be undertaken each year by all registered health care professionals which are monitored by the CPD section. They randomly select individual health care professionals for compliance checks every two months. This requires the health care professional to submit all required documents within 21 working days. From here, submission of documents will be made to the CPD committee and the respective Professional Board for action if required.

Each health care professional has to acquire 30 continuing education units (CEU) per annum. Ethics, human rights and medical law must constitute 5 units of the collective 30 units. CEUs accrued for CPD activities will be valid for a 24 month period. The aim is to accumulate the balance of the end of the second year of registration and then “TOP UP”. The requirement is to reach and maintain 60 CEUs of which 10 should be for ethics, human rights and medical law (HPCSA, 2009).

According to Martin (2006) undertaking CPD is a challenge for many health care providers. Martin (2006) states that in order to embrace CPD and encourage it to work, the health care provider must understand its purpose and benefits. The author describes that some of the challenges for emergency care providers is that, previously the responsibility had fallen with

managers and training institutions to ensure that their staff were undertaking CPD, but now the responsibility lies with the individual. The challenge is to empower the individuals with the skills to accept this as a personal responsibility and to make them understand that CPD is about developing professional excellence and going beyond the boundaries of meeting the base level standard. This will, in turn, strengthen their skill set and directly link their learning into practice (Martin, 2006).

Another challenge is to acquire appropriate CPD activities. The appropriateness of the activities undertaken by health care providers makes for a more competent provider and such activities needs to focus on the individual's area of practice. CPD then will directly contribute to improving the individual's practice and patient care will benefit if CPD is based on individual needs and not limited to scope of practice. Diverse activities can result in a broad improvement to the entire range of work of health care providers. There is also a challenge for managers to remove barriers that may stand in the way of health care providers taking the individual responsibility for learning (Martin, 2006).

In summary, the challenges are for the individual to develop the intrinsic motivation to assess their own needs and take the responsibility to act accordingly and for managers to facilitate opportunities for a path of

improvement and better health care delivery in an increasingly changing environment.

2.4 Highly effective learning to improve knowledge retention

Billington (2000) conducted a four year study to answer the question, what are the conditions required for highly effective adult learning? In her quest to answer this question she connected growth with development. The author states that these two aspects are inseparable because growth refers to the maturity of our thought processes as we grow and just like children develop from simple to complex thinking. The way adults think affects their character development, interpersonal relationships, moral judgement, impulse control, self-concept and their functioning in a particular environment. However, not all adults continue to develop, some cease to want to learn and therefore cease to grow (Billington, 2000). The author investigated which factors in adult learning environments best facilitated their growth and development. Sixty men and women who began their doctoral studies were asked to participate by completing two tests measuring adult development, a questionnaire, and an interview which measured the same. All the measures revealed the same results. To quote Billington (2000), “It was as though this research snapped multiple pictures of a barely visible phenomenon from various angles and when developed, all the pictures revealed the same clear image”. The results showed that adult students grew significantly only in one

type of learning environment and tended not to grow or to regress in another type. The study found seven key factors that stimulated adult development.

1. Safety: Learners feel safe and supported, where individual needs and uniqueness are honoured, where abilities and life achievements are acknowledged and respected.

2. **Intellectual freedom:** An environment that fosters intellectual freedom and encourages experimentation and creativity.

3. Respect: Learners enjoy an environment where they are treated as peers and accepted and respected as intelligent experienced adults and whose opinions are listened to, honoured and appreciated.

4. **Self-directed learning:** Learners take responsibility for their own learning. They work together with their facilitators to design individual learning programmes which address what each person needs and wants to learn in order to function optimally in their environment.

5. Pacing or intellectual challenge: Billington (2000) found that pacing or intellectual challenge stimulated development. The author describes it further as “optimal pacing” which challenges people just beyond their present level of ability. If challenged too far beyond their ability, people give up. If challenged too little, they become bored with learning and therefore don’t learn. The author draws the analogy of tennis, where it is described that pacing can be compared to playing tennis with a slightly better player; your

game tends to improve. But if the other player is far better and it's impossible to return a serve, you give up, feeling overwhelmed. If the other player is less experienced and cannot return your serve, you learn little. The author stated that those adults, who reported experiencing high levels of intellectual stimulation, developed a lot more.

6. Active involvement: The study also identified that active involvement in learning where facilitators and students interact and dialogue as opposed to passively listening to lectures and took exercises and experiences to reinforce facts and theory allowed for more growth and development.

7. Regular feedback mechanisms: Learners must feel free to tell facilitators or providers or learning programmes, what works best for them and what they want and need to learn. Changes are thereafter made based on their input.

The findings of this study are supported by the thinking of Malcolm Knowles who is champion of andragogy, self-directed learning and informal adult education. (Smith, 2002). The Social Learning theory (Bandura, 1977), Motivation and Self-determination theory (Ryan, 2000) also supports this study. Billington (2000) concludes that highly effective learning improves knowledge retention. Drey, Gould and Allen (2009) concur as they found in their study conducted on 451 nurses in the United Kingdom that acquiring knowledge and skills is essential for nurses to practice safely in new and extended roles and that highly effective CPD increases retention.

Figure 1: Skills development model

Adapted from Grantharov and Reznick, (2008); Dreyfus and Dreyfus, (1986); Krathwhol, (2002) and Billington, (2000)

The adaptation of the skills development model is based on theory providing a solid foundation that strengthens and develops the learner's knowledge and intellectual ability whilst encouraging information autonomy and a high level of self-esteem (Billington, 2000). Enriched levels of knowledge and self-esteem intrinsically motivate the learner to achieve their goals with enthusiasm and the desire to produce their best through self and peer evaluation. Through a feedback mechanism learners can inform their facilitators of their individual needs (Billington, 2000); (Grantharov and Reznick, 2008). Facilitators can ensure that with continuous practice and feedback, learner motivation is always maintained and improved which will eventually lead to mastery of skill (Dreyfus and Dreyfus, 1986).

CHAPTER THREE

LITERATURE REVIEW

3. Introduction

All registered health professionals are required to complete a series of accredited CPD activities each year. They are required to select activities from the CPD hierarchy to meet their particular needs or the demands of their practice environments. This mandate issued by the HPCSA (2006), seems clear, however, in the field of emergency medical care, CPD was only enforced as from January 2007. Consequently, only a basic structure exists without a comprehensive list of available appropriate activities which may not fulfil individual needs. On the subject of clinical skills, when an individual qualifies as an ALS provider he/she becomes the first port of call for all emergencies and starts the chain of medical intervention. Clinical skills constitute a vital part of practice and with a newly acquired advanced skill set; over forty diverse skills may be performed. These extend from highly invasive surgical airway techniques which entails an incision through the cricothyroid membrane to restore breathing in consequence of a blocked upper airway to obstetric manoeuvres which are designed to assist with a delivery of a baby that is trapped in the birth canal. At this early stage in their careers, competence should not be questioned and it is hoped that with experience and enactive mastery experiences the performance of clinical

skills will greatly improve beyond competency to proficiency (Bandura, 1995) Over time in the absence of experience and appropriate CPD, competence may become questionable, therefore, this chapter reviews literature related to CPD and clinical skills.

3.1 Literature search strategy

The literature search was an on-going process that was carried out timeously to remain in touch with developments in the research area. Subject headings and catalogues were searched using the library facility at the Durban University of Technology. Internet explorer was extensively utilized, using defined inclusion and exclusion criteria to locate scientific research articles and reports directly related to the research topic. The search incorporated, the Google scholar search engine and the following data bases; Science Direct, PubMed and Medline.

According to de Vos et al (2005), a literature search strategy is key in identifying previous bodies of knowledge to provide a platform for the study. It is searches that include medical subject headings that yields more appropriate research than searches that are limited to title and text words. The following medical subject headings were used, continuous professional development; appropriate continuous professional development; individual needs for continuous professional development, effective continuous

professional development, needs assessment of continuous professional development, holistic continuous professional development, paramedic frequency of clinical skills, paramedic skills retention, paramedic competence, paramedic burnout, paramedic self-efficacy skills, paramedic motivation.

The searches revealed fair results that included continuous professional development, skills retention and competence with reference to nursing doctors and allied health professionals such as physiotherapists. There were limited sources of literature on ALS including many of which were out-dated. However, the most relevant and related articles were scanned to determine appropriateness. In addition to the traditional searches, the author also received literature from expert colleagues who located articles during their own research which included hand and bibliographical searches.

3.2 The Purpose of CPD

The purpose of CPD is to assist providers of emergency medical care as well as all other health care professionals, to maintain and acquire new and updated levels of knowledge, skills and ethical attitudes that will be of measurable benefit in professional practice and that will enhance and promote professional integrity. CPD is intended to prevent individuals from qualifying in their chosen career and then 'stagnating', or failing to advance

their skills in a safe and acceptable way. Guided by the principle of beneficence and non-maleficence, health professionals should aspire to adhere to standards of excellence in health care provision and delivery (HPCSA, 2006).

Even with the ALS activities that populate the PBEC CPD list, their applicability to what is required to maintain and acquire new and updated levels of knowledge and skills may be questionable. Hence, ALS providers may be attending inappropriate CPD activities and hence, may not meet their individual needs. Although they may be allotted the CPD points enabling them to retain professional registration, they may not be achieving the professional maintenance and development that they require. Consequently, the main purpose of CPD is lost which is for individuals to demonstrate competence by being shaped according to personal learning needs and evaluated according to these (Gosling, 2005).

3.3 What should Continuous Professional Development address?

The emphasis upon the continuous acquisition of knowledge, skills and attitudes to enable competent practice is of paramount importance (Griscti and Jacono, 2006). CPD must consequently attend to the holistic development needs of individuals. Griscti and Jacono (2006) assert that an adequate needs assessment is a basic principle of adult learning which

honours the fact that while people may register for the same activities they all arrive with different experiences and expectations. No two people are the same as they perceive the world in different ways. Thus listening to learner's wants and needs helps shape a programme and has immediate usefulness to adults with measurable outcomes. Knowles (1976) says that dialogue begins long before the programme commences and learning is best achieved through dialogue. Dia means "between", and logo means "word". Hence dia + logue = "the word between us". Training through dialogue has proven to work under diverse and sometimes extraordinarily difficult situations (Knowles, 1976).

In the literature, Schostak (2009), explains that there is "no single, singular or correct way of doing CPD" and that the content, context and processes chosen were dependent upon spheres of practice, learning styles and personal preferences but not limited to scope of practice. In order to reflect a diverse range of content and address expectations and demands of professionals, CPD activities should be expressed as themes which include two modalities, an organizational and individual modality (Schostak, 2009; Pennington, 2011). From the perspective of the individual health care provider, the literature, according to Schostak (2009), Pennington (2011), Staniland, Rosen, and Wild (2011) suggests eight themes. The themes are *context and circumstance*, *knowledge*, *a human factor* which is non-technical skills, *clinical know-how* which is clinical skills and practice, *professional*

values and identities, *decision-making*, *realization and performance* and finally *approaches to identifying learning needs.*

Schostak (2009) explains that the themes mentioned above are multiple domains of actions that although on paper appear to stand alone, in the real clinical day-to-day world interact in a complex way known as pluralism. A brief overview of each of the eight themes will bring to light some of the issues, underlying tensions, learning points and failures health care professionals face in their everyday working life which contributed to the development of these themes. *Context and circumstance* refers to individuals of varying professions that are faced with circumstances that involve: violence and aggression; lack of patient's medical history; a short time in which to see the presenting illness evolve; system versus the individual and making judgement calls under difficult circumstances. *Knowledge*, Wears (2004) states that the nature of knowledge, given that we live in the real-world of changeable and unpredictable situations, places individuals in conditions where time is limited to make decisions with too much information of the wrong kind. *Human factors,* refers to the aspects of working as teams, improving team work and communication activities. Greco, Spike, Powell and Brownlea (2002) state that it is widely accepted in the field of medicine that interpersonal communication is amongst the most important skills to be developed in a health care provider as this is integral for positive patient outcomes. *Clinical know-how,* involves contexts that maintain and improve one's range of skill. *Professional values,* refers to the professional values

such as ethical aspects of patient care. *Decision-making,* According to Croskerry (2003), people take it for granted that postgraduate students have somehow developed the ability to think critically and thus be able to distinguish foreground from distracting background stimuli. The expectation is that they can identify, analyze and challenge assumptions in arguments as well as assess credibility of information, be critically aware of and be in control of their own decision-making even in stressful contexts such as fatigue and impending danger.

Realization and performance, this theme refers to quality assurance and clinical governance where CPD contributes to reducing medical errors. *Approaches to identifying learning needs,* this theme makes reference to identifying one's own personal learning needs, seeking the means by which to fill the gap in one's actual practice (Schostak, 2009; Redwood, Winning and Townsend 2010; Pennington 2011; Staniland, Rosen, and Wild, 2011).

Guly (2000), presents a model on continuous professional development which begins with the individual assessing his/her needs. The model indicates that CPD and high quality care of patients are intertwined as it addresses the individual's needs, improves knowledge and skill thereby ensuring safe practice and improving the quality of care delivered. Refer to Figure 2.

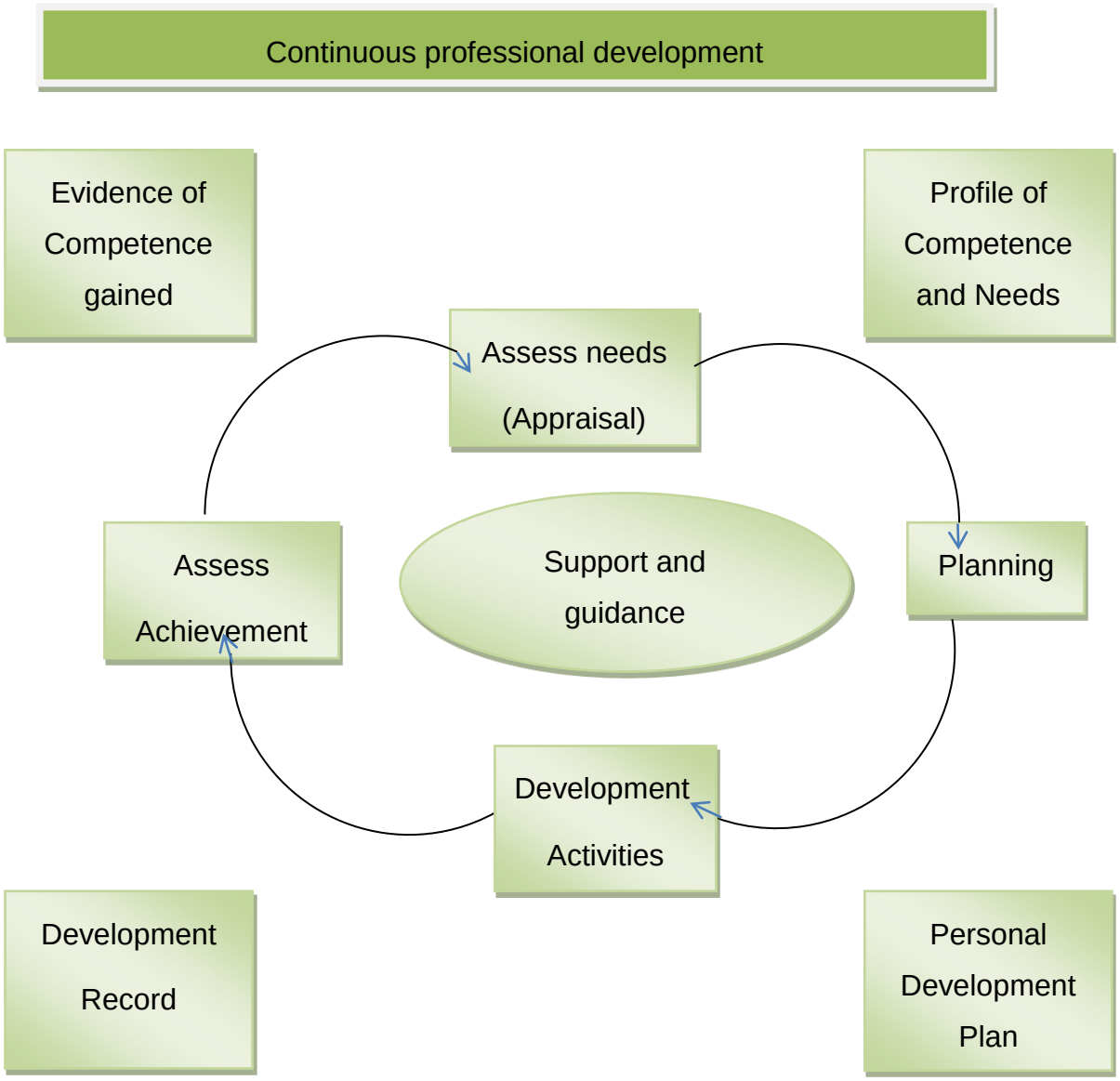

Figure 2: Continuous professional development model

Adapted from (Guly, 2000)

Included with the themes of CPD, the General Medical Council United Kingdom (2004) provides a list of recommendations, which affirms that CPD should cover all areas of professional practice undertaken by the clinician. CPD should also include all seven domains of good medical practice as

these form the framework around which to structure and evaluate learning. These include: good professional practice, maintaining good medical practice, relationships with patients, working with colleagues, teaching and training, probity and health. The HPCSA's standards for good practice include, respect for persons, non-maleficence, beneficence, human rights, autonomy, integrity, truthfulness, confidentiality, compassion, tolerance and justice (HPCSA, 2008).

3.4 Risks of not addressing Continuous Professional Development needs of individuals

With reference to Figure 2, Guly (2000) and Redwood, Winning and Townsend (2010), maintain that the key principle of CPD is individuals taking the lead responsibility for planning and undertaking their own CPD activities. This should ensure that their current practice and future development needs are addressed significantly so that the purpose of CPD is realized. As a result of this premise however, employers may use this as a means of relinquishing responsibility and fail to provide individuals with the support they require in terms of finance, time and guidance. Employers often take the view that CPD is a luxury and not a necessity especially when funding is in question.

The risks, therefore, of not addressing CPD needs of individuals include sub-optimal care of patients, medical errors, lack of competitiveness in the

provision of health care, lowered staff morale, reduced job satisfaction, insubordination, and problems with recruitment and retention of staff (Gibbs 2011, Richman *et al* 2009). These risks may be transferred to patients, individuals and organizations. Firstly, patient care is potentially compromised due to the lack of high quality care; a lack of skilled individuals and low retention of staff which will result in an inequitable provision of services to patients. Secondly, staff shortages may make it difficult to release staff members from clinical work to attend CPD activities. Consequently, staff may not meet the requirement for professional registration, knowledge and skills development framework and personal development needs. Thirdly, organizations will not be able to comply with national directives and guidelines and there would be an inability to meet broad business objectives such as commitments to establish a skilled work force for delivery of the best possible care. The failure of improvement initiatives may also lead to a lack of motivation and morale, further compromising patient care (Gibbs, 2011).

With particular reference to medical error in the out-of-hospital environment, Meisal, Hargarten and Jon Vernick (2008) and Atack and Maher (2010) state that patient safety is a huge priority, however, a large gap exists in the understanding and incidence of out-of-hospital medical adverse events. Alexander Pope said that “To err is human” hence scholarly investigations into the nature and cause of medical adverse events have become common (Meisal, Hargarten and Jon Vernick, 2008). In saying that, data regarding patient safety studies in the out-of-hospital setting are limited and thus

qualitative studies were conducted to gain an in-depth view of EMS providers, administrators and educators on major issues pertaining to EMS patient safety. Atack and Maher (2010) define patient safety as “the reduction and mitigation of unsafe acts within the health care system, as well as through the use of best practices shown to lead to optimal patient outcomes”. According to Meisal, Hargarten and Jon Vernick (2008), the most thoroughly explored patient safety issues in the EMS are limited to errors that can be easily identified. Out-of-hospital endotracheal intubations have been subject to multiple investigations on arrival at the receiving emergency department. Incorrect tube placements that rated as high as 25% have been identified. Errors of omission such as failure to apply a cervical collar on patients with potentially compromised cervical spines, use of supplemental oxygen, failure to check a serum glucose level and vital signs were also investigated.

Errors of commission, such as medication dosing mistakes were common. Many of the types of errors described were in clinical judgement (54%), skill performance (21%) and medication delivery (15%). The majority of the medication errors were associated to paediatric cases especially the use of epinephrine in paediatric cardiac arrest. Similar findings were apparent in the study conducted by Atack and Maher (2010) who reported that a major issue contributing to medication errors was poor clinical judgement, for example failing to give necessary medication or the overuse of sedation in treating a patient with a head injury. It was also reported that as the EMS scope of

practice increases, training did not keep up the pace (“scope creep”) and that the more medications given, the greater the incidence of error.

From these few findings that have been identified, it was recommended to address such issues by supporting a culture of error prevention and surveillance through protected reporting, where employees can file complaints directly by contacting their respective organizations and an EMS education programme system that reviews such errors (Meisal, Hargarten and Jon Vernick, 2008; Atack and Maher, 2010).

3.5 Effectiveness of Continuous Professional Development

Practising doctors from junior to consultant level, institutional officials and managers, Deaneries from Universities across a range of specialities were involved in a major study on the effectiveness of CPD. This study was conducted on behalf of the College of Medicine, Manchester Metropolitan University and Federation of Royal Colleges of Physicians and commissioned by the General Medial Council/ Academy of Medical Royal Colleges, United Kingdom. The objectives were to determine the understanding of: their own learning or learning of other doctors within their organizations, how this learning relates to conceptions of CPD; CPD provision and its uptake and effective CPD. The research was conducted by a team comprised of clinicians, educators and managers whose key aim was

to explore what promotes and inhibits the effectiveness of CPD since there was very little literature to provide sufficient information in this area (Schostak, Davis, Hanson, Schostak, Brown, Driscoll, Starke and Jenkins, 2010).

Schostak *et al* (2010), reveals that effective CPD involves both learning and being fit to practise, knowing both the “why” and the “how” and integrating learning with practice. Effectiveness is facilitated when professionals are able to determine their own learning needs through reflection within the totality of their practice, which means going beyond what is quantifiable. Thus, in principle, effectiveness requires flexibility so that health care providers can participate and be recognized for what they do in the context of their professional practice. Flexibility must be based on self-assessment for CPD activities to be tailor made to an individual’s personal clinical practice. Hence, self-assessment must be rigorous and robust to reflect relevance to their profile of professional practice and performance. This includes activities both within and outside the employing institution. The reason for this is that the learning process goes beyond gaining new knowledge and new experience as it is about being able to transfer the experience and knowledge into practice. This translates to a vital role of CPD which is ensuring that everyday practice is best practice. In addition to flexibility, CPD must be justifiable and transparent for activities to stand up to external scrutiny, in accordance with clinical governance, revalidation and poor performance procedures (Schostak *et al* 2010; Redwood, Winning and Townsend 2010).

According to Griscti and Jocono (2006) and Redwood, Winning and Townsend (2010), CPD has to be more than a set of lists of activities, it has to be appropriate to suit individual needs. There has to be guidance on each activity to show the potential quality of it, so that individuals can get a sense of whether the event is likely to suite their learning style and objectives. The objectives of each individual may differ, but of vital importance, is the fact that clinical decisions must be supported by appropriate CPD activities because these decisions are just not simply theoretical discussions, they are decisions that when taken by health care providers have life or death implications. In the book of Genesis 1:26 we learn that God instilled the “breath of life” in man because God said “Let us make man in our image and likeness”. We are therefore called to respect the sanctity of life and the dignity of the human being as this is paramount for decision making in patient care (Dudzinski, 2006). Traditional medical ethics involves the application of religious principles and in light of the sanctity of life, beneficence and nonmalificence must always be the cornerstone when making decisions which is in keeping with good standards of practice. This then links appropriate CPD with effective CPD, which is explained as follows:

Appropriate CPD activities through active rather than passive learning are vital to effectiveness. Active learning is when a student and facilitator engage in dialogue, sharing in each other’s experiences, fostering collegial relationships and intellectual freedom and encourages experimentation and creativity (Billington, 2000). Hence, there is more probability of knowledge

and skills transfer into practice as evidence suggests when training courses are interactive with as much hands-on real life experiences as possible. Exclusively didactic approaches, conferences and activities without practice have little or no role on improved performance. Interactive courses improve prescribing or dispensing behaviour which improves specific clinical skills and positively effects health care utilization, while promoting favourable patient outcome. Low cost approaches that follow the principles of realistic training with adequate continuing support can be very effective in encompassing lifelong learning (Redwood, Winning and Townsend, 2010).

The outcome of effective CPD is categorically improved patient care. The starting point is participation in relevant CPD programmes. Figure 3 displays the steps leading on from participation to improvement of patient care through effective CPD.

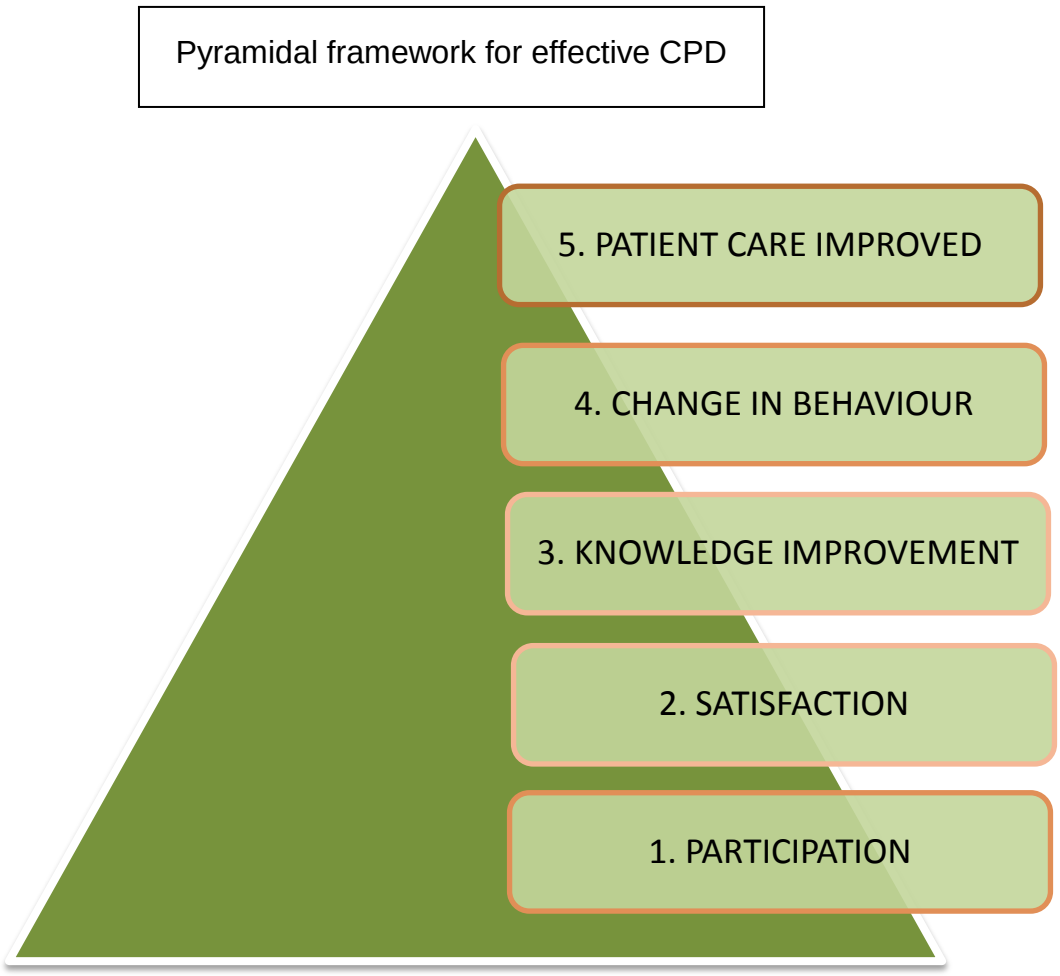

Figure 3: Pyramidal framework for effective CPD

Adapted from Starke and Wade, (2005)

In summary, effective CPD is a systematic process rather than a product; it is about individuals assessing CPD needs, flexibility, justifiability, transparency, and appropriateness. This should then build on what is known to assure competence, enhance professional and technical skills; maintains, enhances and broadens professional knowledge; develops and enhances practice, develops personal qualities; expands as well as helps to fulfil student's potential. It has a positive impact on health care provision and outcomes and

maintains quality and relevance of professional services (Schostak *et al,* 2010; Redwood, Winning and Townsend, 2010; Griscti and Jacono, 2006; Starke and Wade, 2005).

Redwood, Winning and Townsend (2010); Griscti and Jacono (2006) and Starke and Wade (2005) state that effective CPD, will in turn, develop individuals to strive for excellence which will make them competent because they have an up to date knowledge and skills base. They will gain self-efficacy because they have the evidence to show that they can practise effectively and are capable because their CPD skills equip them to meet the changing demands of their practice.

3.6 The relationship between Continuous Professional Development and Competence

Hodkinson (1995), asserts that competence is the primary rationale for CPD. He expresses that the concepts of CPD and competence are closely related as CPD provides the medium for individuals to maintain their competence. Although these concepts are closely related they are not the same since CPD essentially forms the process whilst competence is the state that forms the outcome of CPD. Granted that CPD is an evolving and multifaceted process for both the profession and individuals, it tends to be seen as an expansive concept that emphasises the notion of professional excellence, the

magnitude of professional development and the fulfilment of organizational outcomes. In contrast, competence is seen as more focused on individual's maintenance of a minimum level of safety to practise.

In the context of professional practice, CPD must be able to help individuals to articulate and demonstrate their safe, effective and competent practice. Most individuals' desire and need to engage in continued learning and development for broader and more varied reasons, including new job acquisitions, personal interest and motivation, improving practice and responding to change. Nonetheless, whatever the reasons may be, elements of each of these reasons must relate to maintaining and expanding competence, both in terms of scope and quality (Gosling, 2005).

Fundamentally, CPD is about expanding knowledge and skills whilst competence ensures fitness for practice and fitness for purpose. CPD involves professional knowledge improvement and competence is improvement in line with developments in professional practice and thinking, technological advances and changing priorities in patient care. CPD contributes to patient care and enhances service delivery through continued learning, whereas competence ensures that an individual possesses the minimum level of knowledge and skills required to practise safely and benefit the patient. CPD is about fulfilling the notion of continuous improvement and career progression and competence relates to recognizing that individuals'

scope of practice evolves according to their role, their career progression and area of practice (Gosling, 2005).

CPD and competence forms a link by virtue of, firstly, the ALS providers own professional conduct that makes it clear that all health care providers guarantee safe and competent practice within their scope and this is underpinned by the expectation that establishing maintenance and competence to practise rests on individuals engaging in CPD throughout their professional career. Secondly, the linkage between CPD and competence is explicit within the key statements of The Health Professions Act, 1974 (Act No. 56 of 1974), discusses the relationship between CPD and competence and suggests that there must be supportive, constructive and robust mechanisms for individuals to demonstrate their competence especially by the implementation of clinical governance which encapsulate excellence and safe practice. Additionally, the CPD committee of the HPCSA encourages providers of CPD to offer learning activities in line with adult education principles with the goal of not only updating knowledge and skill but also improving competence and ultimately the performance of the health care provider for the benefit of the patient (HPCSA, 2009).

The emphasis on the relationship between CPD and competence is driven by a growing body of research knowledge and the importance of evidence-based practice which increases the imperative of individuals showing that

their practice is informed by research-based thinking on what is clinically effective (Schostak, 2009). There is also an increasing need for health care providers to demonstrate their credibility, accountability and the right to autonomy. Beyond these clinical governance stresses on achieving explicit links between learning and practice to ensure that poor clinical performance is recognized and addressed promptly (Gosling, 2005).

3.7 Factors that may contribute to frequency of skill performance

3.7.1 Skills retention

In all disciplines of health care, retention of cognitive knowledge and skills ability are recognized challenges (Miller, Issenberg, Petrusa, Gordon and Scott, 2004). Miller *et al* (2004) and Latman and Wooley (2005) state that it is generally agreed that knowledge and skills performance will persistently decline over time. According to the International Liaison Committee Guidelines (2010), knowledge and skill can deteriorate in as little as three to six months after training. Miller *et al* (2004) undertook a retrospective analysis of emergency management of acute myocardial infarction (AMI) knowledge and skills decay, over a five-year period from a randomized set of practicing ALS learners. Learners were grouped into 180-day intervals for comparison and correlation. The authors' concluded that knowledge and skill decay for emergency management of AMI occurs less than 180 days after initial training.

Simlarly, Latman and Wooley's (2005) study of knowledge and skill retention found that skill retention is poor and appears to be directly related to frequency of use. They evaluated the skill competency of ALS providers, which represented 4.1% of individuals trained and certified in the state of Texas. They found that after a period of two years, ALS providers lost 61% of their skills competency. It was also noted in Latman and Wooley's (2005) study that participants in CPD programmes experienced an 11% improvement in retention of skills. Interestingly enough, the employees of privately operated ambulance services retained their basic skills better than members of other types of services. The reasons for this are unclear (Latman and Wooley, 2005). Research conducted by Hammond, Saba, Simes, Crossand Teach (2000) highlighted that 18 months after successfully completing an ALS course, only 75 % of the participating, registered nurses passed the practical assessment components According to Kovacs, Bullock, Achroyd-Stolarz, Cain and Pietrie (2007), airway management skills performance declines early after initial training. The authors' conducted a randomized controlled trial on the effect of educational interventions in promoting airway management skills maintenance. This study conducted by Kovacs *et al* (2007), was conducted to determine the natural history of airway management skill decay. They noted that although airway management skill declined after initial training, independent practice combined with periodic feedback was effective in maintaining performance.

Hubble, Paschal and Sanders (2000); found that a group of practicing ALS providers lacked the knowledge and ability to calculate medication dosages. In addition, it was reported that there were infrequent opportunities to perform this skill in the clinical setting; hence this is likely to be a basis for infrequent performance of skills and poor retention. Hubble, Paschal and Sanders (2000) also noted that medication calculations were not routinely part of continuing education programmes. With regards to opportunities to perform clinical skills, Hein, Owen and Plummer's (2008) study on orotracheal intubation, found that low exposure resulted in a low frequency and unsuccessful orotracheal intubation and may affect levels of confidence (self-efficacy). Various studies have therefore reached the same conclusion: a lack of opportunity to practice a clinical skill leads to a deterioration of competency in that skill.

3.7.2 Self-efficacy

Self-efficacy is the core belief and conviction about one's ability of performing in a certain manner to attain certain goals (Bandura, 1995). Albert Bandura's educational psychology has been vastly recognized by many. Bandura (1995) describes how people guide their lives by their beliefs of self-efficacy, which lies at the core of human functioning. He asserts that a person who possesses the requisite knowledge and skills to perform a task alone is insufficient. That person must have the conviction that he/she can

successfully perform the required task under difficult circumstances on the other hand, if people believe they cannot produce desired effects by their actions; they have little incentive to act. Those with high assurance of their capabilities, approach difficult tasks as challenges to be mastered rather than as threats to be avoided (Bandura, 1995).

A strong sense of efficacy enhances human accomplishment and personal well-being which fosters deep engrossment in activities. These people adapt to a sense that failure may be due to insufficient effort or deficient knowledge and skills which are acquirable. They approach threatening situations with assurance that they can exercise control over them and recover quickly from failure and setbacks (Bandura, 1995). In contrast, people who doubt their capabilities shy away from difficult tasks which are viewed as personal threats. They dwell on their personal deficiencies, and they slacken their efforts and give up quickly. It does not require much failure for them to give up faith in their capabilities and fall easy victim to stress and depression. Self-efficacy affects an individual's choice of activities, effort, and persistence. According to Bandura (1995), those with low self-efficacy for accomplishing a specific task may avoid it, while those who believe they are capable, are more likely to undertake the task. Bandura (1995) further asserts that in order to succeed, people need a strong sense of task-specific self-efficacy, tied together with resilience to meet the unavoidable obstacles of life (Bandura, 1995).

"Learning would be exceedingly laborious, not to mention hazardous, if people had to rely solely on the effects of their own actions to inform them what to do. Fortunately, most human behavior is learned observationally through modeling: from observing others one forms an idea of how new behaviors are performed, and on later occasions this coded information serves as a guide for action." (Bandura, 1995).

People's beliefs about their efficacy can be developed through four main sources of influence. The most effective way to create a strong sense of efficacy is through (a) enactive mastery experiences (actual performances); followed by (b) observation of others (vicarious experiences); (c) forms of persuasion, both verbal and otherwise; and (d) physiological and affective states from which people partly judge their capability, strength, and vulnerability to dysfunction. Of these four information sources, research has shown that enactive mastery experiences are the most influential sources. (Bandura, 1995)

3.7.3 Cognitive overload

Laxmisan, Hakinzada, Sayan, Green, Zhang, and Patel (2006) , define cognitive overload as a state of having more information available that one can readily assimilate, which means that people have difficulty absorbing the information into their knowledge base. The authors claim that this difficulty impacts on a person's decision-making and judgment by causing stress and cognitive impediments, such as confusion, uncertainty and distraction which

in turn contributes to medical error. In today's age of technology, the ability to comprehend multifaceted cognitive processes has become a requirement for ALS providers. However, once newly qualified, ALS providers are required to immediately adapt to an on-demand business culture including having to synthesise knowledge and skills which they have to systematically transfer from the learning environment to daily life. The requirement for ALS providers to cognitively manage multifaceted processes therefore increases. To reduce cognitive overload, instructional designs that deliver learning strategies need to be planned in such a way that it meets with the learner's cognitive ability. This can be achieved by simplifying processes whilst maintaining the fundamentals to ultimately improve memory retention and performance.

3.7.4 Motivation

Naude and Rothman (2006), explains that motivation is a set of reasons for engaging in a particular behaviour, especially human behaviour. Motivated employees tend to look for better ways to do a job; are more quality oriented and more productive which leads to improved performance. Accordingly, they are motivated toward particular goals that leads to increased effort and energy; increases initiation of, and persistence in activities and also enhances cognitive processing (Naude and Rothman, 2006). Their study showed that a lack of job resources and a weak sense of coherence predicted emotional exhaustion and decreased work engagement.

3.7.5 Job burn out

South African out-of-hospital emergency care providers are immersed in a vast amount of out-of-hospital trauma care and unfortunately tend to “burn out” quickly as observed by MacFarlane, Van Loggerenberg and Kloeck (2005). Job burnout is a state of physical, emotional and mental exhaustion caused by long term exposure to demanding work situations. Some of the symptoms are: lack of energy to be consistently productive; no longer feel satisfaction from achievements; more irritable and less patient with co-workers, customers, clients or patients (Shiron, Nirel and Vinokur, 2006).

One of the main causes is extremes of activity, this is when a job is always chaotic, and one needs constant energy to remain focused, leading to energy drain and job burnout. This is apparent in some of the private emergency medical services were ALS providers are required to work twenty, twenty four hour shifts a month (DuRandt, 2009). Shiron, Nirel and Vinokur (2006) undertook a study on the quality of care of physicians based on three factors: work overload, autonomy and burnout. They concluded that all three factors collectively impact negatively on quality of care. Nirel, Goldwag, Feigenberg, Abadi and Halpern (2008), found that in their study on ALS graduates, 35% reported burnout from physical fatigue and 15 % reported burnout from emotional and cognitive demands.

3.7.6 Geographic location

Geographical location may play a role with regard to the possible difference of skills practiced by urban and rural ALS providers. Response times may be a contributory factor as this may be because lengthy journeys in response to emergencies may prevent practising of skills because the patient may have been transported privately or demised in the time it took to respond. According to MacFarlane, Van Loggerenberg and Kloeck (2005), rural and urban response times vary greatly; the national yardstick is less than 15 minutes for urban responses, and an average of 40 minutes for rural responses due to the proximity of EMS facilities.

Differences in the nature of emergencies may reveal that urban and rural ALS providers may have different specific skill needs as was identified in a study undertaken by Marais, De Villiers, Kruger, Conradie, Jenkins, and Reuter (2007), in the Western Cape who discovered that education and training of general practitioners for rural practice needs specific attention. Christopher (2007) found that differences and difficulty of ALS providers in application of HPCSA protocols were due to geographical location. The above implies a need to study responses from both urban and rural providers as their operational contexts may differ, thereby impacting on their CPD needs. This may also be true for the South African ALS providers working abroad.

3.7.7 Appropriateness of Continuous Professional Development activities for ALS providers

No literature could be identified to address profession specific CPD with regard to appropriateness of activities. This further emphasises that the current South African situation with ALS CPD is a unique context and warrants extensive investigation.

3.7.8 Conclusion

From this review, it would appear that even though CPD is a legal requirement for ALS providers, it is also an ethical consideration, grounded equally in the principle of non-maleficience and beneficience. This requirement of CPD activities lacks clarity on what the expectations of such activities will be or are at present. There is no evidence to suggest a scientific and educationally sound basis to guide the implementation of CPD for this cohort of health care providers in South Africa. It is precisely this gap in the body of knowledge which this study will address. To this end, mutually non-exclusive factors of skills exposure (which is central to skills competency) will be enquired into-such as skills retention, cognitive overload, self-efficacy, motivation, job burn-out and also the work environment as these may determine minimum or maximum skill proficiency which are particular to different patient cohorts.

CHAPTER FOUR

STUDY DESIGN AND RESEARCH METHODS

4. Introduction

Brink (2006) and Polit and Beck (2010) described the importance of employing appropriate research methodology to ensure validity of the findings. This chapter explains and justifies the design and research methods for this study.

4.1 Study design

This study was a quantitative non-experimental design as it focused on describing concise concepts. Kelley, Clark, Brown and Sitza (2003) and De Vos (2005) stated that, within a well-defined context descriptive research is used to provide an accurate description of the characteristics and associations for a given population, situation or frequency within which certain phenomena occur. The purpose of this research was to identify gaps in the professional development of South African ALS providers, hence the study was designed to describe through a baseline needs assessment, the frequency of ALS clinical skills being performed, what, where and why CPD activities were being undertaken and the appropriateness thereof (Figure 6, 7 and 8). The description through a needs assessment provided a systematic

exploration of ALS clinical skills and CPD in relation to the way things were and the way they should be. By conducting a needs assessment, it incorporated: a gap analysis, which was to check actual performance, identify priorities and important information, investigate causes of performance problems and finally identify possible solutions and growth opportunities to inform policy and resource allocation (Polit and Beck, 2010).

4.2 Study setting

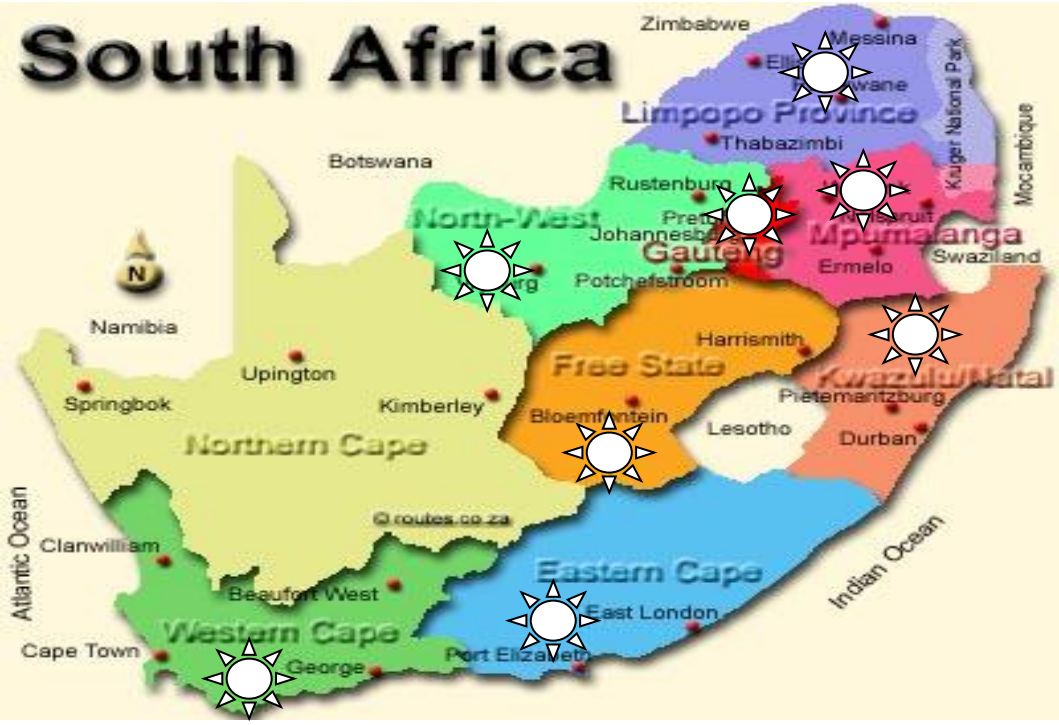

Figure 4: Map of South Africa

(South Africa.info, 2011)

☼ - Provinces included in this study

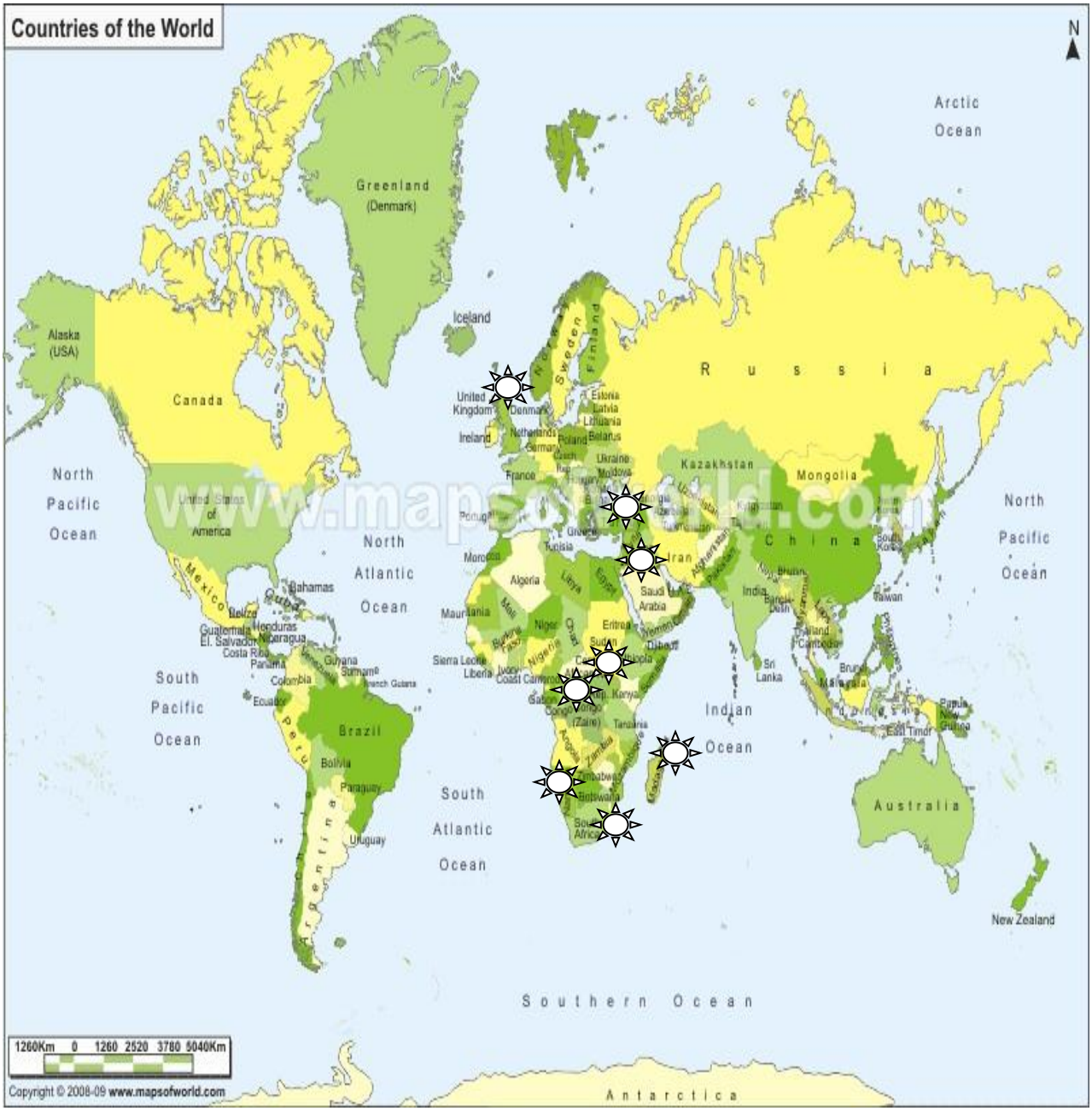

Figure 5: Map of the World

(www.map of the world .com)

☼ - Eight countries included in the study

4.3 Study, target and sample population

The study population was 1631 ALS providers registered with the HPCSA. The target population was 318 ALS providers as the entire study population could not be accessed via the HPCSA data base due to the lack of accessibility and current, updated contact details. The target population contact details were accessed through the Higher Education Institutions. Of the 318 distributed questionnaires, 140 ALS providers completed and returned the questionnaires. This constituted a 45% return rate and formed the sample population. The final study population was 140 (N).

4.4 Sampling method

Despite attempts to attain contact details of the target population of 1631 ALS providers registered with the HPCSA, only 318 could be verified as current. Convenience sampling was used as completion and return of the distributed 318 questionnaires implied automatic consent to participate in the study (Annexure 5). According to Polit and Beck (2010) convenience sampling is using those respondents that are willing to participate in the study.

4.5 Data collection method and instrument used

Data was collected under controlled conditions and incorporated logistic and deductive reasoning through a structured survey. According to Polit and Beck (2010) a survey can prove to be particularly useful in describing what exists, the frequency and distribution of events and variables. Similarly, Kelley *et al* (2003) affirmed that a survey is designed to provide a snapshot of how things are at a specific time. The data collection instrument used was through a self-report, limited to a precise and concise questionnaire (Annexure 5). The choice of a questionnaire was based on its ability to provide wide geographical coverage and to gather individual responses in a standardized way. Cost was kept to a minimum as it was relatively cheap whilst also maintaining respondent confidentiality. Both electronic and hard copy formats were available, due to a portion of the population not having access to an e-mail facility. For those respondents' questionnaires was distributed *via* fax or post. The electronic format was ideal as it was convenient and was filled out immediately and returned, contributing to a reduction in data collection time as opposed to individual postage to prospective participants (Polit and Beck, 2010).

To ensure a good questionnaire return rate, the researcher e-mailed and/or telephoned ahead and briefly explained to the ALS provider the nature and importance of the study. Thereafter, the questionnaire and information letter was delivered. To stress the questionnaire's importance, reminder e-mails,

and letters and repeat faxes were sent timeously. For those respondents that could be reached, the researcher noticed that after an explanation and a brief question answering session, most ALS providers eventually responded. The researcher collected, compiled and coordinated all returned questionnaires to ensure confidentiality and a trouble free data collection process. When developing the collection tool, the researcher was cognizant of low response rates to questionnaires so the aim was to attract the respondent by adopting a simple, concise, appealing design which incorporated mainly tick boxes and a limited number of explanations. This improved ease of answering and reduced time spent answering the questions (Polit and Beck, 2010). To minimize the risk of questions being avoided, misinterpreted or confused, the appropriate vocabulary and grammar for the target population was used with the avoidance of ambiguity, confusion and vagueness. Furthermore, no emotional, leading, double barrelled, negative or double negative questions were incorporated into the questionnaire.

The following figures are representative of the questions and categories adapted for the research tool, which is in keeping with the research objectives (Figures 6, 7 and 8).

Figure 6: Objective one

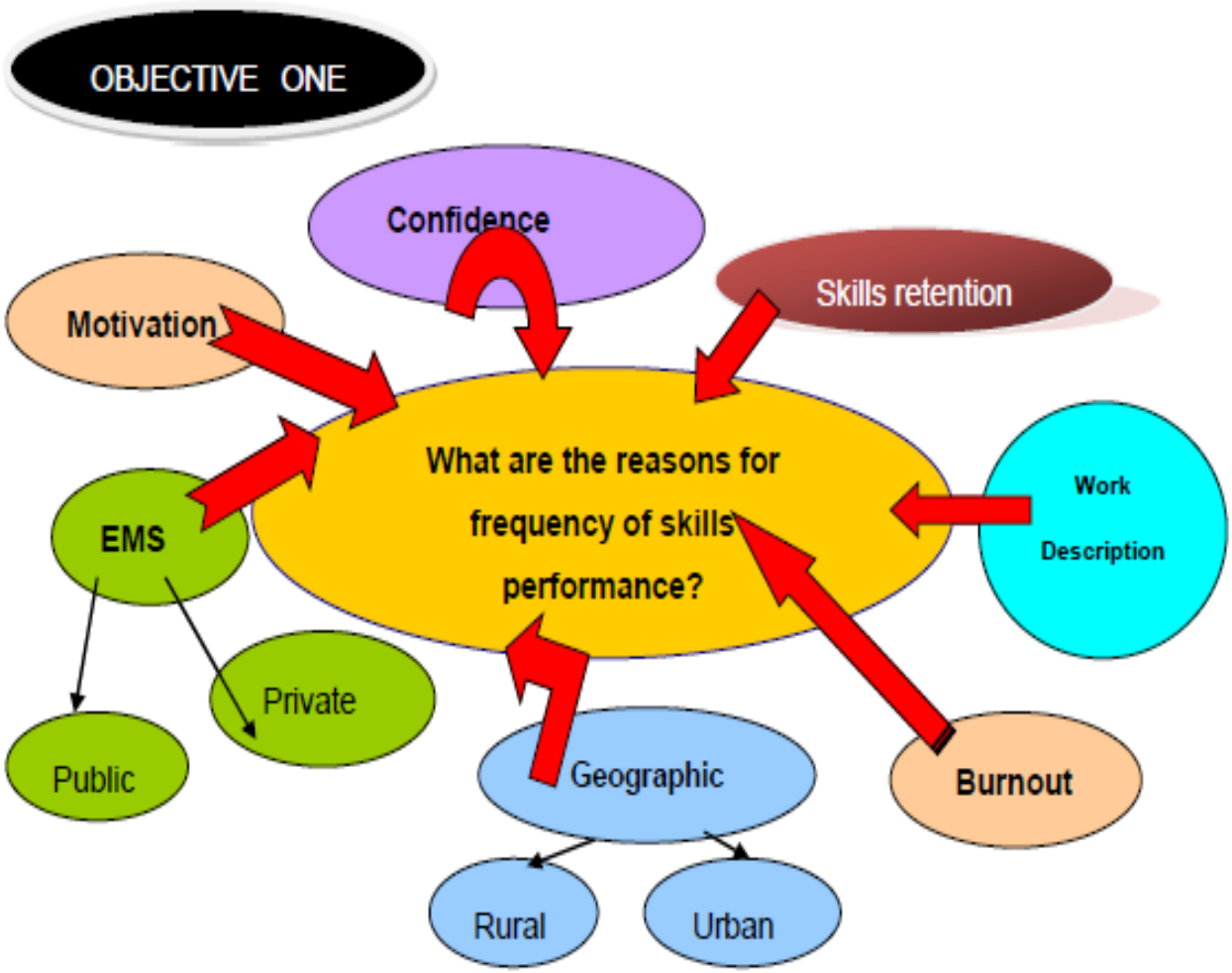

Figure 6 depicts the factors that were used in the formulation of the questions for the data collection tool that addressed objective one of the study.

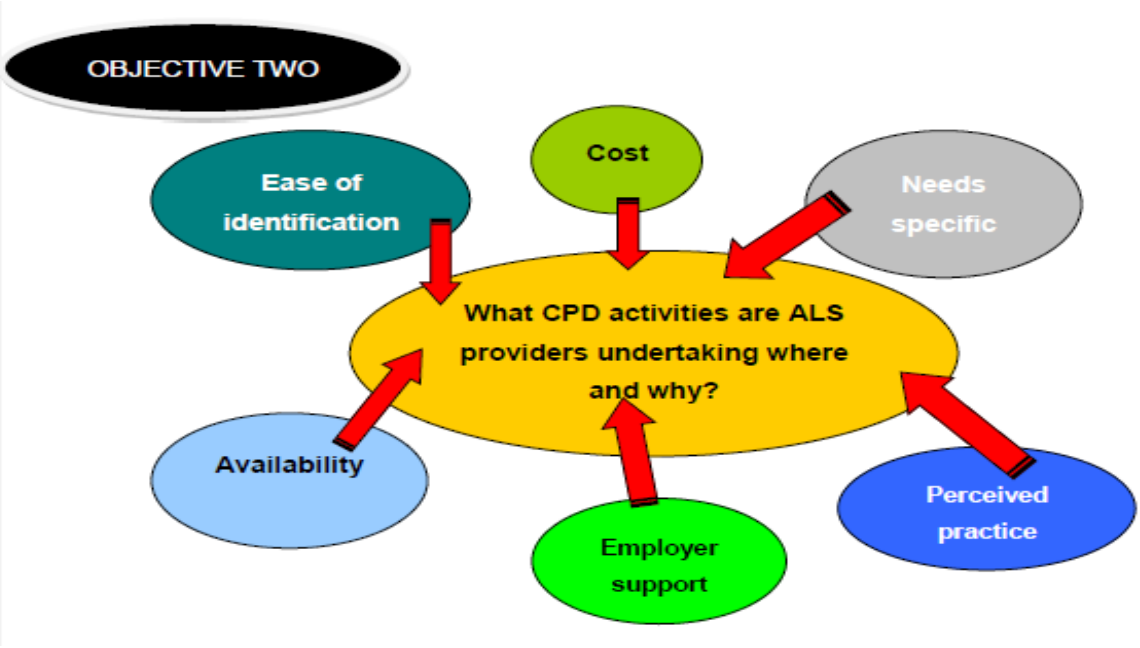

Figure 7: Objective Two

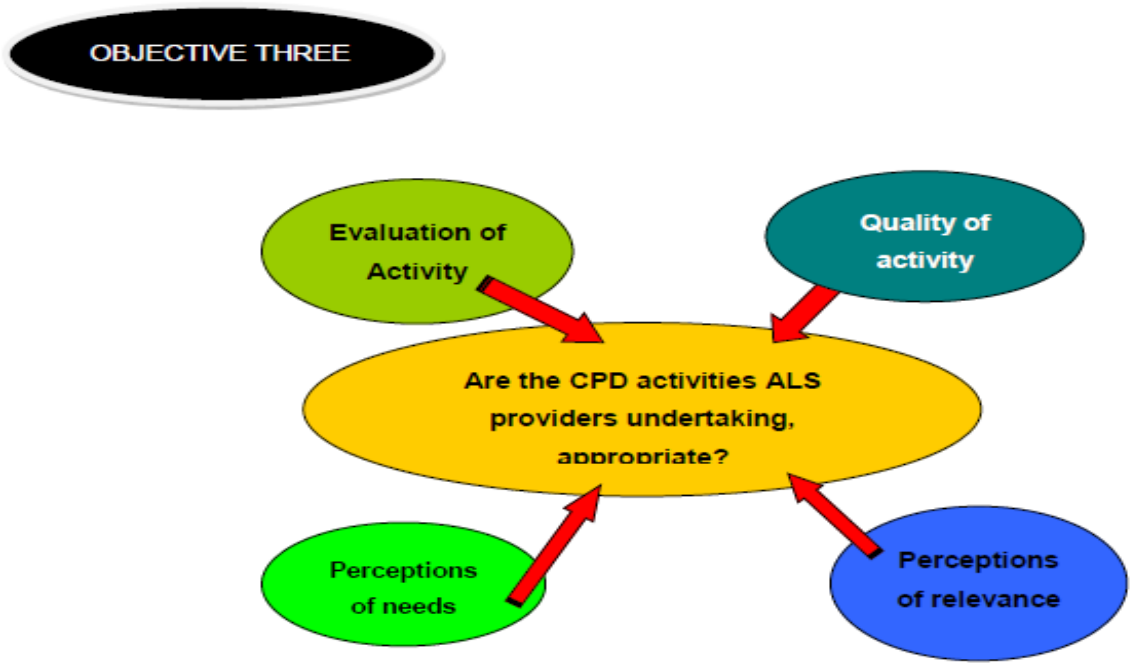

Figure 8: Objective Three

Figure 7 and 8 depicts the factors that were used in the formulation of the questions for the data collection tool that addressed objective two and three of the study.

4.5.1 Testing the data collection tool

According to Brink (2006) and Kelley *et al* (2003) a pilot study, also known as a “preliminary study” is a small scale study to investigate the feasibility of the main proposed study and to detect possible flaws in the data collection instrument. Prior to the pilot study, an expert panel comprising of the academic staff of the Department of Emergency Medical Care and Rescue, Durban University of Technology collectively appraised and commented on the design, appropriateness and manner in which the questions were asked pertaining to the research objectives. The pilot study was then conducted via e-mail on five independent ALS providers (Annexure 2) as the main study was predominantly an e-mail survey. The information letter (Annexure 3), was pasted as a message whilst the questionnaire formed the attachment. The results from the pilot test revealed that all the participants were generally satisfied with the questionnaire, however, three participants mentioned that thinking about what and where CPD was done took a fair amount of time. The average time for completion of the questionnaire was 20 minutes.

4.5.2 Validity and reliability of the research Instrument

The central question according to Brink (2006) that determines the concept of validity and reliability is whether the researcher yielded data that reflects the truth. The truth is achieved through both reliability and validity as they

share a close relationship. Reliability is the accuracy with which the research instrument measures the responses whilst validity is the degree to which the instrument measures what it is supposed to measure. Polit and Beck (2010) states that the research instrument must fulfil its purpose by collecting the intended data in order to provide the correct information to describe the area of enquiry.

To ensure reliability and validity of the research instrument, the researcher applied face and content validity. Face validity, although regarded as a weak measure by Brink (2006) was used to determine readability and clarity of the variables. Content validity was used to assess how well the research instrument represents all the components of the variable to be measured. By applying content validity, the assessment measured the overall suitability for use by evaluating what the research instrument measured and also what it does not measure (Brink, 2006). As mentioned in section 4.5.1, all the fields of the research instrument was interrogated internally by the expert panel and externally through the pilot study to attain the intended purpose of the data collection for the purpose of the study.

4.5.3 Internal and external validity of the study

Polit and Beck (2010) states that internal validity denotes the degree to which it is possible to make an inference that the independent variable is truly causing or influencing the dependant variable. Possible threats to the study's

internal validity could be selection threat, which encompasses biases when people are not assigned randomly to groups. For this study, as presented in section 4.4, participants were sampled through convenience sampling as all the South African and International participants that completed and returned the questionnaire were selected to form the sample population. Of the 318 questionnaires distributed, the sub numbers of questionnaires distributed to ALS providers were representative of the number of ALS providers per province.

According to Polit and Beck (2010), external validity is the degree to which relationships hold true to different people, conditions and settings. Replication is an important concept relevant to external validity as multiple site studies are powerful and produce more confidence in the generalizability of the results. The diverse sample of the study can test whether study results are replicated in subgroups. This study produced a diverse sample as it tested eight countries including South Africa and eight provinces within South Africa.

4.5.4 Ethical Considerations for survey research

Of particular importance when conducting a survey is safeguarding the participant and protecting their right to self-determination by obtaining their informed consent (Polit and Beck, 2010). The purpose and nature of the study, including any risks and benefits was fully disclosed to the respondents

so that informed decisions could be made regarding their participation in this the study (Annexure 3). All individuals had the right not to participate if they so wished, as their participation were entirely voluntary. Completing and returning the questionnaire implied that consent was given (Annexure 5).

Careful planning ensured that respondents were protected from harm and discomfort. The respondent's privacy was respected throughout the research process. A pilot study was conducted to root out any questions that were viewed as sensitive in nature. This study had no adverse social, physical or financial implications. The participants were assured that any data collected and results thereof will not be used against them but rather for the benefit of the profession (Annexure 2). The participants were treated as anonymous; they were free from coercion of any type, free from any cost and were not compensated in any form (Annexure 3). Respondent were able to withdraw from the study at any time during the duration of the research process (Annexure 3). The respondent's privacy was strictly observed throughout the entire research process, as no names appeared on the data collection tool or the result report forms. All correspondence was handled with the utmost confidentiality. Only the researcher and supervisors had access to the raw data (Annexure 3).

4.5.6 Ethical approval

An application for ethical approval was approved by the Durban University of Technology, Faculty of Health Sciences (Annexure 4).

4.5.7 Research process

The research process included attaining contact details (e-mail addresses, postal addresses, cellular numbers, home and work telephone numbers) for as many ALS providers registered with the HPCSA as possible. This process proved to be very difficult and eventually 318 of 1631 ALS providers contact details were attained and verified. The individuals were contacted and the study was explained (Annexure 3). Addresses were once again verified. The questionnaire (Annexure 5) was distributed, addressed to individuals to demonstrate their importance of contributing to this study. The questionnaire were collected and collated by the researcher and all other ethical considerations were adhered to.

4.5.8 Problems encountered with data collection

A few problems were encountered with data collection. Return times of the questionnaire were too long. Many respondents had to be reminded a few times, both by telephone and e-mail and it was only after weeks and for some respondents, months that the questionnaire was returned. Some of the

reasons the researcher received were: that they were too busy, could not find their CPD portfolio or forgot about it. Only a few respondents encountered difficulty opening the questionnaire which was in excel format. The researcher changed the format and re-sent the version applicable to their software. Many respondents omitted to insert information highly applicable to the study, hence, the missing information made it difficult to achieve consistent respondent numbers during data analysis.

4.5.9 Limitations of the study

Whilst the intention was to recruit a much larger sample size of ALS providers registered with the HPCSA, working domestically and abroad, this was not possible due to accessibility to the ALS data base and the lack of current, updated contact details. The study only included the ALS population and not the BLS and ILS population.

The frequency of ALS clinical skills performance was assessed but did not include the success rates of those clinical skills performed. Frequency of clinical skills was assessed over a twelve month period. An assumption was made that on completion of their qualification that ALS providers are competent with ALS skill performance. Evidence has shown the skills degradation can occur in as little as six months after training. The average years of 140(N) respondents that were registered with the HPCSA were in excess of six years (Annexure 6). Competence of ALS skills performance

was not assessed. Respondents were asked to indicate reasons for attending CPD activities, but they were not asked to indicate reasons for not attending CPD events. They were also asked to indicate if the CPD activities they attended were appropriate. The question did not ask them to specify which facet of their education they found it to be appropriate for.

4.6 Statistical analysis

The raw quantitative data collated was subjected to descriptive statistical analysis using the PASW statistics version 18.0. The analysis was conducted through descriptive statistics, frequency distributions, and measures of central tendency to determine frequencies in line with the objectives. A reliability test was computed by taking several measurements on the same respondents with Chronbach's alpha, which is a measure of internal consistency. A reliability coefficient of 0.70 or higher was considered as "acceptable". A coefficient alpha ranges in value from 0-1. A high coefficient alpha indicates more reliability for the data processed with that instrument. A test result was undertaken using Chronbach's alpha for the rating of the personal level of confidence for 41 skills. The overall reliability score was 0.966, which indicates a high degree of acceptable, consistent scoring for the rating levels of this research. Inferential statistics was also used to describe the data in terms of differences identified. A "probability" or *"p"* value was generated from a test statistic. The statistical test used was a Chi-squared

test (χ^2). A statistical significance of a 5% level was achieved if the *p* value was less than 0.05. Inferential statistics were conducted across all variables; however the following results presented are limited to those of significant importance to the objectives (Willemse, 2009).

4.7 Conclusion

Despite the problems encountered with data collection and the limitations of the study, it was possible to obtain valuable information on frequency of ALS skills performance and CPD activities undertaken.

CHAPTER FIVE

RESULTS

5. Introduction

This chapter provides a detailed analysis and description of the research findings. The results are presented below as tables and figures which are outlined in accordance to Annexure 5.

5.1 Demographic data results

A descriptive analysis of the 140 (N) respondents work environment is presented in this subsection. To begin with, the country that respondents are practising in is presented, followed by the location of the South African respondents within the provinces. The respondent's ages and the average number of years professionally registered with the HPCSA, their professional qualification, the EMS setting ALS providers are currently employed in, including the setting they have been employed in mostly since professional registration and the kind of geographical setting currently employed in will follow this. The final three demographic variables include their current work title, work mode and type of shift work the respondents are involved in.

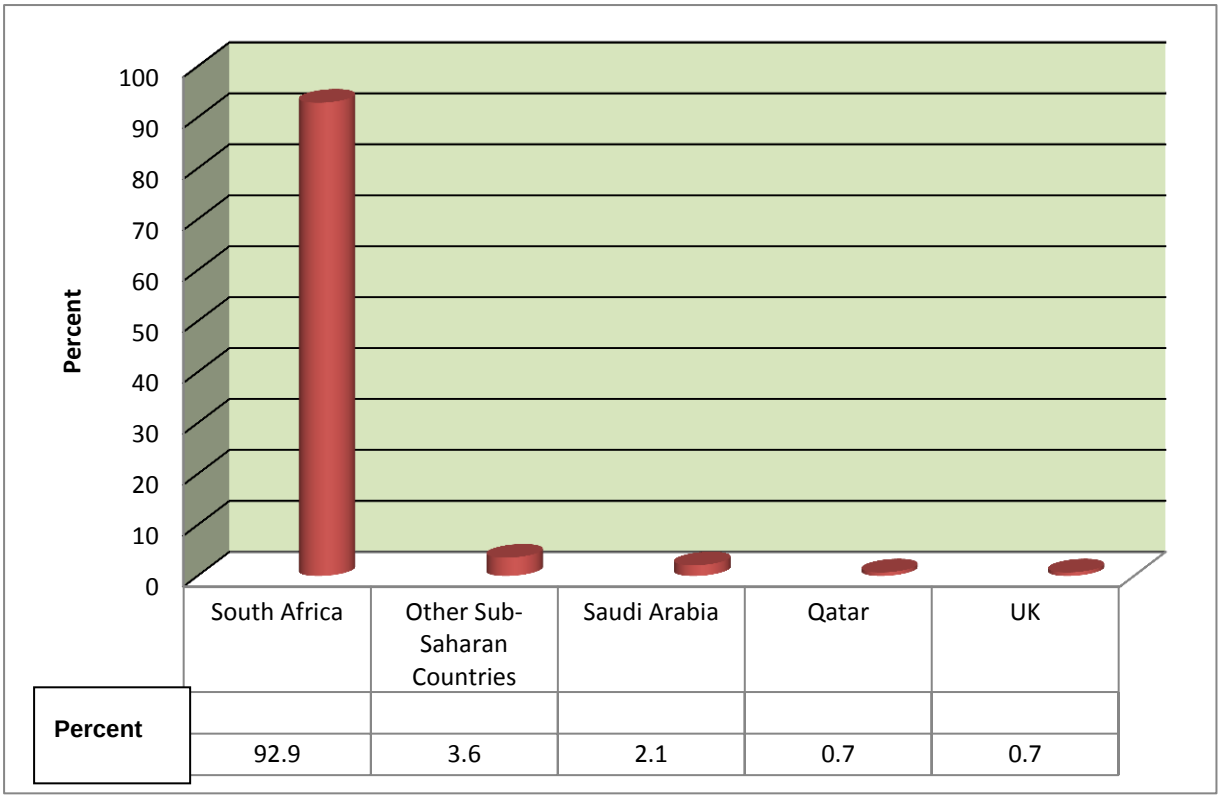

Figure 9: Respondent Location

The total number of ALS providers that responded to the survey was 140 (N). Figure 9, illustrates the eight countries in which the respondents are located in. Of the eight countries, South Africa is represented by 130 (92.9%) of the total population. These respondents reside and are employed within eight of the nine provinces in South Africa, refer to (Figure 10). Seven other countries constituted the remaining number of respondents which totalled to 10 (7.1%). The respondents' distributions for the seven countries were: 1 (0.7) is employed in the United Kingdom (UK), 3 (2.1%) in Saudi Arabia, 1 (0.7) in Qatar. The remaining 5 (3.6%) respondents were located in other sub Saharan countries that include, 2 (1.4%) in Namibia, 1 (0.7%) in Mozambique, 1 (0.7%) in Ghana and 1 (0.7%) in Congo.

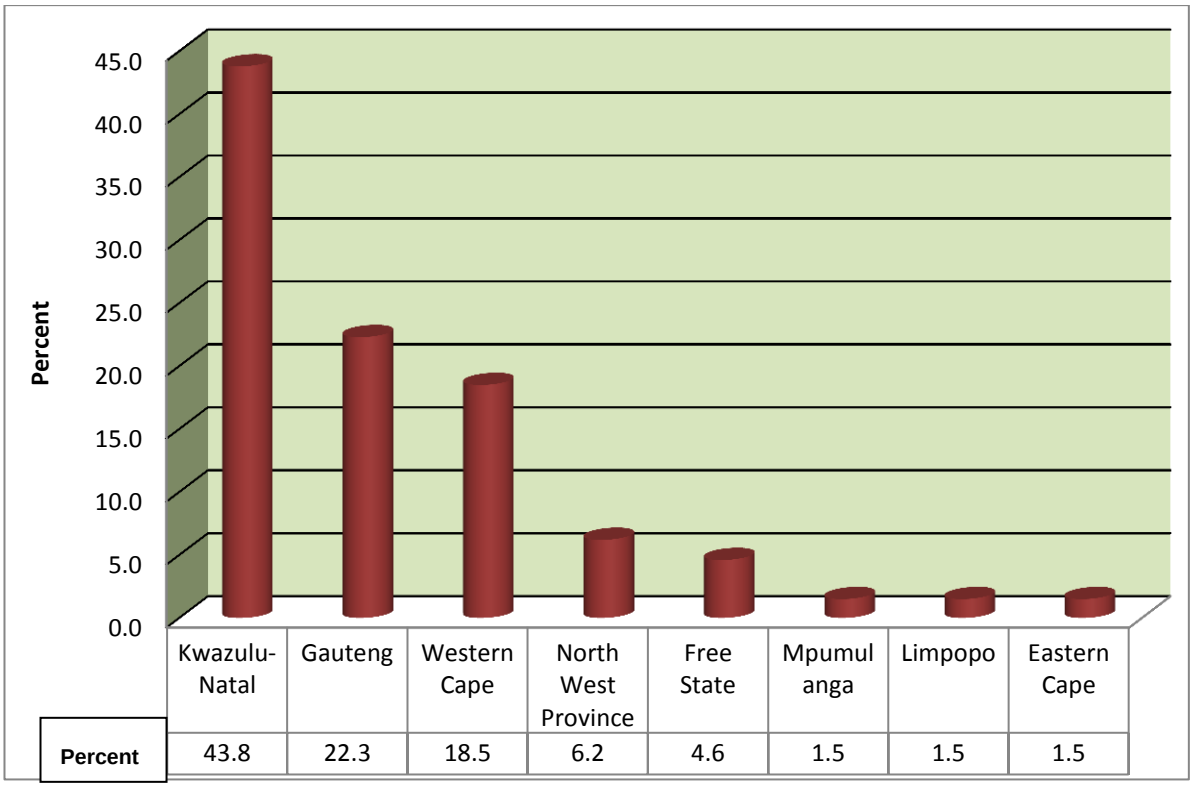

Figure 10: **ALS distribution per province in South Africa**

Figure 10 shows the South African respondents distribution within eight provinces which are as follows: Kwazulu-Natal 57 (43.8%), Gauteng 29 (22.3%), Western Cape 24 (18.5%), North West Province 8 (6.2%), Free State 6 (4.6%) and Mpumalanga Province, Limpopo Province and Eastern Cape were represented equally with, 2 (1.5%) each.

Table 1: Age and professional registration with the HPCSA

	What is your age?	How long have you been professionally registered with the HPCSA as an advanced life support provider?
		133 (N)
		7
Mean	**33.29**	**6.83**
Median	**32.50**	**5.00**
Mode	**30**	**2**
Std. Deviation	7.149	5.611

The respondents were asked to indicate their age and how long they had been professionally registered with the HPCSA. Measures of central tendency were used to show the mean, median and mode. This was done to summarize each variable into a single figure. The mean is an arithmetical average of the scores in the distribution. The total number in the age distribution is 130 (N) with a mean age of 33.29 years. A mean term of 6.83 years emerged as the number of years ALS providers were professionally registered with the HPCSA. The age distribution ranged from 21 to 53 years, with the median being 32.50. The median for the number of years registered with the HPCSA was 5.00. The mode is the value that occurs most frequently in the distribution. An age of 30 years, occurring 9 times and a 2, year registration term occurring 19 times appeared most frequently. The median result indicates that the average ALS provider is a mature and experienced individual.

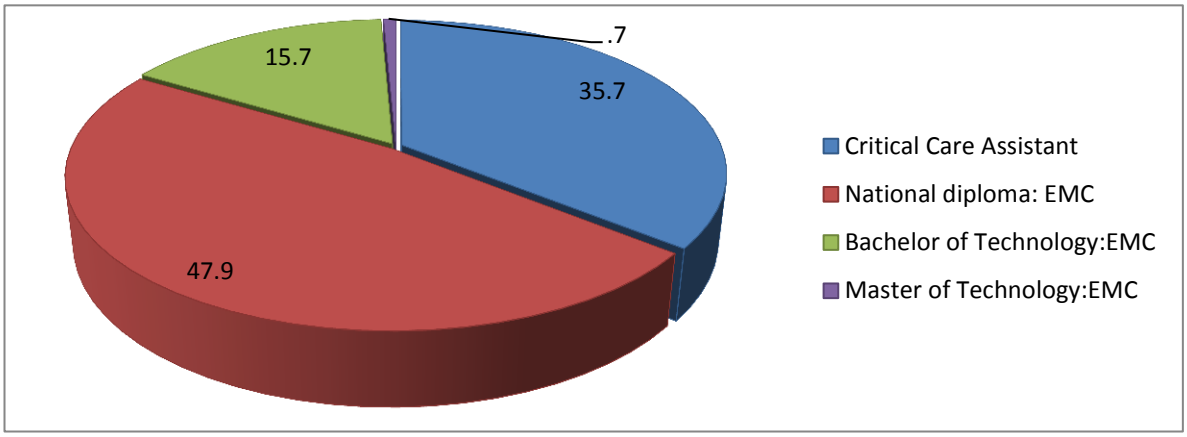

Figure 11: Advanced life support qualification

The highest qualification for the total respondents of 140 (N) comprised of Critical Care Assistants 50 (35.7%), National Diploma: EMC 67 (47.9%), Bachelor of Technology: EMC 22 (15.7%) and Master of Technology: EMC1 (0.7%).

Table 2: Current EMS settings and EMS setting in which ALS respondents are mostly employed in

CURRENT EMS SETTING			EMS SETTING MOSTLY EMPLOYED		
SETTING	FREQUENCY	PERCENTAGE	SETTING	FREQUENCY	PERCENTAGE
Public	n (55)	39.3 %	Public	n (69)	49.3 %
Private	n (35)	25.0 %	Private	n (45)	32.1 %
College	n (36)	25.7 %	College	n (17)	12.1 %
University	n (9)	6.4 %	University	n (5)	3.6 %
Other	n (5)	3.6 %	Other	n (4)	2.9 %
Total	**140 (N)**	**100.0 %**	**Total**	**140 (N)**	**100.0 %**

Table 2, depicts the frequency data for the EMS setting in which ALS providers work. Fifty-five (39.3%) work in the public sector whilst 35 (25%) work in the private sector. Forty-five (32.1%) of the sample work as lecturers and tutors in the Universities and Colleges. Universities were represented by 9 lecturers (6.4%) and the provincial colleges were 36 tutors (25.7%). The category labelled “Other” is represented by 5 (3.6%) respondents that work outside of an EMS who are contracted to mines, oil rigs and offshore work. They are deployed where there is a need for ALS and once the short term contract is completed they return to South Africa. The respondents were asked to indicate the EMS setting in which they were mostly employed, of which: 69 (49.3%) have worked mostly in the public sector, 45 (32.1%) in the private sector, 17 (12.1%) in Colleges, 5 (3.6%) in Universities whilst 2.9% worked mostly outside these categories.

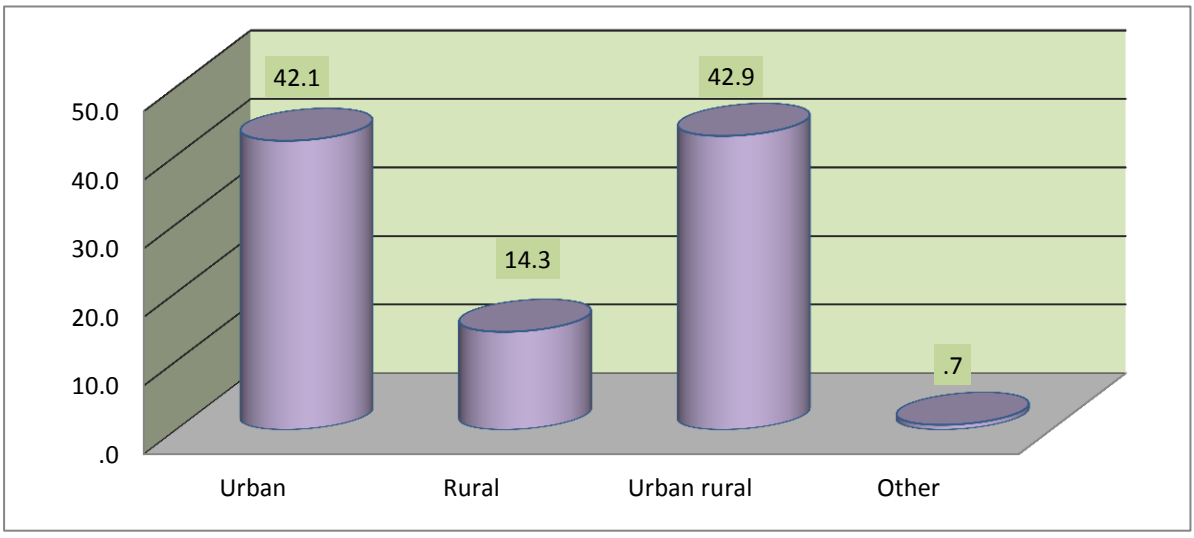

Figure 12: Geographical setting

Figure 12, shows that ALS providers worked in various geographic settings. Of the total140 (N) respondents, 59 (42.1%) of the respondents worked in an urban setting, whilst 20 (14.3%) worked in a rural setting and 60 (42.9%) worked in both geographical settings. The “Other” category 1 (0.7%) ALS respondent worked on an off shore vessel.

Table 3: Current work title and shift worked

CURRENT WORK TITLE			SHIFT WORKED		
TITLE	FREQUENCY	PERCENT	SHIFT	FREQUENCY	PERCENTAGE
Duty ALS	n (69)	49.3 %	Day	n (17)	12.1 %
Manager	n (28)	20.0 %	Day/ night	n (66)	47.1 %
Lecturer	n (36)	25.7 %	Office	n (51)	36.4 %
Other	n (7)	5.0 %	Other	n (6)	4.3 %
Total	**140 (N)**	**100.0%**	**Total**	**140 (N)**	**100.0 %**

With regard to work title, nearly half 69 (49.3%) of the ALS providers belong to the sub-category Duty ALS. The Duty ALS provider’s primary role is to deliver the highest level of care available in the out-of-hospital environment. This is done either through primary despatch, junior crews that require ALS assistance for continued management of their patients or inter-hospital transfers; for example, a neonatal transfer requiring incubation and mechanical ventilation. Hence, they are in regular contact with patients. Their duty period is usually a twelve hour shift cycle. Table 3, illustrates that 83

(59.2%) worked a twelve hour shift of which 17 (12.1%) worked during the day and 66 (47.1%) worked a combined shift cycle of day and night.

The remaining 71 (50.7%) fit into the second sub category of non-duty ALS which included 28 (20.0%) managers and 36 (25.7%) lecturers. These individuals were ALS providers whose primary role was to manage operations and lecture respectively. Thus, they were not in regular contact with patients. These ALS providers primarily worked office hours, 51(36.4%) as illustrated in Table 3. But many perform duty ALS shifts outside their primary role on an overtime basis and through this mechanism have contact with patients. The third categories are respondents who indicated the category “other”. These 7 ALS providers (5.0%) worked in hospital casualties and/or clinics were they receive patients and render ALS in conjunction with nurses and doctors. Those respondents under shift worked 6 (4.3%) who indicated the category “other”, usually worked on a standby basis or a twilight shift, for example: a 16H00 to 00H00 shift.

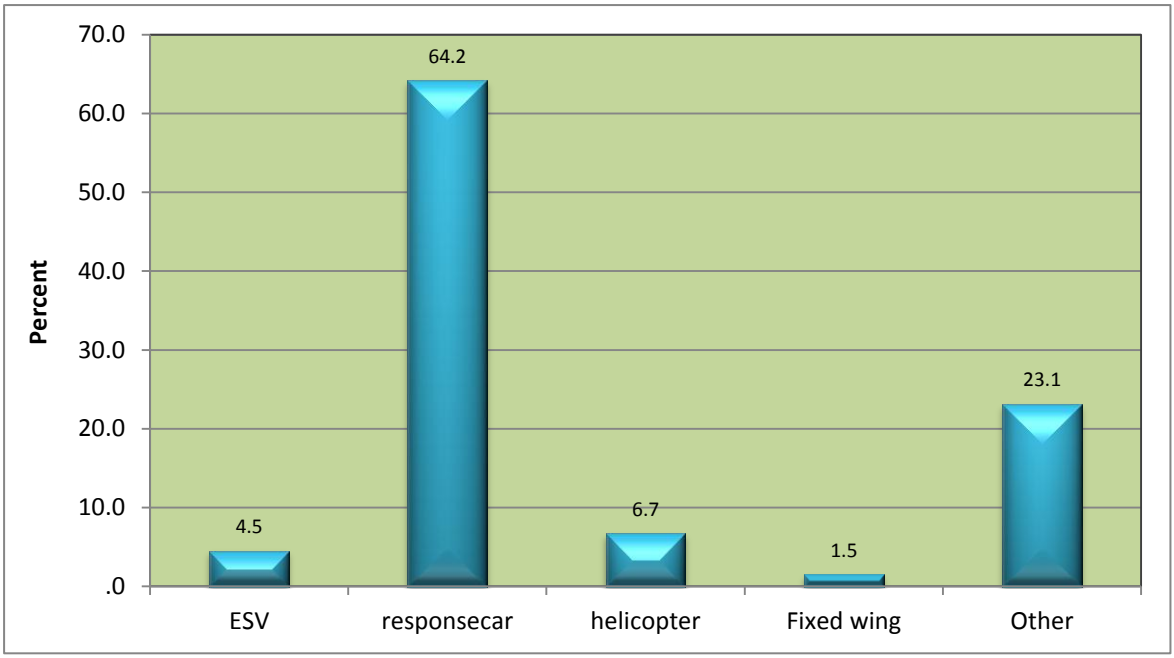

Figure 13: Primary mode of work

The respondents were asked to indicate what their primary description of their mode of work was. Figure 13 shows that 86 (61%) indicated the response car mode to be their primary mode of work. The is probably because the duty ALS provider's mode of work is primarily a response car for the purpose of rapid response to any location within or out of his/her designated geographical area. The duty ALS is hence the first port of call for all emergencies and is supported by the following modes of work, Emergency Service Vehicles (ESV) were 6 (4.5%) indicated this to be their primary mode of work, helicopter/s 9 (6.7%) and 2 (1.5%) for a fixed wing which is an aeroplane was indicated as the primary mode of work. For the "other" category, 31 (23.1%) did not have a primary mode of work as they were based in clinics or hospitals.

5.2 Clinical Skills data results

A descriptive analysis of the 140 (N) respondents' clinical skills data is presented in this subsection. The ALS clinical skills set of 41 skills is presented first, (Tables 4, 5 and 6). The table is divided into three parts and is colour coded into skill categories as shown by the key bar, which highlights the frequency of each clinical skill that was performed by ALS providers and their reported levels of confidence for each skill performed. With regard to the overall average confidence rating per time period (Tables 4, 5 and 6), a Lickert scale from 1 to 5 was used. Level 1 constituted a poor level of confidence, 3 constituted a good level of confidence whilst 5 was an excellent level of confidence. The overall average confidence rating per time period is calculated as follows: See example 1.

	Poor =1	Fair =2	Good =3	Very Good =4	Excellent =5	Total
Daily	0	0	1	0	1	2
2-6 times/week	0	0	2	3	6	11
Once/week	0	0	2	13	18	33
Once/month	0	1	7	24	11	43
Once/6months	0	3	8	11	7	29
Other	1	2	2	9	6	20
Total	1	6	22	60	49	138

Example 1: Please rate your level of confidence for the clinical skill orotracheal intubation.

The confidence for orotracheal intubation performed daily = **1x3 + 1x5 = 8/2 = 4.0.** The overall average confidence rating per time period = **1x1+ 6x2 + 22x3 + 60x4 + 49x5 = 564/138 = 4.1**.

Table 4 : Frequency of performance and level of confidence for forty one ALS clinical skills performed (A)

	ADVANCED LIFE SUPPORT CLINICAL SKILLS	FREQUENCY						Overall average confidence rating per time period	LEVEL OF CONFIDENCE					
		DAILY	2-6 PER WEEK	ONCE A WEEK	ONCE A MONTH	ONCE IN 6 MONTHS	OTHER		POOR	FAIR	GOOD	VERY GOOD	EXCELLENT	TOTAL
1.	Orotracheal intubation	2	11	33	43	29	20	4.1	1	6	22	60	49	138
2.	Nasotracheal intubation	3	0	1	10	45	72	2.8	23	31	43	18	15	131
3.	Blind nasotracheal intubation	1	0	0	3	28	91	2.3	47	28	27	12	9	123
4.	Laryngeal mask airway	0	2	5	11	48	58	3.6	9	19	30	22	43	124
5.	Combitube insertion	0	1	1	4	13	96	2.9	23	28	22	21	21	115
6.	Retrograde intubation	0	1	0	2	13	96	2.1	42	33	29	4	4	112
7.	Digital tracheal intubation	0	1	0	0	11	100	2.1	46	32	22	6	6	112
8.	Needle cricothyrotomy	0	1	1	4	26	85	3.3	13	21	31	22	30	117
9.	Surgical cricothyrotomy	0	0	2	4	24	91	2.9	20	25	38	22	16	121
10.	Nebulization	11	31	28	32	29	9	4.7	0	0	7	22	102	131
11.	Mechanical ventilator	6	15	21	33	34	21	4.1	3	7	18	43	59	130
12.	Needle thoracentesis	0	2	3	4	50	47	4.0	6	4	28	36	49	123
13.	Capnography application	4	9	15	26	24	42	3.8	11	8	21	36	44	120
14.	Pulse oximetry application	58	24	13	16	10	13	4.8	1	0	6	17	110	134
15.	Defibrillation	0	4	10	44	39	33	4.4	1	7	15	26	81	130
16.	Transcutaneous pacing	0	0	2	6	46	68	3.5	10	19	26	35	32	122
17.	Synchronized cardioversion	0	0	3	7	49	65	3.6	10	13	29	31	40	124
18.	Vagal manoevres	1	1	2	11	54	55	3.9	4	13	26	30	51	124

Table 5 : Frequency of performance and level of confidence for forty one ALS clinical skills performed (B)

	ADVANCED LIFE SUPPORT CLINICAL SKILLS	FREQUENCY						Overall average confidence rating per time period	LEVEL OF CONFIDENCE					
		DAILY	2-6 PER WEEK	ONCE A WEEK	ONCE A MONTH	ONCE IN 6 MONTHS	OTHER		POOR	FAIR	GOOD	VERY GOOD	EXCELLENT	TOTAL
19.	Peripheral vein cannulation	35	36	22	20	10	10	4.7	0	0	7	23	103	133
20	External jugular vein cannulation	0	8	4	40	45	34	3.8	4	11	30	44	42	133
21.	Femoral vein cannulation	0	2	1	13	43	66	3.0	19	22	41	25	18	125
22.	Pressure infusion device	5	11	5	22	36	46	3.7	8	16	24	32	45	125
23.	Care of central venous lines	10	12	15	32	31	33	3.8	9	11	30	34	49	133
24.	Intraossoeus cannulation	0	1	2	13	38	71	3.3	14	22	28	39	22	125
25.	Umbilical vein cannulation	0	0	2	1	31	88	2.6	32	23	37	17	13	122
26.	Incubator management	5	7	20	34	35	27	4.0	3	8	21	44	52	128
27.	Normal vaginal delivery	1	6	6	13	53	50	4.1	4	6	26	33	60	129
28.	Mal-presentation management	0	1	1	10	30	82	3.0	19	21	42	26	16	124
29.	Premature labour management	1	3	5	11	40	67	3.2	12	27	34	32	22	127
30.	Obstructed labour management	0	1	0	10	31	84	2.9	18	26	43	25	14	126
31.	Prolapsed cord management	0	1	0	6	29	87	3.1	17	26	29	30	21	123

Table 6: Frequency of performance and level of confidence for forty one ALS clinical skills performed (C)

	ADVANCED LIFE SUPPORT CLINICAL SKILLS	FREQUENCY						Overall average confidence rating per time period	LEVEL OF CONFIDENCE					
		DAILY	2-6 PER WEEK	ONCE A WEEK	ONCE A MONTH	ONCE IN 6 MONTHS	OTHER		POOR	FAIR	GOOD	VERY GOOD	EXCELLENT	TOTAL
32.	Use of three lead monitoring	51	31	9	19	10	12	4.6	1	2	6	25	98	132
33.	Use of twelve lead monitoring	8	22	7	19	29	39	3.6	13	8	29	42	32	124
34.	IV medication administration	37	41	8	19	13	15	4.3	2	4	13	50	64	133
35.	Intramuscular injections	7	15	17	33	32	23	4.3	2	4	18	28	75	121
36.	Subcutaneous injections	2	9	8	28	38	41	4.1	4	7	25	29	61	126
37.	Medication via ETT	0	2	2	15	34	71	4.1	4	14	16	25	65	124
38.	PASG application	0	1	0	0	9	102	2.9	23	22	27	24	16	112
39.	Nasogastric tube insertion	3	7	6	32	48	31	3.9	3	14	28	26	56	127
40.	Orogastric tube insertion	1	7	4	29	42	40	3.7	9	13	25	29	46	123
41.	Urinary catheterization	0	3	3	11	38	65	3.2	15	27	25	30	23	120
	TOTAL	252	330	287	688	1281	2194		616	628	1044	1175	1774	5118

KEY:	AIRWAY CLINICAL SKILLS	BREATHING CLINICAL SKILLS	ACLS CLINICAL SKILLS	IV CLINICAL SKILLS	PAEDIATRIC CLINICAL SKILLS	OBSTETRIC CLINICAL SKILLS	ECG MONITORING SKILLS	MEDICATION CLINICAL SKILLS	PASG APPLICATION SKILL	CATHETER INSERTION SKILLS

5.2.1 Airway clinical skills

The frequency of performance of 138 (N) respondents for **orotracheal intubation** was 2 (1.4%) daily, 11 (7.9%) 2-6 times per week, 33 (23.9%) once a week, 43 (31.1%) once a month, 29 (21.0%) once in six months and 20 (14.4%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 1(0.7%) poor, 6 (4.3%) fair, 22 (15.9%) good, 60 (43%) very good and 49 (35.5%) indicated an excellent level of confidence. The frequency of performance of 131(N) respondents for **nasotracheal intubation** was 3 (2.2%) daily, 0 (0%) 2-6 times per week, 1 (0.7%) once a week, 10 (7.6%) once a month, 45 (34.3%) once in six months and 72 (54.9%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 23 (17.5%) poor, 31 (23.6%) fair, 43 (32.8%) good, 18 (13.7%) very good and 15 (11.4%) indicated an excellent level of confidence.

The frequency of performance of 123 (N) for **blind nasotracheal intubation** was 1 (0.8%) daily, 0(0%) 2-6 times per week, 0 (0%) once a week, 3 (2.4%) once a month, 28 (22.7%) once in six months and 91 (73.9%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 47 (38.2%) poor, 28 (22.7%) fair, 27 (21.9%) good, 12 (9.7%) very good and 9 (7.3%) indicated an excellent level of confidence.

The frequency of performance of 124 (N) of **laryngeal mask airway insertion** was 0 (0%) daily, 2 (1.6%) 2-6 times per week, 5 (4.0%) once a week, 11 (8.8%) once a month, 48 (38.7%) once in six months and 58 (46.7%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 9 (7.2%) poor, 19 (15.3%) fair, 30 (24.1%) good, 22 (17.7%) very good and 43 (34.6%) indicated an excellent level of confidence. The frequency of performance of 115 (N) for **combitube insertion** was 0 (0%) daily, 1 (0.8%) 2-6 times per week, 1 (0.8%) once a week, 4 (3.4%) once a month, 13 (11.3%) once in six months and 96 (83.4%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 23 (20.0%) poor, 28 (24.3%) fair, 22 (19.1%) good, 21 (18.2%) very good and 21 (18.2%) indicated an excellent level of confidence.

The frequency of performance of 112 (N) for **retrograde intubation** was 0 (0%) daily, 1 (0.8%) 2-6 times per week, 0 (0%) once a week, 2 (1.7%) once a month, 13 (11.6%) once in six months and 96 (85.7%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 42 (37.5%) poor, 33 (29.4%) fair, 29 (25.8%) good, 4 (3.5%) very good and 4 (3.5%) indicated an excellent level of confidence. The frequency of performance 112 (N) for **digital tracheal intubation** was 0 (0%) daily, 1 (0.8%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 11 (9.8%) once in six months and 100 (89.2%) performed the skill in a period

greater than six months. The level of confidence indicated for this skill is 46 (41.0%) poor, 32 (28.5%) fair, 22 (19.6%) good, 6 (5.3%) very good and 6 (5.3%) indicated an excellent level of confidence.

The frequency of performance of 117 (N) for **needle cricothyrotomy** was 0 (0%) daily, 1 (0.8%) 2-6 times per week, 1 (0.8%) once a week, 4 (3.4%) once a month, 26 (22.2%) once in six months and 85 (75.8%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 13 (11.1%) poor, 21 (17.9%) fair, 31 (26.4%) good, 22 (18.8%) very good and 30 (25.6%) indicated an excellent level of confidence. The frequency of performance of 121 (N) for **surgical cricothyrotomy** was 0 (0%) daily, 0 (0%) 2-6 times per week, 2 (1.6%) once a week, 4 (3.2%) once a month, 24 (19.3%) once in six months and 91 (73.3%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 20 (16.1%) poor, 25 (20.1%) fair, 38 (30.6%) good, 22 (17.7%) very good and 16 (12.9%) indicated an excellent level of confidence.

5.2.2 Breathing clinical skills

The frequency of performance of 131 (N) for **nebulization** was 11 (8.3%) daily, 31 (23.6%) 2-6 times per week, 28 (21.3%) once a week, 32 (24.4%) once a month, 29 (22.1%) once in six months and 9 (6.8%) performed the skill in a period greater than six months. The level of confidence indicated for

this skill is 0 (0%) poor, 0 (0%) fair, 7 (5.3%) good, 22 (16.7%) very good and 102 (77.8%) indicated an excellent level of confidence.

The frequency of performance of 130 (N) for **mechanical ventilation** was 6 (4.6%) daily, 15 (11.5%) 2-6 times per week, 21 (16.1%) once a week, 33 (25.3%) once a month, 34 (26.1%) once in six months and 21 (16.1%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 3 (2.3%) poor, 7 (5.3%) fair, 18 (13.8%) good, 43 (33.0%) very good and 59 (45.3%) indicated an excellent level of confidence. The frequency of performance of 123 (N) for **needle thorocentesis** was 0 (0%) daily, 2 (1.6%) 2-6 times per week, 3 (2.4%) once a week, 4 (3.2%) once a month, 50 (40.6%) once in six months and 47 (38.2%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 6 (4.8%) poor, 4 (3.2%) fair, 28 (22.7%) good, 36 (29.2%) very good and 49 (39.8%) indicated an excellent level of confidence.

The frequency of performance of 120 (N) for **capnography application** was 4 (3.3%) daily, 9 (7.5%) 2-6 times per week, 15 (12.5%) once a week, 26 (21.6%) once a month, 24 (20.0%) once in six months and 42 (35.0%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 11(9.1%) poor, 8 (6.6%) fair, 21 (17.5%) good, 36 (30.0%) very good and 44 (36.6%) indicated an excellent level of

confidence. The frequency of performance of 134 (N) for **pulse oximetry application** was 58 (43.2%) daily, 24 (17.9%) 2-6 times per week, 13 (9.7%) once a week, 16 (11.9%) once a month, 10 (7.4%) once in six months and 13 (9.7%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 1 (0.7%) poor, 0 (0%) fair, 6 (4.4%) good, 17 (12.6%) very good and 110 (82.0%) indicated an excellent level of confidence.

5.2.3 Advanced cardiac life support skills

The frequency of performance of 130 (N) for **defibrillation** was 0 (0%) daily, 4 (3.0%) 2-6 times per week, 10 (7.6%) once a week, 44 (33.8%) once a month, 39 (30.0%) once in six months and 33 (25.3%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 1 (0.7%) poor, 7 (5.3%) fair, 15 (11.5%) good, 26 (20.0%) very good and 81 (62.3%) indicated an excellent level of confidence. The frequency of performance of 122 (N) for **transcutaneous pacing** was 0 (0%) daily, 0 (0%) 2-6 times per week, 2 (1.6%) once a week, 6 (4.9%) once a month, 46 (37.7%) once in six months and 68 (55.7%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 10 (8.1%) poor, 19 (15.5%) fair, 26 (21.3%) good, 35 (28.6%) very good and 32 (26.2%) indicated an excellent level of confidence.

The frequency of performance of 124 (N) for **synchronized cardioversion** was 0 (0%) daily, 0 (0%) 2-6 times per week, 3 (2.4%) once a week, 7 (5.6%) once a month, 49 (39.5%) once in six months and 65 (52.4%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 10 (8.0%) poor, 13 (10.4%) fair, 29 (23.3%) good, 31 (25.0%) very good and 40 (32.2%) indicated an excellent level of confidence.

The frequency of performance of 124 (N) for **vagal manoeuvres** was 1 (0.8%) daily, 1 (0.8%) 2-6 times per week, 2 (1.6%) once a week, 11 (8.8%) once a month, 54 (43.5%) once in six months and 55 (44.3%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 4 (3.2%) poor, 13 (10.4%) fair, 26 (20.9%) good, 30 (24.1%) very good and 51 (41.1%) indicated an excellent level of confidence.

5.2.4 Intravenous clinical skills

The frequency of performance of 133 (N) for **peripheral vein cannulation** was 35 (26.3%) daily, 36 (27.0%) 2-6 times per week, 22 (16.5%) once a week, 20 (15.0%) once a month, 10 (7.5%) once in six months and 10 (7.5%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 0 (0%) poor, 0 (0%) fair, 7 (5.2%) good, 23 (17.2%) very good and 103 (77.4%) indicated an excellent level of confidence. The frequency of performance of 133 (N) for **external jugular**

vein cannulation was 0 (0%) daily, 8 (6.0%) 2-6 times per week, 4 (3.0%) once a week, 40 (30.0%) once a month, 45 (33.8%) once in six months and 34 (25.5%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 4 (3.0%) poor, 11 (8.2%) fair, 30 (22.5%) good, 44 (33.0%) very good and 42 (31.5%) indicated an excellent level of confidence.

The frequency of performance of 125 (N) for **femoral vein cannulation** was 0 (0%) daily, 2 (1.6%) 2-6 times per week, 1 (0.8%) once a week, 13 (10.4%) once a month, 43 (34.4%) once in six months and 66 (52.8%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 19 (15.2%) poor, 22 (17.6%) fair, 41 (32.8%) good, 25 (20.0%) very good and 18 (14.4%) indicated an excellent level of confidence. The frequency of performance of 125 (N) for **pressure infusion devices** was 5 (4.0%) daily, 11 (8.8%) 2-6 times per week, 5 (4.0%) once a week, 22 (17.6%) once a month, 36 (28.8%) once in six months and 46 (36.8%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 8 (6.4%) poor, 16 (12.8%) fair, 24 (19.2%) good, 32 (25.6%) very good and 45 (36.0%) indicated an excellent level of confidence.

The frequency of performance of 133 (N) for **care of central venous lines** was 10 (7.5%) daily, 12 (9.0%) 2-6 times per week, 15 (11.2%) once a week,

32 (24.0%) once a month, 31 (23.3%) once in six months and 33 (24.8%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 9 (6.7%) poor, 11 (8.2%) fair, 30 (22.5%) good, 34 (25.5%) very good and 49 (36.8%) indicated an excellent level of confidence.

5.2.5 Paediatric clinical skills

The frequency of performance of 125 (N) for **Intraossoeus cannulation** was 0 (0%) daily, 1 (.8%) 2-6 times per week, 2 (1.6%) once a week, 13 (10.4%) once a month, 38 (30.4%) once in six months and 71 (56.8%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 14 (11.2%) poor, 22 (17.6%) fair, 28 (22.4%) good, 39 (31.2%) very good and 22 (17.6%) indicated an excellent level of confidence. The frequency of performance of 122 (N) for **umbilical vein cannulation** was 0 (0%) daily, 0 (0%) 2-6 times per week, 2 (1.6%) once a week, 1 (0.8%) once a month, 31 (25.4%) once in six months and 88 (72.1%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 32 (26.2%) poor, 23 (18.8%) fair, 37 (30.3%) good, 17 (13.9%) very good and 13 (10.6%) indicated an excellent level of confidence.

The frequency of performance of 128 (N) for **incubator management** was 5 (3.9%) daily, 7 (5.4%) 2-6 times per week, 20 (15.6%) once a week, 34

(26.5%) once a month, 35 (27.3%) once in six months and 27 (21.0%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 3 (2.3%) poor, 8 (6.2%) fair, 21 (16.4%) good, 44 (34.3%) very good and 52 (40.6%) indicated an excellent level of confidence.

5.2.6 Obstetric clinical skills

The frequency of performance of 129 (N) for **normal vaginal delivery** was 1 (0.7%) daily, 6 (4.6%) 2-6 times per week, 6 (4.6%) once a week, 13 (10.0%) once a month, 53 (41.0%) once in six months and 50 (38.7%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 4 (3.1%) poor, 6 (4.6%) fair, 26 (20.1%) good, 33 (25.5%) very good and 60 (46.5%) indicated an excellent level of confidence. The frequency of performance of 124 (N) for **mal-presentation management** was 0 (0%) daily, 1 (0.8%) 2-6 times per week, 1 (0.8%) once a week, 10 (8.0%) once a month, 30 (24.1%) once in six months and 82 (66.1%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 19 (15.3%) poor, 21 (16.9%) fair, 42 (33.8%) good, 26 (20.9%) very good and 16 (12.9%) indicated an excellent level of confidence.

The frequency of performance of 127 (N) for **premature labour management** was 1 (0.7%) daily, 3 (2.3%) 2-6 times per week, 5 (3.9%) once a week, 11 (8.6%) once a month, 40 (31.4%) once in six months and 67 (52.7%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 12 (9.4%) poor, 27 (21.2%) fair, 34 (26.7%) good, 32 (25.1%) very good and 22 (17.3%) indicated an excellent level of confidence. The frequency of performance of 126 (N) for **obstructed labour management** was 0 (0%) daily, 1 (0.7%) 2-6 times per week, 0 (0%) once a week, 10 (7.9%) once a month, 31 (24.6%) once in six months and 84 (66.6%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 18 (14.2%) poor, 26 (20.6%) fair, 43 (34.1%) good, 25 (19.8%) very good and 14 (11.1%) indicated an excellent level of confidence.

The frequency of performance of 123 (N) for **prolapsed cord management** was 0 (0%) daily, 1 (0.8%) 2-6 times per week, 0 (0%) once a week, 6 (4.8%) once a month, 29 (23.5%) once in six months and 87 (70.7%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 17 (13.8%) poor, 26 (21.1%) fair, 29 (23.5%) good, 30 (24.3%) very good and 21 (17.0%) indicated an excellent level of confidence.

5.2.7 ECG monitoring and identification skills

The frequency of performance of 132 (N) for **three lead monitoring** was 51 (38.6%) daily, 31 (23.4%) 2-6 times per week, 9 (6.8%) once a week, 19 (14.3%) once a month, 10 (7.5%) once in six months and 12 (9.0%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 1 (0.7%) poor, 2 (1.5%) fair, 6 (4.5%) good, 25 (18.9%) very good and 98 (74.2%) indicated an excellent level of confidence. The frequency of performance of 124 (N) for **twelve lead monitoring** was 8 (6.4%) daily, 22 (17.7%) 2-6 times per week, 7 (5.6%) once a week, 19 (15.3%) once a month, 29 (23.3%) once in six months and 39 (31.4%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 13 (10.4%) poor, 8 (6.4%) fair, 29 (23.3%) good, 42 (33.8%) very good and 32 (25.8%) indicated an excellent level of confidence.

5.2.8 Medication administration as per recommended guidelines

The frequency of performance of 133 (N) for **intravenous administration of medication** was 37 (27.8%) daily, 41 (30.8%) 2-6 times per week, 8 (6.0%) once a week, 19 (14.2%) once a month, 13 (9.7%) once in six months and 15 (11.2%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 2 (1.5%) poor, 4 (3.0%) fair, 13 (9.7%) good, 50 (37.5%) very good and 64 (48.1%) indicated an excellent level of confidence. The frequency of performance of 121 (N) for **intramuscular**

injections was 7 (5.7%) daily, 15 (12.3%) 2-6 times per week, 17 (14.0%) once a week, 33 (27.2%) once a month, 32 (26.4%) once in six months and 23 (19.0%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 2 (1.6%) poor, 4 (3.3%) fair, 18 (14.8%) good, 28 (23.1%) very good and 75 (61.9%) indicated an excellent level of confidence.

The frequency of performance of 126 (N) for **subcutaneous injections** was 2 (1.5%) daily, 9 (7.4%) 2-6 times per week, 8 (6.4%) once a week, 28 (22.2%) once a month, 38 (30.1%) once in six months and 41 (32.5%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 4 (3.1%) poor, 7 (5.5%) fair, 25 (19.8%) good, 29 (23.0%) very good and 61 (48.4%) indicated an excellent level of confidence.

The frequency of performance of 124 (N) for **medication via the endotracheal tube route** was 0 (0%) daily, 2 (1.6%) 2-6 times per week, 2 (1.6%) once a week, 15 (12.0%) once a month, 34 (27.4%) once in six months and 71 (57.2%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 4 (3.2%) poor, 14 (11.2%) fair, 16 (12.9%) good, 25 (20.1%) very good and 65 (52.4%) indicated an excellent level of confidence.

5.2.9 Pneumatic anti-shock garment (PASG) application

The frequency of performance of 112 (N) for **PASG application** was 0 (0%) daily, 1 (0.8%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 9 (8.0%) once in six months and 102 (91.0%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 23 (20.5%) poor, 22 (19.6%) fair, 27 (24.1%) good, 24 (21.4%) very good and 16 (14.2%) indicated an excellent level of confidence.

5.2.10 Catheter insertion skills

The frequency of performance of 127 (N) for **nasogastric tube insertion** was 3 (2.3%) daily, 7 (5.5%) 2-6 times per week, 6 (4.7%) once a week, 32 (25.1%) once a month, 48 (37.7%) once in six months and 31 (24.4%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 3 (2.3%) poor, 14 (11.0%) fair, 28 (22.0%) good, 26 (20.4%) very good and 56 (44.0%) indicated an excellent level of confidence.

The frequency of performance of 123 (N) for **orogastric tube insertion** was 1 (0.8%) daily, 7 (5.6%) 2-6 times per week, 4 (3.2%) once a week, 29 (23.5%) once a month, 42 (34.1%) once in six months and 40 (32.5%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 9 (7.3%) poor, 13 (10.5%) fair, 25 (20.3%)

good, 29 (23.5%) very good and 46 (37.3%) indicated an excellent level of confidence. The frequency of performance of 120 (N) for **urinary catheterization** was 0 (0%) daily, 3 (2.5%) 2-6 times per week, 3 (2.5%) once a week, 11 (9.1%) once a month, 38 (31.6%) once in six months and 65 (53.7%) performed the skill in a period greater than six months. The level of confidence indicated for this skill is 15 (12.5%) poor, 27 (22.5%) fair, 25 (20.8%) good, 30 (25.0%) very good and 23 (19.1%) indicated an excellent level of confidence.

5.2.11 Average ALS skills performed daily to greater the six months and reported levels of confidence for ALS skills performed

Of 252 ALS skills that have been performed daily, an average of 6 (4.8%) skills was performed. Of 330 skills that were performed 2-6 times a week, an average of 8 (6.4%) was performed. Of 287 ALS skills that were performed once a week, an average of 7(5.6%) were performed. Of 688 ALS skills that was performed once a month, an average of 17(13.7%) were performed Of the 1281 ALS skills that was performed once in six months, an average of 31(25%) were performed and of the 2194 ALS skill that was performed greater than six months, an average of 54(43.5%) were performed. For the reported levels of confidence, an average of 15 out of 616 (12%) respondents indicated poor, 15 (12%) out of 628 respondents indicated fair, 25 (20.0%) out of 1044 respondents indicated good, 28 (23.2%) respondents

out of 1175 indicated very good and 43 (34.4%) respondents out of 1774 indicated excellent.

Table 7: A comparison of four major categories of clinical skill frequencies for three major provinces (A)

ADVANCED LIFE SUPPORT CLINICAL SKILLS	KWAZULU-NATAL (N=57)						WESTERN CAPE (N=24)						GAUTENG (N=29)					
	FREQUENCY						FREQUENCY						FREQUENCY					
	Daily	2-6 times per week	Once a week,	Once a month	Once in six months	Other	Daily	2-6 times per week	Once a week	Once a	Once in six months	Other	Daily	2-6 times per week	Once a week	Once a month	Once in six months	Other
Orotracheal intubation	2	5	11	20	14	5	0	1	6	11	4	2	0	3	10	5	4	6
Nasotracheal intubation	0	3	1	3	18	28	0	0	0	1	9	14	0	0	0	3	12	13
Blind nasotracheal intubation	1	0	0	1	9	41	0	0	0	0	6	17	0	0	0	1	9	18
Laryngeal mask airway	0	0	4	1	14	32	0	0	0	3	13	8	0	0	0	2	12	14
Combitube insertion	0	1	1	0	5	45	0	0	0	0	2	21	0	0	0	0	2	26
Retrograde intubation	0	1	0	0	3	45	0	0	0	1	4	18	0	0	0	1	2	24
Digital tracheal intubation	0	1	0	0	3	45	0	0	0	0	1	22	0	0	0	0	2	25
Needle cricothyrotomy	0	1	1	1	8	40	0	0	0	0	5	18	0	0	0	0	4	24
Surgical cricothyrotomy	0	0	2	0	7	41	0	0	0	0	5	19	0	0	0	1	5	22
Defibrillation	0	2	1	16	22	14	0	1	4	5	9	5	0	0	1	17	3	7
Transcutaneous pacing	0	0	1	2	20	28	0	0	0	0	15	9	0	0	0	1	4	22
Synchronized cardioversion	0	0	1	1	24	25	0	0	0	0	9	15	0	0	0	1	7	20
Vagal manoevres	1	1	0	3	21	25	0	0	0	2	11	11	0	0	1	1	12	14

Table 8: A comparison of clinical skill frequency for three major provinces (B)

ADVANCED LIFE SUPPORT CLINICAL SKILLS	KWAZULU-NATAL 57 (N)						WESTERN CAPE 24 (N)						GAUTENG 29 (N)					
	FREQUENCY						FREQUENCY						FREQUENCY					
	Daily	2-6 times per week	once a week,	Once a month	Once in six months	Other	Daily	2-6 times per week	once a week,	Once a	Once in six months	Other	Daily	2-6 times per week	once a week,	Once a month	Once in six months	Other
Intraossoeus cannulation	0	0	2	1	16	31	0	0	0	1	10	12	0	0	0	3	11	14
Umbilical vein cannulation	0	0	2	1	12	35	0	0	0	0	6	16	0	0	2	1	12	14
Incubator management	4	6	15	15	11	5	0	1	5	7	6	5	1	0	3	6	5	13
Normal vaginal delivery	1	6	4	5	22	16	0	0	2	3	10	8	0	0	1	4	7	16
Mal-presentation management	0	1	1	9	13	29	0	0	0	2	6	15	0	0	1	0	4	23
Premature labour management	1	2	5	11	12	22	0	0	1	2	9	11	0	1	1	0	8	18
Obstructed labour management	0	1	0	8	14	30	0	0	0	1	7	15	0	0	1	1	6	20
Prolapsed cord management	0	1	0	5	13	31	0	0	0	0	1	7	0	0	0	1	4	22

KEY:	AIRWAY CLINICAL SKILLS	ACLS CLINICAL SKILLS	PAEDIATRIC CLINICAL SKILLS	OBSTETRIC CLINICAL SKILLS

5.2.12 Airway clinical skills Kwazulu-Natal, Gauteng and Western Province

For Kwazulu-Natal, the frequency of performance of 57 (N) for **orotracheal intubation** was 2 (3.5%) daily, 5 (8.7%) 2-6 times per week, 11 (19.2%) once a week, 20 (35.0%) once a month, 14 (24.5%) once in six months and 5 (8.7%) performed the skill in a period greater than six months. Whilst for Gauteng, of 28 (N), 0 (0%) was daily, 3 (10.7%) was 2-6 times per week, 10 (35.7%) was once a week, 5 (17.8%) was once a month, 4 (14.2%) was once in six months and 6 (21.4%) performed the skill in a period greater than six months and for the Western Cape, of 24 (N) , the skill performance was 0 (0%) daily, 1 (4.1%) 2-6 times per week, 6 (25.0%) once a week, 11 (45.8%) once a month, 4 (16.6%) once in six months and 2 (8.3%) performed the skill in a period greater than six months.

For Kwazulu-Natal, the frequency of performance of 53 (N) for **nasotracheal intubation** was 0 (0%) daily, 3 (5.6%) 2-6 times per week, 1 (1.8%) once a week, 3 (5.6%) once a month, 18 (33.9%) once in six months and 28 (52.8%) performed the skill in a period greater than six months. Whilst for Gauteng the frequency of performance of 28(N) for the skill was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 3 (10.7%) once a month, 12 (42.8%) once in six months and 13 (46.4%) performed the skill in a period greater than six months and for the Western Cape, the frequency of performance of 24(N) respondents, for the skill was 0 (0%) daily, 0 (0%) 2-6

times per week, 0 (0%) once a week, 1 (4.1%) once a month, 9 (37.5%) once in six months and 14 (58.3%) performed the skill in a period greater than six months.

For Kwazulu-Natal the frequency of performance of 52 (N) for **blind nasotracheal intubation** was 1 (1.9%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 1 (1.9%) once a month, 9 (17.3%) once in six months and 41 (73.9%) performed the skill in a period greater than six months. For Gauteng the frequency of performance of 28 (N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 1 (3.5%) once a month, 9 (32.1%) once in six months and 18 (64.2%) performed the skill in a period greater than six months. For **Western Cape,** the frequency of performance of 23 (N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 6 (26.0%) once in six months and 17 (73.9 %) performed the skill in a period greater than six months.

For **Kwazulu-Natal** the frequency of performance of 51 (N) for **laryngeal mask airway insertion** was 0 (0%) daily, 0 (0%) 2-6 times per week, 4 (7.8%) once a week, 1 (1.9%) once a month, 14 (26.9%) once in six months and 32 (62.7%) performed the skill in a period greater than six months, whilst for **Gauteng**, the frequency of performance of 28(N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 2 (7.1%) once a month, 12 (42.8%) once in six months and 14 (50.0%) performed the skill in a period greater

than six months and for the Western Cape, the frequency of performance of 24(N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 3 (12.5%) once a month, 13 (54.1%) once in six months and 8 (33.3%) performed the skill in a period greater than six months.

For Kwazulu-Natal the frequency of performance of 52 (N) for **combitube insertion** was 0 (0%) daily, 1 (1.9%) 2-6 times per week, 1 (1.9%) once a week, 0 (0%) once a month, 5 (9.6%) once in six months and 45 (86.5%) performed the skill in a period greater than six months, whilst or Gauteng, the frequency of performance of 28 (N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 2 (7.1%) once in six months and 26 (92.8%) performed the skill in a period greater than six months and for the Western Cape, the frequency of performance of 23 (N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 10 (0%) once a week, 0 (0%) once a month, 2 (8.6%) once in six months and 21 (91.3%) performed the skill in a period greater than six months.

For Kwazulu-Natal, the frequency of performance of 49 (N) for **retrograde intubation** was 0 (0%) daily, 1 (2.0%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 3 (6.1%) once in six months and 45 (91.8%) performed the skill in a period greater than six months. whilst or **Gauteng,** the frequency of performance of 27(N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 1 (3.7%) once a month, 2 (7.4%) once in six

months and 24 (88.8%) performed the skill in a period greater than six months and for the Western Cape, the frequency of performance of 23(N) for was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 1 (4.3%) once a month, 4 (17.3%) once in six months and 18 (78.2%) performed the skill in a period greater than six months.

For Kwazulu-Natal, the frequency of performance of 49 (N) for **digital tracheal intubation** was 0 (0%) daily, 1 (2.0%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 3 (6.1%) once in six months and 45 (91.8%) performed the skill in a period greater than six months. For Gauteng, the frequency of performance of 27 (N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 2 (7.4%) once in six months and 25 (92.5%) performed the skill in a period greater than six months, whilst for the **Western Cape,** the frequency of performance of 23 (N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 1 (4.3%) once in six months and 22 (95.6%) performed the skill in a period greater than six months.

For Kwazulu-Natal, the frequency of performance 51 (N) for **needle cricothyrotomy** was 0 (0%) daily, 1 (1.9%) 2-6 times per week, 1 (1.9%) once a week, 1 (1.9%) once a month, 8 (15.6%) once in six months and 40 (78.4%) performed the skill in a period greater than six months. For Gauteng, the frequency of performance of 28(N) was 0 (0%) daily, 0 (0%) 2-6 times per

week, 0 (0%) once a week, 0 (0%) once a month, 4 (14.2%) once in six months and 24 (85.7%) performed the skill in a period greater than six months, whilst for the Western Cape, the frequency of performance of 23(N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 5 (21.7%) once in six months and 18 (78.2%) performed the skill in a period greater than six months.

For Kwazulu-Natal, the frequency of performance 50 (N) for **surgical cricothyrotomy** was 0 (0%) daily, 0 (0%) 2-6 times per week, 2 (4.0%) once a week, 0 (0%) once a month, 7 (14.0%) once in six months and 41 (82%) performed the skill in a period greater than six months. For Gauteng, the frequency of performance of 28 (N) for was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 1 (3.5%) once a month, 5 (17.8%) once in six months and 22 (78.5%) performed the skill in a period greater than six months, whilst for **Western Cape**, the frequency of performance of 24 (N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 5 (20.8%) once in six months and 19 (79.1%) performed the skill in a period greater than six months.

5.2.13 Advanced cardiac life support skills KwaZulu Natal, Gauteng and Western Cape

Kwazulu-Natal showed a frequency of performance of 55 (N) for **defibrillation**. The results were 0 (0%) daily, 2 (3.7%) 2-6 times per week, 1 (1.8%) once a week, 16 (29.0%) once a month, 22 (40.7%) once in six months and 14 (25.9%) performed the skill in a period greater than six months. Gauteng was for 28 (N) respondents, 0 (0%) daily, 0 (0%) 2-6 times per week, 1 (3.5%) once a week, 17 (60.7%) once a month, 3 (10.7%) once in six months and 7 (25.0%) performed the skill in a period greater than six months. Western Cape was for 24 (N) respondents, 0 (0%) daily, 1 (4.1%) 2-6 times per week, 4 (16.6%) once a week, 5 (20.8%) once a month, 9 (37.5%) once in six months and 5 (20.8%) performed the skill in a period greater than six months.

For Kwazulu-Natal, the frequency of performance of 51(N) for **transcutaneous pacing** was 0 (0%) daily, 0 (0%) 2-6 times per week, 1 (1.9%) once a week, 2 (3.9%) once a month, 20 (39.2%) once in six months and 28 (54.9%) performed the skill in a period greater than six months. For Gauteng, the frequency of performance of 27(N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 1 (3.7%) once a month, 4 (14%) once in six months and 22 (81.4%) performed the skill in a period greater than six months. and or Western Cape, The frequency of performance of 24(N) for

transcutaneous pacing was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 15 (62.5%) once in six months and 9 (37.5%) performed the skill in a period greater than six months.

The frequency of performance for the Kwazulu-Natal respondents 51 (N) for **synchronized cardioversion** was 0 (0%) daily, 0 (0%) 2-6 times per week, 1 (1.9%) once a week, 1 (1.9%) once a month, 24 (47.0%) once in six months and 25 (49.0%) performed the skill in a period greater than six months, whilst Gauteng, was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 1 (3.5%) once a month, 7 (25.0%) once in six months and 22 (78.5%) performed the skill in a period greater than six months. and Western Cape, the frequency of performance of 24 (N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 9 (37.5%) once in six months and 15 (62.5%) performed the skill in a period greater than six months.

For Kwazulu-Natal, the frequency of performance of 51(N) for **vagal manoeuvres** was 1 (1.9%) daily, 1 (1.9%) 2-6 times per week, 0 (0%) once a week, 3 (5.8%) once a month, 21 (41.1%) once in six months and 25 (49.0%) performed the skill in a period greater than six months. For Gauteng, The frequency of performance of 28 (N) for **vagal manoeuvres** was 0 (0%) daily, 0 (0%) 2-6 times per week, 1 (3.5%) once a week, 1 (3.5%) once a month, 12 (42.8%) once in six months and 14 (50.0%) performed the skill in a period

greater than six months. and for Western Cape, the frequency of performance of 24(N) for **vagal manoeuvres** was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 2 (8.3%) once a month, 11 (45.8%) once in six months and 11 (45.8%) performed the skill in a period greater than six months.

5.2.14 Paediatric clinical skills Kwazulu Natal, Gauteng and Western Cape

The frequency of performance of 50 (N) respondents for **Intraossoeus cannulation** in Kwazulu-Natal was 0 (0%) daily, 0 (%) 2-6 times per week, 2 (4.0%) once a week, 1 (2.0%) once a month, 16 (32.0%) once in six months and 31 (62.0%) performed the skill in a period greater than six months, whilst Gauteng, the frequency of performance of 28 (N) for **Intraossoeus cannulation** was 0 (0%) daily, 0 (%) 2-6 times per week, 0 (0%) once a week, 3 (10.7%) once a month, 11 (39.2%) once in six months and 14 (50.0%) performed the skill in a period greater than six months. and Western Cape, the frequency of performance of 23 (N) for was 0 (0%) daily, 0 (%) 2-6 times per week, 0 (0%) once a week, 1 (4.3%) once a month, 10 (43.4%) once in six months and 12 (52.1%) performed the skill in a period greater than six months.

For Kwazulu-Natal, the frequency of performance 50 (N) for **umbilical vein cannulation** was 0 (0%) daily, 0 (0%) 2-6 times per week, 2 (4.0%) once a

week, 1 (2.0%) once a month, 12 (24.0%) once in six months and 35 (70.0%) performed the skill in a period greater than six months. For Gauteng the frequency of performance of 29 (N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 2 (6.8%) once a week, 1 (3.4%) once a month, 12 (41.3%) once in six months and 14 (48.2%) performed the skill in a period greater than six months. and Western Cape, the frequency of performance of 22 (N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 6 (27.2%) once in six months and 16 (72.7%) performed the skill in a period greater than six months.

The frequency of performance for respondents from Kwazulu-Natal, 56 (N) for **incubator management** was 4 (7.1%) daily, 6 (10.7%) 2-6 times per week, 15 (26.7%) once a week, 15 (26.7%) once a month, 11 (19.6%) once in six months and 5 (8.9%) performed the skill in a period greater than six months. For Gauteng, the frequency of performance of 28 (N) was 1 (3.5%) daily, 0 (0%) 2-6 times per week, 3 (10.7%) once a week, 6 (21.4%) once a month, 5 (17.8%) once in six months and 13 (46.4%) performed the skill in a period greater than six months and Western Cape, the frequency of performance of 24 (N) was 0 (0%) daily, 1 (4.1%) 2-6 times per week, 5 (20.8%) once a week, 7 (29.1%) once a month, 6 (25.0%) once in six months and 5 (20.8%) performed the skill in a period greater than six months.

5.2.15 Obstetric clinical skills Kwazulu-Natal, Gauteng and Western Cape

For Kwazulu-Natal, the frequency of performance of 54 (N) for **normal vaginal delivery** was 1 (1.8%) daily, 6 (11.1%) 2-6 times per week, 4 (7.4%) once a week, 5 (9.2%) once a month, 22 (40.7%) once in six months and 16 (29.6%) performed the skill in a period greater than six months. For Gauteng the frequency of performance of 28 (N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 1 (3.5%) once a week, 4 (14.2%) once a month, 7 (25.0%) once in six months and 16 (57.1%) performed the skill in a period greater than six months and Western Cape, the frequency of performance of 23 (N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 2 (8.6%) once a week, 3 (13.0%) once a month, 10 (43.4%) once in six months and 8 (34.7%) performed the skill in a period greater than six months.

The frequency of performance of 53 (N) respondents from Kwazulu-Natal for **mal-presentation management** was 0 (0%) daily, 1 (1.8%) 2-6 times per week, 1 (1.8%) once a week, 9 (16.9%) once a month, 13 (24.5%) once in six months and 29 (54.7%) performed the skill in a period greater than six months, whilst Gauteng, the frequency of performance of 28 (N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 1 (3.5%) once a week, 0 (0%) once a month, 4 (14.2%) once in six months and 23 (82.1%) performed the skill in a period greater than six months. and Western Cape, the frequency of

performance of 23 (N) 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 2 (8.6%) once a month, 6 (26.0%) once in six months and 15 (65.2%) performed the skill in a period greater than six months.

For Kwazulu-Natal, the frequency of performance 0f 53 (N) for **premature labour management** was 1 (1.8%) daily, 2 (3.7%) 2-6 times per week, 5 (9.4%) once a week, 11 (20.7%) once a month, 12 (22.6%) once in six months and 22 (41.5%) performed the skill in a period greater than six months. For Gauteng, the frequency of performance of 28 (N) was 0 (0%) daily, 1 (3.5%) 2-6 times per week, 1 (3.5%) once a week, 0 (0%) once a month, 8 (28.5%) once in six months and 18 (64.2%) performed the skill in a period greater than six months. and Western Cape, the frequency of performance of 23 (N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 1 (4.3%) once a week, 2 (8.6%) once a month, 9 (39.1%) once in six months and 11 (47.8%) performed the skill in a period greater than six months.

The frequency of performance of 53 (N) Kwazulu-Natal respondents for **obstructed labour management** was 0 (0%) daily, 1 (1.8%) 2-6 times per week, 0 (0%) once a week, 8 (15.0%) once a month, 14 (26.4%) once in six months and 30 (56.6%) performed the skill in a period greater than six months, whilst Gauteng the frequency of performance of 28 (N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 1 (3.5%) once a week, 1 (3.5%) once a month, 6 (21.4%) once in six months and 20 (71.4%) performed the skill in a

period greater than six months and Western Cape, the frequency of performance of 23 (N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 1 (4.3%) once a month, 7 (30.5%) once in six months and 15 (65.2%) performed the skill in a period greater than six months.

The Kwazulu-Natal frequency of performance of 50 (N) for **prolapsed cord management** was 0 (0%) daily, 1 (2.0%) 2-6 times per week, 0 (0%) once a week, 5 (10.0%) once a month, 13 (26.0%) once in six months and 31 (62.0%) performed the skill in a period greater than six months. For Gauteng, the frequency of performance of 27 (N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 1 (3.7%) once a month, 4 (14.8%) once in six months and 22 (81.4%) performed the skill in a period greater than six months, whilst Western Cape, the frequency of performance of 8 (N) was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 1 (12.5%) once in six months and 7 (87.5%) performed the skill in a period greater than six months.

Table 9: Clinical skill frequency for the international respondents

ADVANCED LIFE SUPPORT CLINICAL SKILLS	INTERNATIONAL RESPONDENTS 10 (N)					
	FREQUENCY					
	Daily	2-6 times per week	once a week,	Once a month	Once in six months	Other
Orotracheal intubation	0	1	5	2	2	0
Nasotracheal intubation	0	0	0	3	2	5
Blind nasotracheal	0	0	0	1	2	7
Laryngeal mask airway	0	1	1	2	3	3
Combitube insertion	0	0	0	2	0	7
Retrograde intubation	0	0	0	1	2	7
Digital tracheal intubation	0	0	0	0	3	7
Needle cricothyrotomy	0	0	0	1	6	3
Surgical cricothyrotomy	0	0	0	1	4	5
Defibrillation	0	1	3	3	0	3
Transcutaneous pacing	0	0	1	2	4	3
Synchronized cardioversion	0	0	2	2	3	3
Vagal manoevres	0	0	0	2	4	3
Intraossoeus cannulation	0	1	0	4	0	5
Umbilical vein cannulation	0	0	0	0	4	6
Incubator management	0	0	0	3	3	4
Normal vaginal delivery	0	0	0	1	5	4
Mal-presentation management	0	0	0	0	4	6
Premature labour management	0	0	0	0	5	5
Obstructed labour management	0	0	0	1	3	6
Prolapsed cord management	0	0	0	0	4	6

KEY:	AIRWAY CLINICAL SKILLS	ACLS CLINICAL SKILLS	PAEDIATRIC CLINICAL SKILLS	OBSTETRIC CLINICAL SKILLS

5.12.16 Airway clinical skills International

The frequency of performance of 10 (N) for **orotracheal intubation** was 0 (0%) daily, 1 (10.0%) 2-6 times per week, 5 (50.0%) once a week, 2 (20.0%) once a month, 2 (20.0%) once in six months and 0 (0%) performed the skill in a period greater than six months. The frequency of performance of 10(N) for **nasotracheal intubation** was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 3 (30.0%) once a month, 2 (20.0%) once in six months and 5 (50.0%) performed the skill in a period greater than six months.

The frequency of performance of 10 (N) for **blind nasotracheal intubation** was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 1 (10.0%) once a month, 2 (20.0%) once in six months and 7 (70.0%) performed the skill in a period greater than six months. The frequency of performance of 10 (N) of **laryngeal mask airway insertion** was 0 (0%) daily, 1 (10.0%) 2-6 times per week, 1 (10.0%) once a week, 2 (20.0%) once a month, 3 (30.0%) once in six months and 3 (30.0%) performed the skill in a period greater than six months.

The frequency of performance of 09 (N) for **combitube insertion** was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 2 (22.2%) once a month, 0 (0%) once in six months and 7 (77.7%) performed the skill in a period greater than six months. The frequency of performance of 10 (N) for

retrograde intubation was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 1 (10.0%) once a month, 2 (20.0%) once in six months and 7 (70.0%) performed the skill in a period greater than six months.

The frequency of performance of 10 (N) for **digital tracheal intubation** was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 3 (30.0%) once in six months and 7 (70.0%) performed the skill in a period greater than six months. The frequency of performance of 10 (N) for **needle cricothyrotomy** was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 1 (10.0%) once a month, 6 (60.0%) once in six months and 3 (30.0%) performed the skill in a period greater than six months.

The frequency of performance of 10 (N) for **surgical cricothyrotomy** was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 1 (10.0%) once a month, 4 (40.0%) once in six months and 5 (50.0%) performed the skill in a period greater than six months.

5.12.17 Advanced cardiac life support skills International

The frequency of performance of 10 (N) for **defibrillation** was 0 (0%) daily, 1 (10.0%) 2-6 times per week, 3 (30.0%) once a week, 3 (30.0%) once a month, 0 (0%) once in six months and 3 (30%) performed the skill in a period greater than six months. The frequency of performance of 10 (N) for

transcutaneous pacing was 0 (0%) daily, 0 (0%) 2-6 times per week, 1 (10.0%) once a week, 2 (20.0%) once a month, 4 (40.0%) once in six months and 3 (30.0%) performed the skill in a period greater than six months.

The frequency of performance of 10 (N) for **synchronized cardioversion** was 0 (0%) daily, 0 (0%) 2-6 times per week, 2 (20.0%) once a week, 2 (20.0%) once a month, 3 (30.0%) once in six months and 3 (30.0%) performed the skill in a period greater than six months. The frequency of performance of 09 (N) for **vagal manoeuvres** was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (%) once a week, 2 (22.2%) once a month, 4 (44.4%) once in six months and 3 (33.3%) performed the skill in a period greater than six months.

5.12.18 Paediatric clinical skills International

The frequency of performance of 10 (N) for **Intraossoeus cannulation** was 0 (0%) daily, 1 (10.0%) 2-6 times per week, 0 (0%) once a week, 4 (40.0%) once a month, 0 (0%) once in six months and 5 (50.0%) performed the skill in a period greater than six months. The frequency of performance of 10 (N) for **umbilical vein cannulation** was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 4 (40.0%) once in six months and 6 (60.0%) performed the skill in a period greater than six months.

The frequency of performance of 10 (N) for **incubator management** was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 3 (30.0%) once a month, 3 (30.0%) once in six months and 4 (40.0%) performed the skill in a period greater than six months.

5.12.19 Obstetric clinical skills International

The frequency of performance of 10 (N) for **normal vaginal delivery** was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 1 (10.0%) once a month, 5 (50.0%) once in six months and 4 (40.0%) performed the skill in a period greater than six months. The frequency of performance of 10 (N) for **mal-presentation management** was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 4 (40.0%) once in six months and 6 (60.0%) performed the skill in a period greater than six months.

The frequency of performance of 10 (N) for **premature labour management** was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 5 (50.0%) once in six months and 5 (50.0%) performed the skill in a period greater than six months. The frequency of performance of 10 (N) for **obstructed labour management** was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 1 (10.0%) once a month, 3 (30.0%) once in six months and 6 (60.0%) performed the skill in a period greater than six months.

The frequency of performance of 10 (N) for **prolapsed cord management** was 0 (0%) daily, 0 (0%) 2-6 times per week, 0 (0%) once a week, 0 (0%) once a month, 4 (40.0%) once in six months and 6 (60.0%) performed the skill in a period greater than six months.

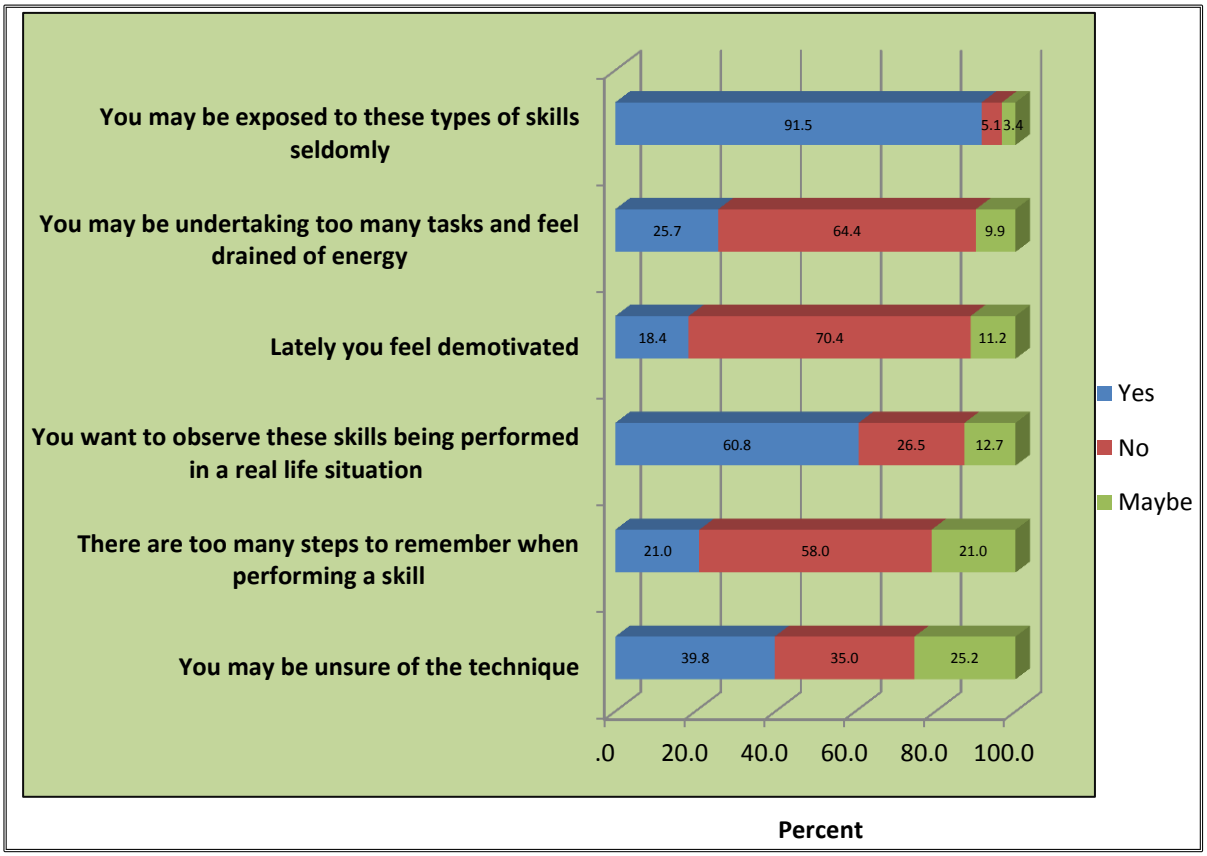

Figure 14: Reasons for a POOR or FAIR confidence level for ALS clinical skills undertaken.

Figure 14, depicts the values for respondents that had poor or fair levels of confidence when performing a particular clinical skill. The researcher aimed to identify possible reasons for these levels of confidence thus, question

thirteen of the survey provided six possible reasons for poor or fair confidence levels. The respondents were asked to place an “X” in the appropriate box, which indicated Yes, No or Maybe. The results illustrated in Figure 14, reveals that 118 (N) responded to reason one, “you may be exposed to these types of skills seldomly”, for which 108 (91.5%) said “Yes”, 6 (5.2%) said “No” and 4 (3.4%) said “Maybe”. For reason two, “you may be undertaking too many tasks and feel drained of energy”, 101 (N) responded, 26 (25.7%) said “Yes”, 65 (64.4%) said “No” and 10 (9.9%) said “Maybe”. For reason three, “lately you feel demotivated”, 98 (N) responded, 18 (18.4%) said “Yes”, 69 (70.4%) said “No” and 11 (11.2%) said “Maybe”. Reason four; “you want to observe these skills being performed in a real life situation”, showed 102 (N) responded, 62 (60.8%) said “Yes”, 27 (26.5%) said “No” and 13 (12.7%) said “Maybe”. Reason five, “there are too many steps to remember when performing the skill”, 100 (N) responded, 21 (21%) said “Yes”, 58 (58%) said “No” and 21 (21%) said “Maybe”. For reason six, “ou may be unsure of the technique”, 103 (N) responded, 41 (39.8%) said “Yes”, 36 (35%) said “No” and 26 (25.2%) said “Maybe”.

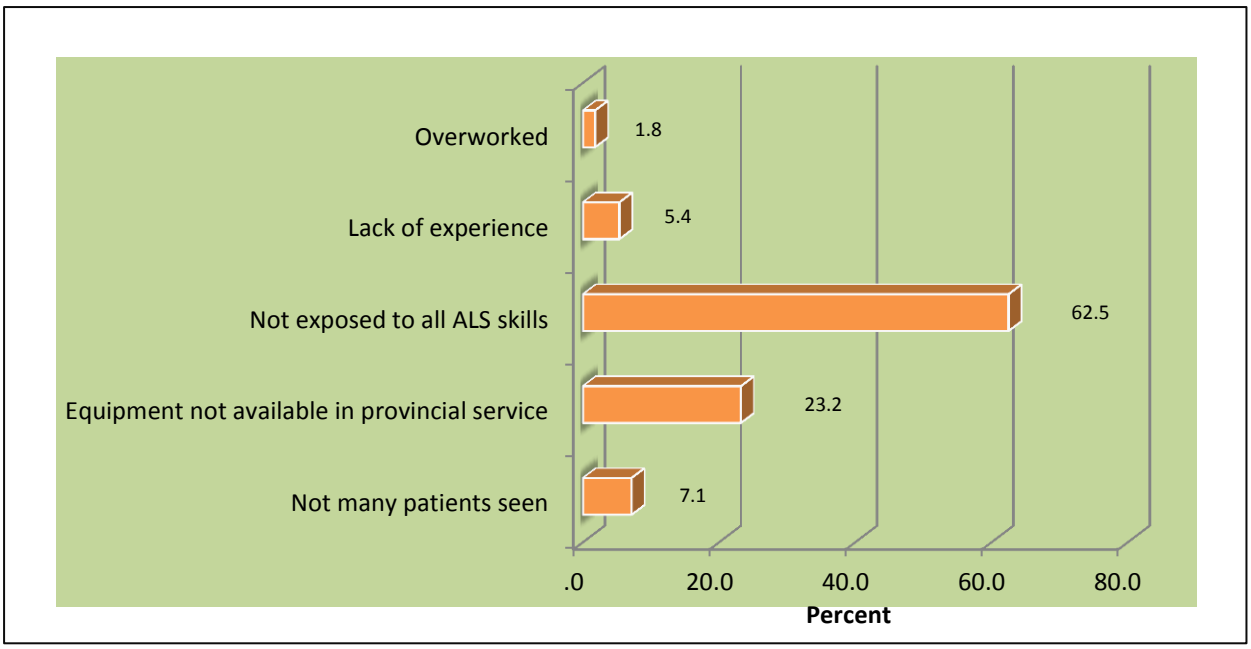

Figure 15: Additional reasons for POOR or FAIR confidence level for ALS clinical skills undertaken.

In addition to Figure 14, question thirteen asked respondents to list additional reasons for poor to fair confidence levels. These reasons were labelled as illustrated in Figure 15. Only 56(N) responded to this part of the question. The following reasons were given, 4 (7.1%) said that they don't see too many patients, 13 (23.2%) said that equipment to undertake skills is not available in the provincial service, 35 (62.5%) said that they are not exposed to all their ALS skills. 3 (5.4%) said that they are lacking experience, 1 (1.8%) said that he/she is overworked.

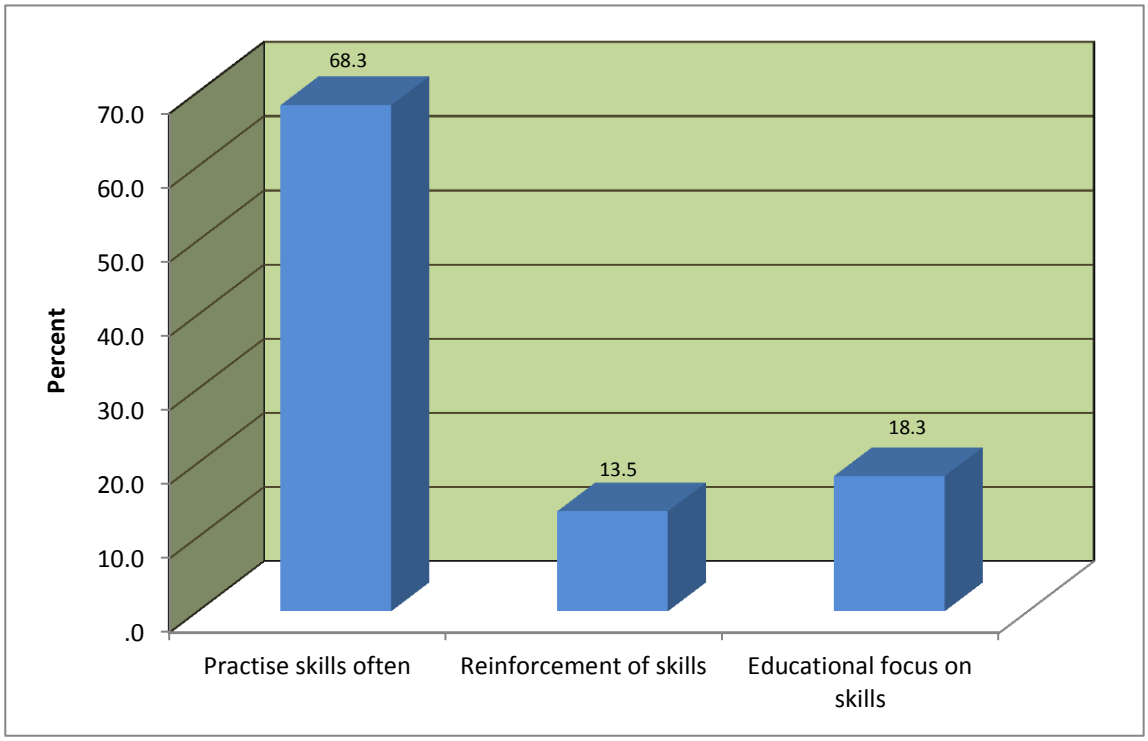

Figure 16: Reasons for a GOOD, VERY GOOD or EXCELLENT confidence level for ALS clinical skills undertaken.

The researcher aimed to identify the reasons for those respondents who indicated a “good”, “very good” and “excellent” level of confidence. Figure 16, shows 126 (N) responded to the question and reveals that 86 (68.3%) said they practice their skills often, 17 (13.5) said that there is skill reinforcement and 23 (18.3%) stated that that there is an educational focus on their skills which lead to good, very good or excellent confidence.

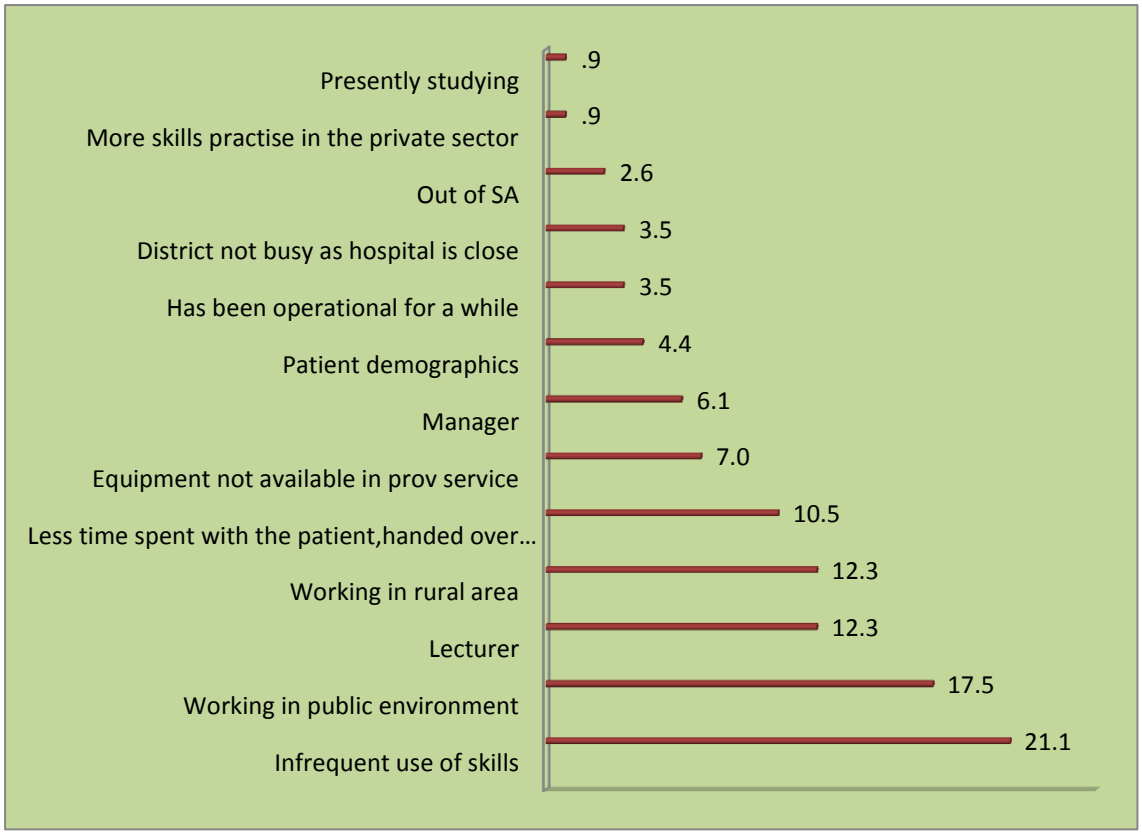

Figure 17: Reasons for seldom exposure to ALS clinical skills

The respondents, 114 (N) listed thirteen reasons for seldom exposure to ALS clinical skills. The first reason was listed by 24 (21.1%) who indicated infrequent use of skills, which is skills that could have been performed but was not. The seconded reason was listed by 20 (17.5%) who stated working in a public environment as the reason for seldom exposure to ALS skills. Lecturing, 14 (12.3%), working in a rural area 12 (10.5%), less time spent with the patient as the patient is handed over to the hospital due to close proximity 12 (10.5%), equipment not available in the provincial service 8 (7.0%), being a manager 7 (6.1%), patient demographics 5 (4.4.%), have been operational for a short while 4 (3.5%), district not busy, patients use public transport to the hospital 3 (2.6%), working out of South Africa 3 (2.6%),

more skills practiced in the private sector 1 (0.9%) and presently studying 1 (0.9%) were stated as other reasons for seldom exposure to ALS skills.

5.3 Continuous professional development data

The CPD data presented in this subsection is a descriptive data analysis for Objective Two of the study. The type of CPD, content and where CPD was undertaken by the 140 (N) respondents will be presented first. The data presented thereafter state the reasons ALS respondents attend CPD activities and whether it had been beneficial to them. Finally the activities the respondents with like to undertake to maintain and improve their competence, including the reasons for choosing the particular activities will be presented.

Table 10: Type of CPD activity undertaken by ALS providers

WHAT TYPE OF CPD	FREQUENCY	PERCENTAGE
Medical updates	52	42.9%
BLS and CPR for healthcare course	42	34.6%
Advanced Cardiac Life Support course	42	34.7%
ALS forum	27	22.3%
Post Graduate studies	23	19.0%
Paediatric Advanced Life Support Course	17	14.0%
MIMMS	16	13.2%
Mortality & Morbidity Meetings Netcare/EMRS HEMS	15	12.2%
Intermediate Trauma Life Support Instructor Course	15	12.3%
EMS conference	14	11.4%
Neonatal Resuscitation course	7	5.7%
RSI Update	6	4.9%
PHTLS	6	4.9%
Journal discussion group	6	4.9%
ATLS course	3	2.4%
National Diploma: EMC	3	2.4%
Basic emergency skills training	2	1.6%
Aviation Health Care Provider course	2	1.6%
Rescue update	1	0.8%
HDHET	1	0.8%
Use of Magnesium sulphate update	1	0.8%
Missing 19	19	15.7%
Total	**121(N)**	**100.0%**

Table 10 illustrates the type of CPD activities the respondents attended in the last two years: Medical updates, 52 (42.9%), BLS and CPR for healthcare course 42 (34.6%), ACLS course 42 (34.7%); ALS forum 27 (22.3%); Post graduate studies 23 (19%); PALS Course 17 (14%); MIMMS 16 (13.2%); M & M Meetings Netcare/EMRS HEMS 15 12.2%), ITLS Instructor Course 15

(12.3%), EMS conference 14 (11.4%), Neonatal Resuscitation course 7 (5.7%), RSI Update 6 (4.9%), PHTLS 6 (4.9%), Journal discussion group 6 (4.9%), ATLS course 3 (2.4%), National Diploma: EMC 3 (2.4%), BEST 2 (1.6%), AHCP course 2 (1.6%), Rescue update 1 (.8%), HDHET 1 (.8%), Use of Magnesium sulphate update 1 (0.8%) .

Table 11: Content of CPD activity

CONTENT OF CPD	FREQUENCY	PERCENTAGE
Medical theory topics	67	52.3%
BLS update, latest CPR techniques	39	30.4%
Instructor training	27	21.0%
Undertaking the Bachelor of Technology: EMC programme	22	17.1%
Latest ACLS techniques	19	14.8%
ALS theoretical aspects	17	13.2%
ACLS theory and practice	16	12.5%
Theory refresher	14	10.9%
Research general topics	13	10.1%
Morbidity and mortality case reviews	12	9.3 %
RSI theory and practice	6	4.6%
Neonatal resuscitation techniques	4	3.1%
Post graduate education	1	.7%
Rescue training	1	.7%
Use of magnesium sulphate	1	.7%
Missing	12	9.3%
Total	**128 (N)**	**100%**

In connection with Table 10, Table 11 depicts the content that was delivered to 128(N) respondents. The content related to the types of CDP was, medical theory topics 67 (52.3%), BLS update and latest CPR techniques 39

(30.4%), Instructor training 27 (21%), Undertaking the Bachelor of Technology: EMC programme 22 (17.1%), Latest ACLS techniques 19 (14.8%), ALS theoretical aspects 17 (13.2%), ACLS theory and practice 16 (12.5%), Theory refresher 14 (10.9%), Research general topics 13 (10.1%), Morbidity and mortality case reviews 12 (9.3%), RSI theory and practice (4.6%), Neonatal resuscitation techniques 4 (3.1%), Post graduate education 1 (.7%), Rescue training 1 (0.7%), Use of magnesium sulphate 1 (0.7%).

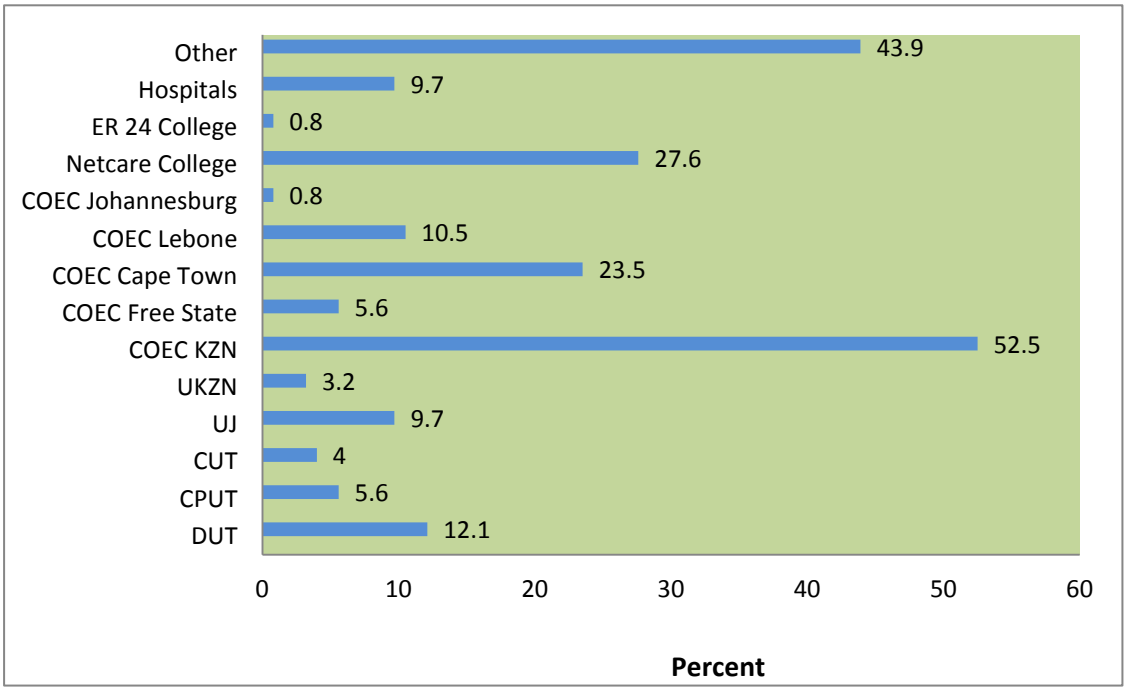

Figure 18: CPD providers

With reference to Table 10 and 11, respondents were asked to indicate where they attended CPD activities. Of the 140 (N) respondents, 123 (N) responded to this question. Figure 18, illustrates that CPD was provided by higher education institutions, colleges of emergency care, hospitals and other

institutions. Of the Higher Education Institutions, Durban University of Technology (DUT) was attended by 15 (12.1%) respondents, Cape Peninsula University of Technology 7(5.6%), Central University of Technology 5 (4.0%), University of Johannesburg 8 (9.7%), University of Kwazulu-Natal 4 (3.2%). The College of Emergency Care (COEC) Kwazulu-Natal was attended by 64 (52.5%), COEC Free State 7 (5.6%), COEC Cape Town 29 (23.5%), COEC Lebone 13 (10.5 %), COEC Johannesburg 1 (.8%), Netcare College 34 (27.6%), ER 24 College 1 (.8%), hospitals 12 (9.7%), Other institutions 54 (43.%).

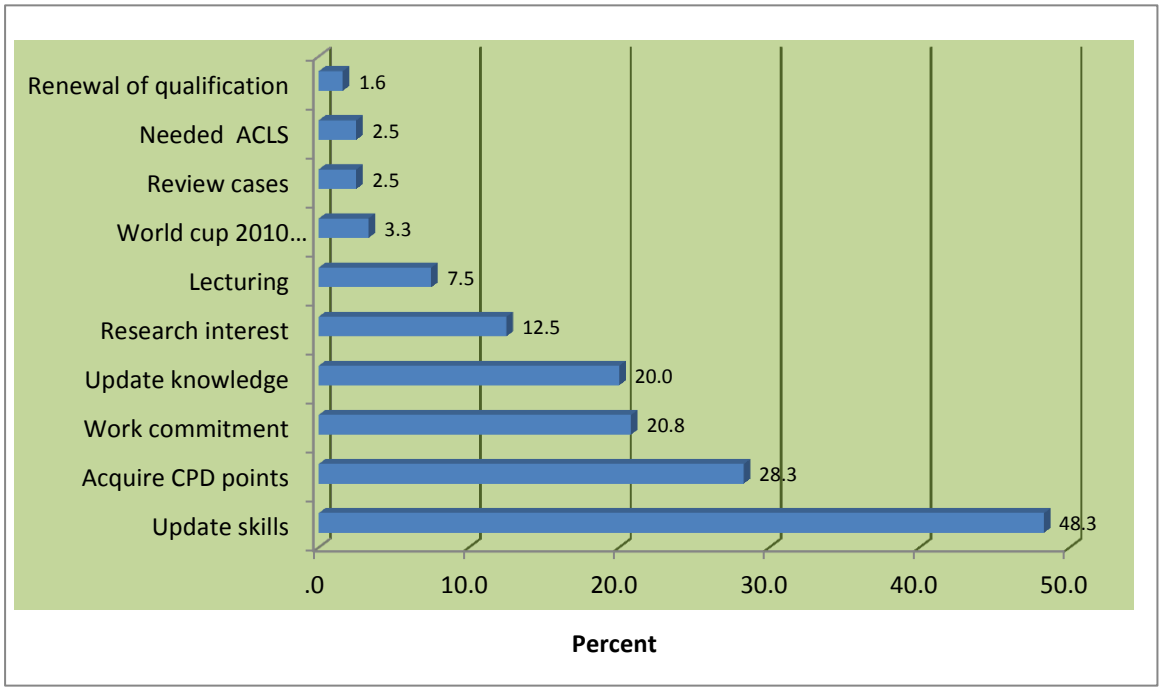

Figure 19: Reasons for attending CPD activity

The respondents were asked to indicate the reasons for attending the CPD activity. Of the 140 (N) respondents, 120 (N) responded to this question.

More than half 58 (48.3%) stated that the activity was undertaken to update skills whilst others indicated it was to acquire CPD points 34 (28.3%), work commitment 25 (20.8%), update knowledge 24 (20.0%), research interest 15 (12.5%), lecturing 9 (7.5%), world cup 2010 preparation 4 (3.3%), review cases 3 (2.5%), needed ACLS 3 (2.5%), renewal of qualification 2 (1.6%).

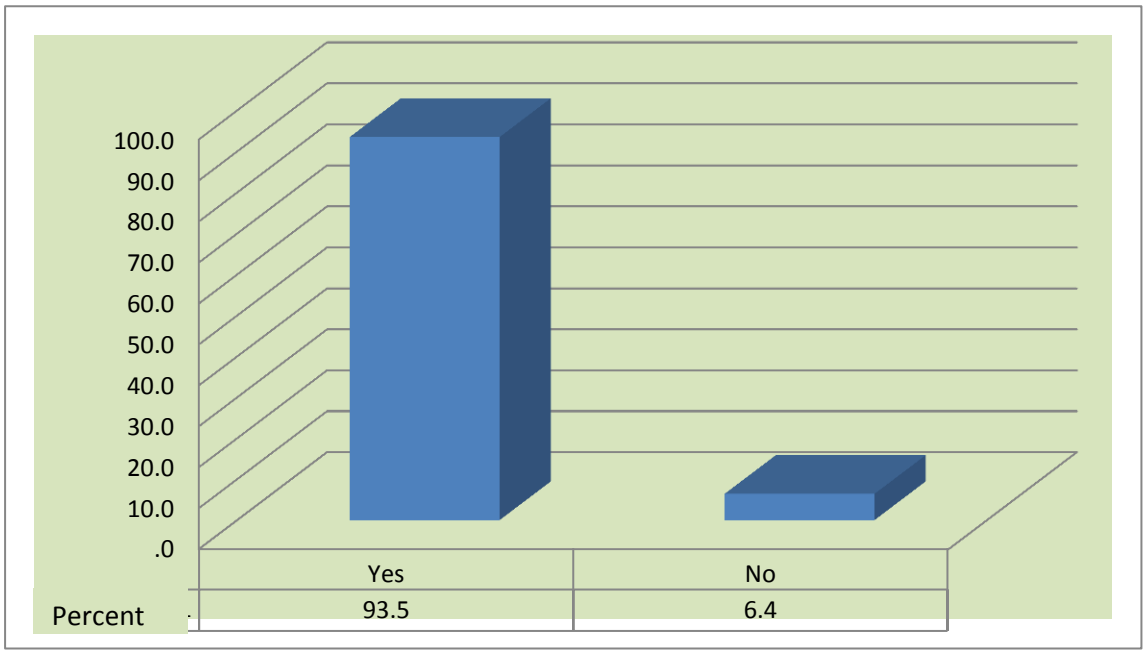

Figure 20: Appropriate CPD

With reference to Tables 10 and 11 and Figures 18 and 19, the respondents were asked to indicate whether or not the CPD activity was beneficial to them. The data analysis presented here is for Objective Three which was to determine whether continuous professional development activities that were being undertaken by ALS providers were appropriate for maintaining the respondent's competency. Of the 140 (N) respondents, 124 (N) responded to

this question. A huge proportion 116 (93.5%) said that the CPD activity attended in line with the reason for attending and was appropriate, 8 (6.4%) said that the CPD was not appropriate.

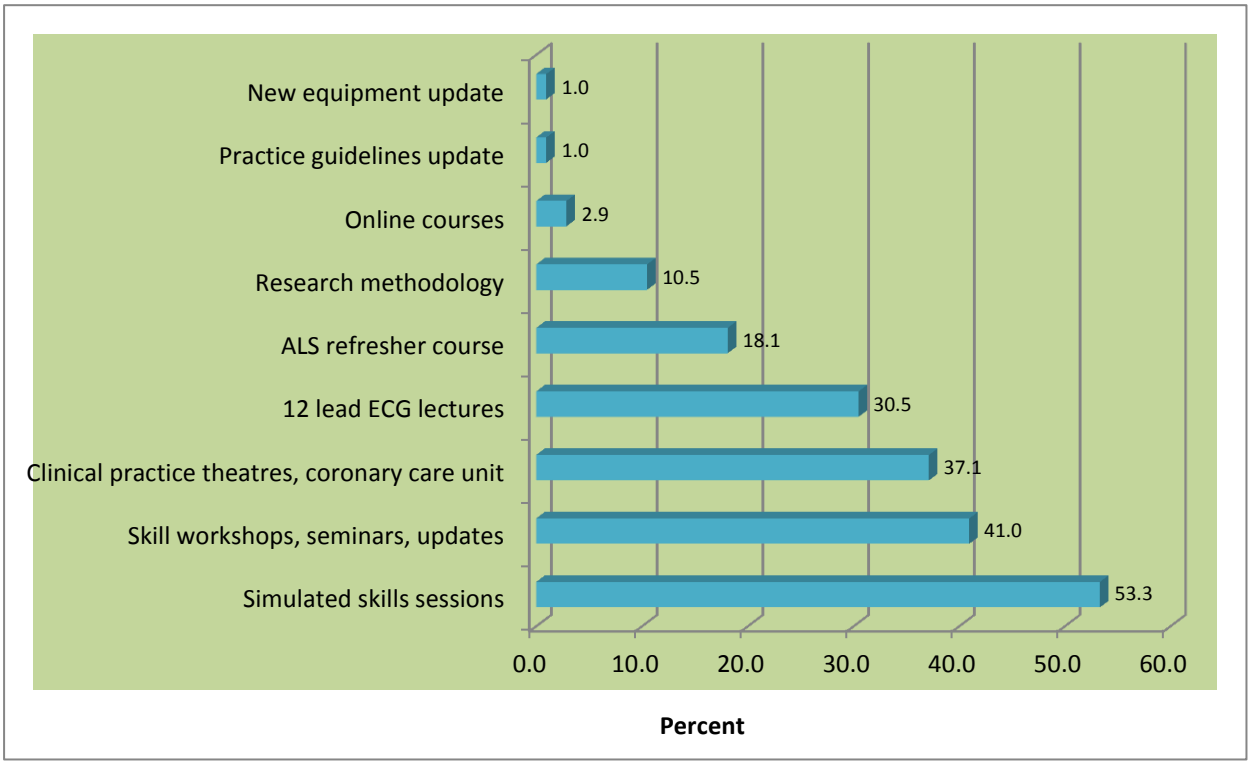

Figure 21: Activities requested to improve/maintain professional competence

The researcher aimed to determine in Question 17 of the survey, what CPD activities the respondents would like to attend. This was significant to Objective Four of the study which asked what specific CPD activities they felt they needed to maintain and improve their competence. The respondents indicated, paediatric and obstetric simulated skill sessions 56 (53.3%), Skill workshops, seminars, updates 43 (40.9%), clinical practice theatres, coronary care unit 39 (37.1%), 12 lead ECG lectures 32 (30.5%), ALS

refresher course 19 (18.0%), research methodology 11 (8.5%), online courses 3 (2.8%), practice guidelines update 1 (.9%) and new equipment update 1 (.9%). as specific CPD needs.

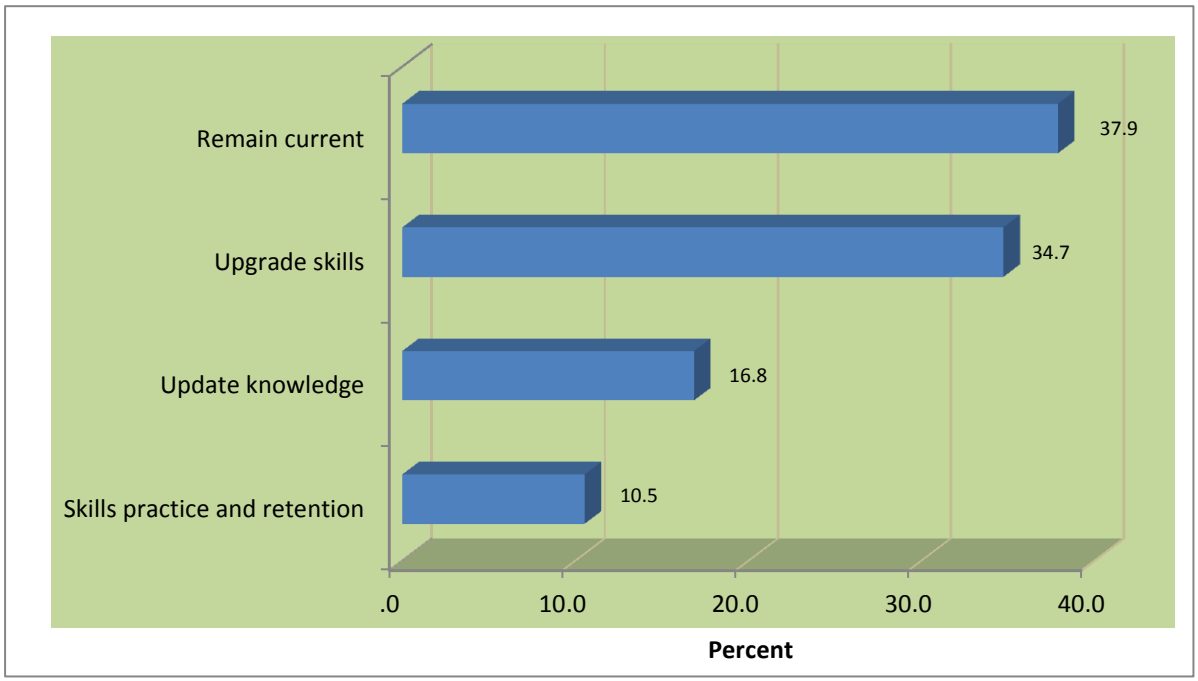

Figure 22: Reasons for requesting specific CPD activities

With reference to Figure 22, thirty six (37.9%) respondents indicated the reasons for choosing those specific CPD activities were to remain current whereas thirty three (34.7%) wanted to upgrade their skills, sixteen (16.8%) wanted to update their knowledge and ten (10.5%) indicated their interest in skills practice and retention

Table 12: χ^2 results for ALS skills and demographic data

ALS CLINICAL SKILLS	Chi-squared test (χ^2) (5% confidence level of significance							
	***p*-values**							
	Country	**Province**	**Qualification**	**EMS setting**	**Geography**	**Work title**	**Mode of work**	**Shift worked**
Orotracheal intubation		0.047		0.004		0.001		0.004
Laryngeal mask airway		0.047		0.002	0.000			
Nebulization		0.018		0.000	0.043	0.001	0.031	0.020
Mechanical ventilation				0.010		0.001		
Capnography application	0.001	0.027		0.003		0.031	0.022	
Pulse oximetry	0.049	0.001	0.001	0.000	0.046	0.000	0.003	0.000
Defibrillation	0.012	0.009		0.023				0.048
Synchronized cardioversion	0.000	0.003	0.009	0.009		0.012		
Transcutaneous pacing	0.012	0.022					0.042	
Three lead ECG	0.040		0.004	0.000		0.000		0.002
Twelve lead ECG				0.000		0.005		0.012
External jugular vein				0.029		0.034		0.018
Premature labour				0.016				0.005
Incubator management		0.020		0.000		0.000	0.038	
Medication administration		0.038		0.000		0.000		0.008
Intramuscular injection						0.040		0.021

Table 12 provides the Pearson's chi-square test results. Bivariate analysis was conducted on the frequency of forty one ALS skills and the demographic variables. Sixteen (39%) of clinical skills showed significant association with the demographic variables.

Orotracheal intubation, showed significant significance with, province; EMS setting; work title and shift worked. Similarly laryngeal mask airway showed significant association with, province, EMS setting but differed with geographical location. Nebulization showed significant association with province; EMS setting; geographical location; work title; mode of work and shift worked. Mechanical ventilator application showed significant association with only, EMS setting and work title. Capnography application as compared to pulse oximetry showed significant association with country; province; EMS setting; work title and mode of work, whilst pulse oximetry showed significant association with all the demographic variables. Defibrillation, transcutaneous pacing and synchronized cardioversion showed similar significant association with country province and EMS setting. Three and twelve lead showed similar significant association with EMS setting, work title and shift worked. Only premature labour from the obstetric skills category showed significant association with two of the nine variables, they are: EMS setting and shift worked. Incubator management and medication administration showed similar significant association with the demographic variables except mode of work and shift worked.

CHAPTER SIX

DISCUSSION

6. Introduction

This chapter presents the discussion of the results and findings in keeping with the objectives of the study.

6.1 Discussion

The results showed that demographics generally affected skill exposure and therefore skill frequency. ALS clinical skills were performed infrequently; however, CPD activities that were undertaken by respondents were not appropriate to address gaps in the ALS provider's professional development.

6.1.1 Demographic data

Of the total number of respondents 140(N), South Africa produced the highest number of respondents 130(N) since the study was conducted in South Africa as compared to the international cohort of 10(N) which had a constitutional make-up of seven different countries Figure 9.

The demographic variables (Annexure 5) were tested for association against clinical skill frequency. The findings from the Pearson's Chi-square correlation between ALS clinical skills and the eight countries (Table 12) showed that a substantial percentage, 85.3% of clinical skills had shown no significant association. Only 14.6% of clinical skills measured significant association. The following clinical skills showed significant association: capnography application; pulse oximetry; defibrillation; synchronized cardioversion; transcutaneous pacing and three lead ECG analyses. In a sub analysis conducted on frequency of ALS clinical skills for the international cohort (Table 9) as compared to the South African cohort (Tables 4, 5 and 6), the trend was similar for those clinical skills that showed significant association and differences. This infers that the International and South African cohorts had similar experiences with frequency of ALS skills. CPD findings was limited to only medical updates under category "CPD type" that showed significant association (p=0.012) between all the countries (Annexure 8).

Of the South African respondents, Kwazulu-Natal (KZN) produced the highest number of respondents, 43.8% followed by Gauteng 22.3%; Western Cape 18.5%; North West Province 6.2%, Free State 4.6%; Mpumalanga Province 1.5%; Limpopo Province 1.5%; and Eastern Cape 1.5%. The Pearson's Chi-square test between all eight provinces and clinical skills showed significant association with only 24.3% of clinical skills. Orotracheal

intubation; laryngeal mask airway; nebulization; incubator management; medication administration; capnography; pulse oximetry defibrillation; synchronized cardioversion and transcutaneous pacing (Table 12).

It is interesting to note, that the findings from this study highlight that orotracheal intubation and LMA insertion have the same *p* value (*p*=0.047), which infers that all the provinces had the same skill experiences. In a sub analysis of three major provinces and four major categories of ALS clinical skills (Table 7.) the trend was similar for clinical skills that showed significant association, however it was evident that frequency of obstetric skills is greater in KZN in comparison to the Western Cape and Gauteng. Pearson's Chi-square test showed significant association between provinces and "CPD type" and provinces and "CPD content" *(p*=0.000).The inference suggests that ALS providers from all eight provinces undertook similar type and content of CPD (Annexure 8).

The qualification of the total respondents comprised of a majority of National Diploma: EMC, 47.9% as compared to, Critical Care Assistants 35.7%. Both these qualifications follow the same scope of practice. Bachelor of Technology: EMC 15.7% and Master of Technology: 0.7% follows a more advanced scope of practice as they have the added capabilities of RSI and fibrinolysis. Pearson's Chi-square test, however, only revealed 7.3% clinical skill that showed significant association with the qualification of the

respondents. Pulse oximetry, synchronized cardioversion (and three lead ECG monitoring. This suggests that all the qualifications experienced similar frequency of skills. The findings from the differences between qualification and CPD revealed that only “CPD type” showed significant association with “type of qualification”.

With reference to EMS setting, it was found that, 39.3% work in the public sector as compared to the private sector which made up 25%. Lecturers and tutors formed 32.1%. The universities are represented by 6.4% whereas the provincial colleges are 25.7%. The category labelled “Other” is represented by 3.6%. of the ALS providers who work on a short contract basis employed by companies that are contracted to mines, oil rigs and offshore work. They are deployed where there is a need for ALS providers and once the contract is completed they return to South Africa. The majority of the respondents, 49.3% were employed in mostly the public sector for the duration of their professional registration.

EMS setting and clinical skills revealed that one third, 34.1% of the clinical skills showed significance (p=< 0.005). The clinical skills were: orotracheal intubation; laryngeal mask airway; nebulization; mechanical ventilation; capnography application; pulse oximetry; defibrillation; synchronized cardioversion; three lead and twelve lead ECG; external jugular vein cannulation and incubator management; medication administration and

premature labour management. The findings from the differences between EMS setting and CPD revealed that only “CPD type” showed a significant association (p=0.000) (Annexure 8). A large portion of the respondents, 42.1% worked in an urban setting. In contrast, 14.3% worked in a rural setting and 42.9% worked in both geographical settings. It was clear from the findings that 92.6% of clinical skills showed no significant association with geographical location. Only laryngeal mask airway; nebulization and pulse oximetry showed significant association (p=< 0.005).

This finding can be interpreted on the basis that urban and rural environments are different in many ways. As mentioned in Figure 17, factors such as patient demographics which relate to different disease profiles, the district not busy as a result patients use public transport to the hospital. In the urban setting drainage hospitals are in close proximity to the patient pick up points and, therefore, less time is spent with the patient to utilize ALS skills. These are associated with other studies such as Mulholland (2010) who compared practice between rural and urban ALS providers. The author concluded that the there is a need for specific rural components in training and education for ALS providers.

Almost half of the respondents, 49% work operationally (duty ALS) and on a shift basis as compared to the remaining half who are mainly office bound. The duty ALS providers, therefore, are exposed to patients more regularly

than the other half of the population; hence it is fair to say that almost 50% of the entire population of respondents are not exposed to patients on a regular basis due to their primary function being other than that of a duty ALS. It can be postulated from this, that due to the limited exposure to patients, there is a reduction in frequency of clinical skill and, therefore, a loss of clinical skill retention. The implication of this is possibly a loss of clinical skill competence and a patient safety consideration. This, by no means, discounts the duty ALS as regular exposure to patients does not necessarily equate to competence. The Pearson's Chi-square test showed no association to 70.7% of clinical skills and work title. Only 29% showed significant association (p=< 0.005) with clinical skills. The following clinical skills showed significant association, orotracheal intubation; nebulization; mechanical ventilation; capnography; pulse oximetry; synchronized cardioversion; three lead and twelve lead ECG analyses; external jugular vein cannulation; incubator management; medication administration and intramuscular injections. Pearson's Chi-square correlation showed significant association between work title and "CPD type", "CPD content" and "where CPD" was undertaken (p=<0.005). The inference suggests that respondents with different work titles undertook a similar type, content of CPD and attended the same venue for CPD (Annexure 8).

The majority, 64.2% of the respondents' primary mode of work was the response car as compared to the ESV, helicopter, and fixed wing. (Figure 13). The duty ALS is usually the ALS provider assigned to a response car

and therefore is the first port of call for all types of emergencies within their geographical area. The ESV and helicopter usually serves as a transportation unit after the patient has been stabilized by the duty ALS.

6.1.2 Clinical skills data

The results of the airway category demonstrated an above average frequency of orotracheal intubation where 65% of respondents performed the skill in the frequently whilst 35 % of respondents performed the skill in the infrequent period. When compared to the laryngeal mask airway (LMA) and Combitube (CT), the frequency of LMA insertion was very low with only 14.5% of respondents in the frequent period and 85.4% in the infrequent period and CT insertion was 94.7% in the infrequent period and only 5.2% in the frequent period. This result clearly demonstrates a notably higher frequency of orotracheal intubation when compared to the LMA and CT. In the category “other” of the infrequent period, 7.1% of respondents indicated that they had never performed the clinical skill orotracheal intubation, whilst 98.2% indicated that they never performed LMA insertion and 85.4% CT insertion (Annexure 6).

Although over one third of the respondents did not perform orotracheal intubation frequently, the overall average confidence rating per time period for the skill orotracheal intubation was high at 4.1 (range 1-5). There was no

significant association, however, between frequency of skill and reported levels of confidence for orotracheal intubation (p=0.088). The inference is probably due to respondents reporting a high level of confidence even when performing the skill infrequently (Annexure 10).

As compared to orotracheal intubation the overall average confidence rating per time period for LMA and CT insertion was not excellent at 3.6. and 2.9. (range 1-5). There was a significant association (p=0.001) between frequency and confidence of LMA insertion and (p=0.000) between frequency and the reported level of confidence for CT insertion. The inference demonstrates that although there was a low frequency of performance for both LMA and CT insertion the confidence level was above average.

The frequency of orotracheal intubation, LMA and CT insertion is of noteworthy importance as it is inconsistent when compared to the United States (US) and United Kingdom (UK) model. It has been reported by Bernhard and Bottiger (2011), the JRCALC Airway Working Group (2010) and Hein, Owen and Plummer (2008) that the frequency of orotracheal intubation is low due to limited exposures, which lead to unsuccessful intubation and increased mortality. As a result, alternative airway devices such as the LMA and CT began to gain huge popularity as a suitable alternative to orotracheal intubation. Deackin, King and Thompson (2009) conducted a twelve month review of ALS providers in the South Central

Ambulance Service Hamshire, on frequency of orotracheal intubation which showed that 47.6% did not perform intubation and 75.8% had undertaken one or less intubations in the twelve month study period.

The authors concluded that the skill is performed infrequently and management of the airway is likely to be inadequate with such infrequent exposure. Conversely a study conducted over a sixty four month period by Fullerton, Roberts and Mathew (2009) on the Warwickshire and Northamptonshire Air Ambulance Service in the United Kingdom found a higher exposure to endotracheal intubation and concluded that regular clinical exposure led to low tracheal intubation failure rates. O'Donnell, Omar, Kamlin, Davis and Marley (2006) also concluded from their study on endotracheal intubation attempts during neonatal resuscitation: success rates, duration, and adverse effects that greater experience is associated with greater success rates and shorter duration of successful attempts.

It can be postulated from this study that low exposure leads to infrequency of the skill and inexperience which is likely to lead to inadequate management of the airway and increased mortality. With regard to this statement, Ruetzier (2011) undertook a study of seven different airway devices. The results showed that three months after initial training, success rates of orotracheal intubation decreased to 58 % from 78%, however, five out of six supraglottic

airway devices showed a 100% success rate including a significantly less time to ventilation as compared to orotracheal intubation.

Deakins, Peters and Tomlinson's (2005) study compared LMA and orotracheal intubations of UK paramedics and found that 30% of intubation attempts were unsuccessful even under optimal conditions. But, LMA insertion had a higher success rate, and overall, secured the airway more reliably than orotracheal intubation. Bernhard and Bottiger's (2011) study of out-of-hospital intubations in the trauma patients stated that orotracheal intubation is advantageous in the care of trauma patients and increases survival rates provided there is correct use of rapid sequence intubation by experienced well-trained ALS providers. Bernhard and Bottiger also stated that previous interpretations of the US/UK trials which showed no positive impact on out-of-hospital intubation on trauma patients failed to consider the role of the inexperienced provider and that with new insights had clearly shown the benefits of well-trained providers, even in the US/UK model.

The frequency of performance of surgical cricothyrotomy (SC) was extremely low with only 4.9% of respondents performing the skill in the frequent period and 95.0% in the infrequent period. In the category "other" of the infrequent period 65.4% of respondents indicated to have "never" performed the skill. The overall average confidence rating per time period was good at 2.9. (range 1-5). Significant association (p=0.003) between frequency and

confidence of SC performance infers an average reported level of confidence associated to a low frequency of skill performance.

This finding is of notable concern as this surgical skill is a potentially life-saving procedure. Katos and Goldenberg (2007), Warner, Sharar, Copass and Bulger (2009) and Walls (2008) stated that a SC must be planned for in anticipation of a difficult or failed airway scenario. A failed airway scenario occurs when the ALS provider cannot intubate or ventilate the patient using a bag valve mask, endotracheal tube or an alternative airway such as a LMA. Hence, there will be an inability to restore adequate oxygenation and ventilation to the patient resulting in disastrous consequences. Therefore, in the event of a failed airway, SC, must be performed as a rapid means to secure or circumvent an obstruction to restore oxygenation and ventilation and prevent mortality. Katos and Goldenberg (2007) further stated that although there is an overall decline in the frequency of SC , the final pathway of the difficult airway algorithm still advised the use of this skill in a cannot intubate, cannot ventilate scenario.

When comparing SC with needle cricothyrotomy (NC) the frequency of NC in the frequent period is 5.1% of respondents and the infrequent period is 94.8%. The overall average confidence levels were 2.9 and 3.3. (range 1-5) respectively. Significant association was shown between frequency and confidence of NC (p=0.000). These findings are very similar for both SC and

NC and presents as a serious concern as the expected NC frequency should be far lower than SC. According to Walls (2008), and current HPCSA practice guidelines, the preferred skill for a failed airway is SC. NC is usually performed as a temporary measure at an intermediate life support level until a definitive airway such as SC can be established by an ALS provider.

It can be postulated from the finding that SC is a far more invasive procedure to perform than NC and due to low frequency of SC there is a possibility of loss of skill retention and competency and, therefore, a low reported level of confidence. This is consistent with Bandura's (1995) self-efficacy theory and, hence, a likely reason for the ALS provider to choose a lesser invasive procedure to perform.

The results of the breathing category demonstrated a high performance of pulse oximetry application where 82.8% of respondents performed the skill in the frequent period whilst only 17.1% performed the skill in the infrequent period. When compared to the capnography application, 45% of respondents performed capnography in the frequent period and 55% in the infrequent period. In category "other" of the infrequent period, 60% of respondents, indicated to have never performed pulse oximetry. The overall average confidence rating per time period for pulse oximetry was highest rating of 4.8. (range 1-5). Significant association was shown between frequency and confidence of pulse oximetry application (p=0.002). The inference

demonstrates a high confidence level associated to a high frequency of skill performance for pulse oximetry application.

This finding of a high frequency associated with a high confidence level is again consistent with Bandura's (1995) self-efficacy theory. It is noteworthy that this non-invasive monitoring skill is being performed frequently as maintaining a safe level of oxygen in the blood is of critical importance, especially for those patients with respiratory compromise (DeMeulenaere, 2007). Of particular importance is the use of pulse oximetry for neonatal resuscitation. The 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency cardiovascular Care (AHA Guidelines), states that numerous published data shows pulse oximetry has provided reliable readings within 1-2 minutes following birth. It is recommended that pulse oximetry be used where resuscitation can be anticipated, when positive pressure is being administered and when cyanosis is present or when supplemental oxygen is being administered. This is a class I recommendation.

When further observing the capnography application results, the category "other" of the infrequent period showed 46.4% of respondents indicated to have "never" performed a capnography application. But the overall average confidence rating per time period was good at 3.8. (range 1-5). Significant association (p=0.001) was shown between frequency and confidence of

capnography application. In comparison to pulse oximetry more than half of the respondents perform this skill infrequently.

This finding is inconsistent with evidence-based management of the critically ill or injured patient as capnography application is equally important as pulse oximetry, or more important in the case of the apnoeic patient as stated by Walls (2008). The AHA Guidelines, (2010) also makes particular reference to capnography as a class I recommendation for displaced tubes and a class IIb recommendation for effective cardiopulmonary resuscitation and return of spontaneous circulation. In this study, the lack of equipment was cited as a legitimate reason for lack of clinical skill performance. This begs the question: why would highly qualified, autonomous ALS providers knowingly place the patient and themselves at undue risk? Omission of a clinically desirable skill by reason of deficient equipment is a poor defence in the light of patient safety, clinical outcomes and evidence based practice. Bandura (1995) would argue that this practice signifies “learnt helplessness” where ALS providers become disempowered by themselves, their environment or the relationship between the two.

In the ACLS category, an average frequency for defibrillation was noted, where 45% of the respondents performed the skill in the frequent period and 55% performed the skill in the infrequent period. Of the category “other” in the infrequent period, 40% of the respondents had “never” performed the

skill. The overall average confidence rating per time period was high at 4.4 (range 1-5). No significant association between reported level of confidence and frequency of skill (p=0.428) was shown. Similarly, with orotracheal intubation, it is also probable that respondents reported a high level of confidence for defibrillation even though less than half the respondents performed the skill frequently.

With regards to defibrillation, the AHA Guidelines (2010) stated that early defibrillation is a vital link in the chain of survival in order to attain return of spontaneous circulation. It is, thus, an EMS standard practice that every ALS response vehicle is equipped with a defibrillator as a basic requirement. It could, therefore, be postulated from this finding that the almost equal incidence between the frequent and infrequent period could be attributed to the incidence of cardiac arrest in the ALS provider's geographical area or the response time to the cardiac arrest. In out-of-hospital cardiac arrest cases, studied in Johannesburg, South Africa, the proportion of patients found in a shockable rhythm was small over the seven year study periods which lead to decreased exposure of such cases (2009). The AHA Guidelines (2010) affirms that the early presenting rhythm after cardiac arrest is ventricular fibrillation (VF). Therefore, defibrillation forms an important part of the chain of survival and is a class I recommendation. If VF is not treated immediately, it rapidly deteriorates within minutes to an asystole. The opportunity to defibrillate was only likely to occur if the cardiac arrest was witnessed. South Africa has a substantial burden of cardiovascular disease that result in

cardiac arrest. The inability to utilize life-saving defibrillation may be explained by sudden cardiac death or by poor and delayed access due to poor or inequitable resource allocation.

The frequency of transcutaneous pacing (TCP) was very low as only 7% of respondents performed TCP in the frequent period whilst the infrequent period showed a 93% non-performance in the infrequent period. The category “other” in the infrequent period revealed that 67% of respondents never performed TCP. The overall average confidence rating per time period was above good at 3.5 (range 1-5). Significant association was shown between frequency of skill and reported levels of confidence (p = 0.010). This infers that there was an average level of confidence even though the TCP was performed infrequently. Synchronized cardioversion showed a very similar result to TCP with a low frequency of 8.0% in the frequent period and 92% in the infrequent period. In the category “other” in the infrequent period was 64% had never performed the skill. Similarly to TCP, synchronized cardioversion showed an overall confidence rating per time period of 3.6. and a significant association between frequency of skill and reported levels of confidence (p=0.025). This finding is consistent with Vrotsos, Pirallo, Guse and Auderheide’s (2008) study. The authors conducted a study in Milwaukee County EMS where they compared results from a 1997 study with a study conducted between 2001 and 2005. The authors found that the data showed a decreased opportunity and a wide variability in the frequency of ALS skill and experience in the EMS system and that limited exposure to critically ill

patients reaffirms that high- risk clinical skills are performed infrequently. The authors' suggested a multifaceted approach should be considered for maintaining provider competency.

Both TCP and synchronized cardioversion are extremely important electrical therapies used to manage critically ill patients. Performing these skills could prevent an impending cardiopulmonary arrest and, hence, is a vital component in the pre-arrest algorithm. (AHA Guidelines, 2010). As with defibrillation, all ALS response vehicles are equipped with transcutaneous pacing and synchronized cardioversion capabilities and, therefore, the low frequency of skill could be attributed to, infrequent use of the skill, increased response times, proximity to the hospital and patient demographics (Figure 17). The implications of low frequency are a loss of clinical skill retention and, therefore, ALS providers may not be performing life-saving ACLS skills to AHA standards. With regard to CPD, Table 10 showed that just one third, 34.7% of the respondents indicated to have undertaken an ACLS course in the last two years. This alone is an area for concern. However, of greater concern is that according to Smith, Gilcreast and Pierce (2008), ACLS skills degrade quickly and faster than BLS skills. The authors stated that over time degradation of skills can occur by at least 50%. The results from Smith, Gilcreast and Pierce's (2008) study of retention of ACLS and BLS skills showed that after three months, only a 30% passed an ACLS skills assessment and at twelve months, only 14% passed the same assessment.

The authors also stated that over a decade of research from other investigators, they too had similar findings.

In the paediatric skills category, Intraossoeus (IO) cannulation showed a very low frequency of 13% of respondents in the frequent period and a high 87% in the infrequent period. The category “other” in the infrequent period showed 63% had never performed the skill. When compared to umbilical vein cannulation (UVC) an extremely low frequency of 2% was shown in the frequent period, whilst a very high 98% performed the skill in the infrequent period. In the category “other” of the infrequent period 66% had “never” performed UVC. For both IO and UVC, the overall average confidence rating per time period was good at 3.3. and fair at 2.6 respectively (range 1-5).

It is important to note that 2.6 was one of the lowest overall average confidence ratings per time period of forty one skills listed. Significant association was shown for both IO and UVC between frequency of skill and reported levels of confidence (p=0.005) and (p=0.000) respectively. This finding is consistent with the study conducted by Vrostos *et al* (2008) and Lammers, Byrwa, Fales and Hale (2009) as these studies also showed very low frequency of paediatric clinical skills. In a study to determine whether ALS providers use resuscitation skills less frequently for injured children than for older patients, Jo Su, Mann, Mcall and Hedges (2007)found that ALS providers infrequently manage seriously injured children. Intravenous lines

are less frequently placed in paediatric patients, even in the setting of physiological abnormalities.

According to AHA Guidelines (2010) IO and UVC are suitable alternatives to intravenous lines in the paediatric patient, however, IO recently has gained huge popularity in the adult patient and as compared to South African ALS providers, their USA, UK, Saudi Arabia and Qatar counterparts are using IO more frequently on adult patients. A study conducted by Langley and Moran (2008) and Wampler, Schwartz, Shumaker, Bolletter, Becket and Manifold (2011) stated that IO needles are not just for paediatrics anymore. Both studies found that use of an IO device can provide easier and faster access than traditional cannulation in the critically ill or injured patient. It is clear from the frequency of IO insertions in this study, that South African ALS providers may not be aware of the evidence associated to adult IO insertion and, hence, are not practising the skill.

In the obstetric skills category, premature labour management (PLM) results showed a slightly higher frequency of 15.7% in the frequent period and 84.2% in the infrequent period as compared to mal-presentation management (MP) which revealed a low frequency of 9.6% of respondents in the frequent period and a high 90.3% in the infrequent period and obstructed labour (OL) also showed a low frequency of 8.7% in the frequent period and 91.2% in the infrequent period. In the category “other” of the infrequent

period 63.6% had never performed PLM, 65.2% of respondents had never performed MP and 62.8% of respondents had never performed OL. The overall average confidence rating per time period for PLM was good 3.2, MP was good 3.0 and OL was good 2.9 (range 1-5). Pearson's chi square correlation showed no significant association between frequency of skill and reported levels of confidence of PLM (p=0.066), whilst both MP and OL showed significant association with p values of (p=0.029) and (p = 0.006) respectively. The inference of no association for PLM is probably due to a higher frequency in the once in six month's category as compared to MP and OL. This finding is consistent with the study conducted by Vrostos *et al* (2008) and Ireland, Byers, Van Teijlinger, Hundley, Farmer, Harris, Tucker, Kruger and Caldow (2007) on nurses in a rural setting who showed major deficiencies in obstetric emergency clinical skills.

Of the forty one skills listed, PASG application showed an extremely low frequency and one of the lowest overall average confidence rating per time period of 2.9 (range 1-5). Only 1 (0.8%) performed the PASG application in the frequent period, whilst 111 (99.1%) performed the skill in the infrequent period with 102 (91%) in the category "other" of the infrequent period of which 10 (52.6%) of (n=19) never performed the skill. No significant association between frequency of skill and reported levels of confidence (p= 0.270). This inference is probably due to an even distribution of reported confidence over the five levels. This finding is of noteworthy concern as since 1997 major speculation around the use of the PASG developed. According to

McSwain and McSwain (2000) and Crawford and Ghosh (2005), the use of the PASG still remains controversial due to its associated adverse effects. It is likely that it is against this premise that the PASG is used so infrequently.

6.1.3 Reasons for clinical skills poor to fair confidence

Six possibilities were given to the respondents to indicate their reasons for poor to fair confidence. The respondents reported the reasons based on their indicated frequency of skills. Seldom exposure to clinical skills was the most important reason given for poor to fair confidences. This reason was indicated by 91.5% of respondents, whilst an additional four (3.4%) respondents thought that seldom exposure to those skills could “Maybe” be the reason for their poor to fair level of confidence. This finding is consistent with Bernhard and Bottiger’s (2011) and the JRCALC Airway Working Group’s (2010) study as discussed in the airway clinical skills discussion.

A substantial 62% of respondents felt that their confidence was” poor to fair” as they wanted to observe these skills being performed in a real life situation before performing them, whist 12.7% said that “Maybe” not seeing the skill being performed on real life patients contributed to their poor to fair level of confidence. This finding is consistent with Bandura’s (1995) self–efficacy theory, were he discusses that observation of others or vicarious experiences act as a significant source of improving one’s self–efficacy (Chapter 3).Yet,

just under half of the respondents 39.8% said “Yes”, and 25.2% said “Maybe” they were unsure of the technique. Twenty one 21% of respondents said “Yes”, and 21% said “Maybe”, there were too many steps to remember when performing the skills. These findings are significant to knowledge and skill retention as described by Smith, (2008), Latman and Wooley (2005) ,Miller *et al* (2004), Hubble, Paschal and Sanders (2000) and Kovacs *et al.* (2000) studies on knowledge and skills retention (Chapter 3).

Reasons Two and Three demonstrated fair results in the “Yes” and “Maybe” columns were 25.7% said “Yes”, 9.9% said “Maybe” there were undertaking too many tasks and felt drained of energy. This finding is consistent with studies conducted by MacFarlane, Van Loggerenberg and Kloeck (2005) and Shiron, Nirel and Vinokur (2006) on job burnout (Chapter 3). Demotivation featured last of the six given possibilities where 18.4% said “Yes”, and 11.2% said “Maybe” this was the reason for poor to fair level of confidence. This finding is consistent as Naude and Rothman’s (2006) study showed that a lack of job resources and a weak sense of coherence predicted emotional exhaustion and decreased work engagement.

A very important finding from other reasons listed for poor to fair level of confidence was that 23.2% stated that equipment to undertake those particular skills was not available in the public sector.

6.1.4 Reasons for clinical skills good, very good and excellent level of confidence

A substantial percentage, 61.4% of respondents stated that the reason for “good”, “very good” and “excellent” levels of confidence for the indicated clinical skills was that those skills were performed often on real life patients. However, only 16.4% stated that this was reinforced with an educational focus on clinical skills. This finding is consistent with Latman and Wooley (2005) who affirm that frequency of skill and CPD equals competency of skill.

6.1.5 Reasons for seldom exposure to ALS clinical skills.

As mentioned under “poor to fair” level of confidence, it is evident that 10.5% of respondents reported that the lack of equipment in the public sector contributed to seldom exposure to ALS clinical skills. A lack of exposure to patients that require the application of ALS skills was also noted again where 21.1% of respondents stated that this was the reason for seldom exposure to ALS skills. Interestingly, 17.5% of respondents stated that working in a public environment was the reason for seldom exposure to ALS skills. This could possibly be attributed to the previously mentioned lack of equipment in the public sector to perform ALS skills (Table 15). A point that could tie this statement together is although only 0.9% stated that more skills are practiced in the private sector, it is still valid as it is from the researcher’s experience that some private EMS are equipped with tools such as twelve lead ECG

monitoring and capnography, whilst most public EMS's are not equipped with such tools. It was also evident that working in rural areas contributed to seldom skill exposure. The findings also demonstrated that lecturers and managers stated that their full time jobs limited their exposure to ALS clinical skills.

6.1.6 Type and content of CPD

Over a two year period for CPD, it was clear that of the twenty one types of CPD activities indicated, the majority of respondents attended theoretically based events. These events were medical updates (42.9%), ALS forums, (22.3%) and M & M meetings (12.2%). It is important to note that these events are usually hosted by the respective EMSs and usually do not have a monetary implication whilst EMS conferences usually have a considerable monetary implication, especially if travel and accommodation is included. EMS conferences were attended by only 11.4% of respondents.

Skill based CPD was limited to only three types of practical aspects of which BLS and ACLS was most popular. The popularity of ACLS could be ascribed to the ALS responders' level of awareness, the accessibility and also its implications for new job applications as noted in Figure 5.10. It was evident that almost half, (42.9%) attended BLS and CPR courses and ACLS courses were attended by (34.7%) of respondents. According to Ramduth (2011) BLS

and CPR certification is a prerequisite for attending the ACLS course and, therefore, is the mostly likely explanation for ALS providers undertaking a BLS CPD event. Although ACLS was most popular, almost two thirds of the respondents did not attend this course. It must be noted once again that the ACLS course like an EMS conferences bears a financial implication. Neonatal Resuscitation courses are as important as ACLS but were only attended by (5.7%) of the respondents. As noted in the paediatric skills discussion, the low frequency of paediatric skills coupled with a very low attendance of this CPD event is an area of great concern. Once again the implication is that ALS providers are not practicing paediatric advanced life support according to AHA guidelines (2010). This is consistent with a study conducted by Lammers *et al* (2009) where the authors found multiple deficiencies in ALS providers' performance of paediatric resuscitation skills. The authors concluded that EMS educators and medical directors must target these specific skill deficiencies when developing CPD in paediatric patient care.

Associated with the "type of CPD", the "content" covered during these CPD events showed that most of the content involved theoretical aspects only. General medical theory topics were 52.3% theory refreshers; 10.9% research general topics 10.1% and ALS theoretical aspects 13.2%. CPD that incorporated skills and practice was focused mainly on basic and advanced CPR and emergency cardiovascular care. It is clearly noticeable that ALS providers are limited and are lacking in holistic development. With reference

to Table 10, it appears that only a small percentage of respondents considered ACLS and an even smaller percentage neonatal resuscitation. However, there was no or extremely limited CPD undertaken in the other skills categories. This could be ascribed to the lack of availability of appropriate CPD events as in a sub analysis (Annexure 6). It was clearly evident that many respondents attended the same type and undertook the same content over the two years of CPD activity. Some of the activities were undertaken three to four times in the two year period.

6.1.7 Where CPD was undertaken

Just over half, (52%) of respondents attended CPD events at the KZN COEC. This is likely due to the high number of respondents working in the public sector in the KZN group. The rest of the COEC's in the country were attended by small percentages including the four HEI's. The area of concern is that almost half, (43.9%) of the respondents attended CPD events outside these institutions. The ALS responder acquires his/her qualification from the HEI's or COEC's however, apart from the KZN COEC, maintenance of knowledge and clinical skills are mainly conducted by providers of CPD that are not associated with HEI's. This may be an area of concern as it is unknown whether these CPD providers are providing quality evidence-based education.

6.1.8 Reasons for attending CPD activity

Almost half of the respondents, 48.3% stated that the main reason for attending CPD activities was to update clinical skills, hence, the need for clinical skills development. However, as noted in Figure 19, these skills were mainly in the ACLS category suggesting a scarcity of additional CPD activities. These included: paediatric and obstetric skills workshops, twelve lead ECG applications, new equipment updates and simulated skill sessions that respondents requested for (Figure 21). It was apparent that apart from updating skills and knowledge the remaining reasons for attending CPD activities seemed to be undertaken for reasons other than maintaining competence and ensuring patient safety. Answers such as the need to acquire CPD points for professional registration were mentioned by over a quarter (28.3%) of the respondents and work commitment was a reason provided by 20.8% of respondents.

6.1.9 Appropriate CPD

A large proportion, 93.5% of respondents said that the CPD activity attended was appropriate to their reasons for attending and only (6.4%) said that the CPD was not appropriate. This finding is likely, as majority of the CPD undertaken was related to the ALS provider's area of expertise; however, the appropriateness is only related to the limited nature of the CPD activities undertaken. For those respondents that stated that the CPD activity was not

appropriate, it was likely the case, because they repeated the same activity in the two years (Annexure 9).

6.1.10 Activities requested to improve/maintain professional competence

It was evident from the results that ALS providers were lacking in other categories of clinical skills development because the majority of activities requested were in the practical aspect of their CPD. This request showed a need for patient simulations, practical workshops, theatre and coronary care unit exposure. Just over half the respondents, (53.3%) requested paediatric and obstetric simulated skill sessions and 40.9% requested clinical skills workshops. Exposure to real life patients in hospital departments such as theatres and coronary care units was requested by 37.1% of respondents. This contributes to the body of knowledge that teaching should be linked to practical experience thereby providing an ideal training ground for airway, breathing and ACLS clinical skills from both a vicarious and enactive mastery skill point of view. According to Grantcharov and Reznick (2008) this allows the learner to transfer skills from a laboratory environment to real life patients and enables the competent ALS provider to convert to a proficient ALS provider.

CHAPTER SEVEN

CONCLUSIONS AND RECOMMENDATIONS

7. Introduction

Centred on the findings of this study, the following conclusions and recommendations are presented.

7.1 Conclusion One

Skills frequency and competence are related

Skill frequency is dependent on skill exposure in that poor exposure results in infrequent skill performance. Infrequent skill performance is correlated with a self-perception of poor levels of confidence. Despite lacking in empirical evidence to positively correlate poor exposure with competence, this study documents sufficient theoretical argument for the same.

7.2 Recommendation One

Acknowledgement of the relationship between skill frequency and skill competence

The researcher strongly recommends that ALS providers, educators and employers accept the intrinsic and conceptual link between skill frequency,

skill exposure, clinical confidence and competent emergency care practice. The HPCSA, as the regulator and custodian of CPD and educational institutions must encourage the practice of reflection, particularly in areas of low skill exposure.

7.3 Conclusion Two

The intersection of needs between the quality assurer, patient and the ALS provider

It is the HPCSA's mandate to guide the professional and protect the public. In practical terms this implies the setting of standards for clinical competence in the interest of patient safety. Whilst the standards for initial competence are well established, it is the clinical governance post qualification that is deficient. Patient safety demands competent new graduates but also proficiency from previously qualified practitioners. ALS providers desire a compliance with the competence standards of particular clinical skills.

7.4 Recommendation Two

Universal CPD audits for ALS providers

The rationale for randomized HPCSA CPD audits includes cost and administrative feasibility. This is understandable when one considers the emergency care population in excess of 54000 people. But the ALS providers registered with the HPCSA are less than 1400 at present. This small

population negates the need for random CPD audits. Due to the nature and scope of practice, all ALS providers should be audited for CPD compliance.

Establishment of a national clinical skills registry

To date, the study remains unique and original. A wider and more consistent sample of the population may yield more conclusive data. This is particularly true in a country that has a widespread burden of disease, differing health seeking behaviour patterns, unequal distribution of emergency care availability and demographically challenging areas that need to be serviced. The establishment of a national skills registry would facilitate clinical surveillance and, therefore, inform clinical governance over a predetermined set of clinical interventions. Over time, this data could serve as a measure of compliance with evidence based medicine and in fact competence in areas of clinical skill. The notifiable skills set was not an intended outcome of this study and, therefore requires, further interrogation by all stakeholders. For this data base to be meaningful, ALS providers must be professionally and ethically obliged to comply with skills notifications under the provision that submitting to the registry is in no way punitively motivated but in the interest of professional growth and indeed patient safety. The registry may be sufficient to measure skill practice.

Auditing of mandatory skill set

The requirement of CPD compliance by emergency care providers is a desirable strategy internationally. Its critique, however, is that South African CPD requirements lack skill specificity. In effect, an ALS provider may be CPD compliant but deficient in skills implementation to the detriment of sufficient and compassionate care. Linked to the skills registry is the need for a mandatory skill set. It is this skill set that must be routinely audited in the interest of comprehensivity, inclusivity and freedom from selection bias. This is likely to improve confidence in and uptake of the newly implemented CPD system.

As CPD compliance is a prerequisite for continued HPCSA registration by both design and default, clinical skills competency may be enhanced.

7.5 Conclusion Three

CPD: Participant or bystander?

To appreciate the status quo of CPD utilization, the analogy of participant versus bystander will be considered. A participant is defined by exercising conscious and judicious appraisal and selection of choice. This freedom of choice is exercised voluntarily without fear or favour, and to fulfil in the first instance, an individual need and secondly, the needs of the group. A bystander by comparison, has no freedom of choice and is unwittingly disenfranchised. The bystander's participation is often the result of undue

inducement, subtle or deliberate coercion or even accidental. The status of current ALS provider participation is similar to the bystander in that participation is neither deliberate nor conscientious, but rather opportunistic and lacking in diversity, motivated by the need to comply with a prescript rather than the ideal of self-development and professional growth.

7.6 Recommendation Three

A strategy to improve CPD uptake

The current ratio of CPD compliance for the PBEC bares testimony to poor access in appropriateness of CPD activity. Where there was CPD compliance, CPD activities were homogenous. A lack of opportunity translates to lack of diversity. A lack of diversity results in individual CPD needs not being satisfied. The CPD policy is based on the professional needs of individual ALS providers relative to that of the emergency care discipline.

The recommendation to the education committee of the PBEC is to endorse and promote the following framework for the design and increased uptake of CPD activities.

1. Consider the market forces: CPD activity specific to skills must consider the health care provider and the health care user in terms of performance and safety respectively.

2. Selection of clinical skills facilitation: A needs assessment should be undertaken in order to be responsive to the specific and general need of the ALS provider. This should be balanced with an assessment of supporting equipment and resources to enable the CPD specific response.

3. Utilization considerations: CPD participants and providers must be appropriately qualified. Both must be effective as learners and facilitators and appreciate the need for good management practice. CPD is not intended to be transformative: that is, that it cannot make “bad” ALS providers “good”. It is intended to keep “good” ALS providers “good”.

4. Scientific evidence: CPD activity must be underpinned by sound scientific evidence which informs clinical practice.

7.7 SUMMARY

Skills competency ensures patient safety. It is also a hallmark of professional rigor in an emerging discipline. All the recommendations of the study are intended to enhance skills competency. Competency, however, implies satisfying a minimum standard for professional compliance and patient safety. Competency is more a measure of effectiveness than efficiency. The former implies doing the right thing; that is, the right skill for the right indication, whereas the latter implies “doing the right thing” “in the right way”; that is to say, the right skill for the right indication at the right time with the highest regard for professional ethics. It is the researcher’s assertion that this

study contextualises the need for ALS providers to claim their professional space in a health system that demands accountability, clinical relevance and a patient centred approach to health care. The researcher argues that skills competence and skills proficiency is at the heart of a patient centred approach.

7.8 CONCLUSION

It is through a professional commitment that ALS providers deliver an advanced evidence-based practice that should be maintained constantly within a dynamic environment. CPD is seen as an instrument for this and should also serve as a means to acquire professional excellence by exceeding the boundaries of base level standards with the aim of providing the finest quality of care in the interest of patient safety. However, with CPD in its current format, there is an absence of easily accessible, appropriate, individualized, high quality CPD activities. Coupled with this and the lack of frequent clinical skill performance and hence, clinical experience, personal levels of confidence and competence are altered.

This, in turn, leads to a non-realization of professional commitment and excellence that potentially places patients at risk. It is, therefore, strongly recommended that universal CPD audits should be undertaken on all ALS providers for appropriated CPD compliance with the establishment of a

national clinical skills registry to facilitate clinical skill surveillance to determine a notifiable, high risk skill set. Further studies should seek to establish whether competence is maintained post qualification. To safeguard against clinical skill attrition and loss of competence highly effective, appropriate CPD activities should be established which are both easily accessible and designed to meet individual needs. Further studies should enquire into the delivery and appropriateness of currently offered CPD activities.

ANNEXURES

Annexure 1: Letter to HPCSA

Annexure 1 – Letter to the HPCSA

HPCSA

PO Box

Pretoria 0001

BC Pillay
M Tech Student
DUT

Re: Request for a comprehensive list of contact details for registered Advanced Life Support providers [CCA, N Dip, BTech, Mtech]

Dear Sir/Mam

The purpose of the above request is the first step of data collection towards a Master's Degree in Technology: Emergency Medical Care. The research aims to reveal through all registered South African Advanced Life Support (ALS) providers vital information within the subject of Continuous Professional Development (CPD).

I am conducting a survey to identify the nature and applicability of CPD activities ALS providers are undertaking and what is required. The survey may reveal valuable information to inform the CPD committee, Health Professions Council of South Africa, so that they may inform accredited providers of CPD to make such activities a priority and a standard feature. The most applicable CPD activities are essential for updating professional competence to ensure that the public's interest will always be promoted and protected.

RESEARCH TOPIC:

A needs assessment for continuous professional development for South African advanced life support providers.

The study has received ethical approval from Health Sciences Faculty research committee, Durban University of Technology.

Name of research student:	Bernard Christopher Pillay
Contact telephone no:	031 3735402
Name of Supervisor:	Dr. L. Grainger
Contact no:	021 851 1790

Annexure 2 : Letter of information to conduct the pilot study

Annexure 2 – Letter of information to conduct a pilot study

Dear Colleague.

Regarding: The pilot study of the research questionnaire

I would like to kindly request your participation in piloting the research questionnaire for a Masters Degree in Technology, research project. The purpose of the research is to undertake a needs assessment for continuous professional development for South African advanced life support (ALS) providers. Your participation as an extensively experienced ALS provider may contribute valuable information for understanding the research topic bearing in mind the purpose of the pilot study as indicated below.

Please note:

1. To test the adequacy of the research instrument.
2. To assess the feasibility of a full scale survey.
3. To assess the proposed data analysis techniques to uncover potential problems.
4. To assess for questions that may be deemed of a sensitive nature.
5. To assess for leading questions.
6. To identify logistical problems that might occur.
7. To determine the time taken to complete the questionnaire.

Should you have any questions pertaining to the questionnaire, please contact the research supervisor or co-supervisor.

Supervisor: Professor Linda Grainger – 031 3735203

Co – Supervisor: Mr. Raveen Naidoo – 031 3732846

Yours faithfully

Mr. B.C.Pillay

Annexure 3: Letter of information to conduct the full scale survey

Annexure 3 – Letter of information to conduct the full scale survey

Dear Colleague

In fulfillment of a Master's degree: Emergency Medical Care at the Durban University of Technology, I am undertaking an e-mail survey (questionnaire), which is essentially a needs assessment for Continuous Professional Development (CPD) for all registered ALS providers. The purpose of the research is to identify gaps in the professional development and in doing so identify specific CPD needs of current registered ALS providers in South Africa and abroad in order to holistically maintain and improve Emergency Medical Care with continuing appropriate CPD activities.

I would like to request your kind contribution to this study as your experiences as an ALS provider may provide valuable information that may highlight the nature and applicability of CPD activities required by ALS providers. Furthermore it may help with the formulation of appropriate and sustainable teaching and learning activities. Sustainable, as our newly qualified graduates will be able to attend applicable CPD events, through accredited providers. This will contribute to maintenance of core competency, proficiency and will continuously develop knowledge, skill and ultimately ensuring that the public's interest will always be promoted and protected.

My research title is: **A needs assessment for continuous professional development for South African advanced life support providers**

If you agree to participate in this study please read the following information:

For this study, all HPCSA registered ALS providers will be approached as participants. Each participant will only be required, to complete a questionnaire.[ATTACHED] and return to the senders e-mail address.

Please be advised of the following regarding the questionnaire:

1. The questionnaire is in no way meant to cause any form of embarrassment and will not hold any adverse consequences which will affect your career as an Advanced Life Support provider.
2. The completion of this questionnaire is entirely voluntary.
3. You may withdraw your questionnaire at any time during the duration of the research project.
4. You may refuse to answer any questions which you regard as being of a sensitive nature.
5. There is no compensation for your participation.
6. No cost will be incurred by you.
7. There will be no coercion or pressure to participate
7. The completion of the questionnaire will take approximately 15 minutes.
8. Respondent confidentiality will be observed, so that no names appear on the data collection or in the results report forms.

The results will also be made available to you if so required. Should you have any questions pertaining to the questionnaire, please contact me, the research supervisor or co-supervisor, details as follows:

Student: Mr. BC Pillay – 0313735402 or 0828096442 or email: bernardp@dut.ac.za

Supervisor: Professor Linda Grainger – 031 3735203

Co – Supervisor: Mr. R. Naidoo – 031 3735269

Greatest thanks and appreciation.

Bernard C. Pillay

Lecturer: Durban University of Technology

Annexure 4: Ethics clearance certificate

DURBAN UNIVERSITY of TECHNOLOGY

Faculty of Health Sciences

ETHICS CLEARANCE CERTIFICATE

Student Name	Bernard Christopher Pillay	Student No	19911380
Ethics Reference Number	FHSEC 053/09	Date of ERC	02 November 2009
Qualification	M.Tech.: Emergency Medical Care		
Research Title:	A needs assessment for continuous professional development for South African advanced life support providers		

In terms of the ethical considerations for the conduct of research in the Faculty of Health Sciences, Durban University of Technology, this proposal meets with Institutional requirements and confirms the following ethical obligations:

1. The researcher has read and understood the research ethics policy and procedures as endorsed by the Durban University of Technology, has sufficiently answered all questions pertaining to ethics in the DUT 186 and agrees to comply with them.
2. The researcher will report any serious adverse events pertaining to the research to the Faculty of Health Sciences Research Ethics Committee.
3. The researcher will submit any major additions or changes to the research proposal after approval has been granted to the Faculty of Health Sciences Research Committee for consideration.
4. The researcher, with the supervisor and co-researchers will take full responsibility in ensuring that the protocol is adhered to.
5. ***The following section must be completed if the research involves human participants:***

	YES	NO	N/A
❖ Provision has been made to obtain informed consent of the participants	✓		
❖ Potential psychological and physical risks have been considered and minimised	✓		
❖ Provision has been made to avoid undue intrusion with regard to participants and community	✓		
❖ Rights of participants will be safe-guarded in relation to: - Measures for the protection of anonymity and the maintenance of Confidentiality.	✓		
- Access to research information and findings.	✓		
- Termination of involvement without compromise	✓		
- Misleading promises regarding benefits of the research	✓		

[redacted]

11/11/09
DATE

11/11/09
DATE

19/11/09
DATE

19/11/09.
DATE

Annexure 5 : Data collection tool

ANNEXURE 1
Data Collection Tool

QUESTIONNAIRE

Title of Research Study: A needs assessment for continuous professional development for South African advanced life support providers.

Dear Colleague,

Thank you for taking the time to fill out this questionnaire. This will automatically imply consent as a study participant.

This is a study that hopes to identify the gaps in the professional development of advanced life support providers. The data generated from the responses to this questionnaire is intended to contribute to the development of the emergency care profession. **Please answer each question as best as possible** to ensure the best possible reflection of the current status of continuous professional development of advanced life support providers.

1. Which country are you currently practicing in?

SOUTH AFRICA		OTHER		*Please specify*

2. Which Province are you currently based in?

W.CAPE	FREE STATE	KZN	GAUTENG	MPUMALANGA	LIMPOPO	E. CAPE	N. CAPE	NORTH WEST

3. What is your age? _____ years

4. Please indicate your level of professional qualification

CCA	NDip:EMC	BTech:EMC	MTech:EMC

5. How long have you been professionally registered with the HPCSA as an ADVANCED LIFE SUPPORT provider? _____ years

6. In what kind of EMS setting are you currently employed?

PUBLIC	PRIVATE	COLLEGE	UNIVERSITY	OTHER	
					Please specify

7. In what kind of EMS setting have you been employed in for most of the duration of your professional registration

PUBLIC	PRIVATE	COLLEGE	UNIVERSITY	OTHER	
					Please specify

8. In what kind of geographical setting have you worked in predominantly since initial professional registration as an ALS provider?

URBAN	RURAL	URBAN/RURAL	PHC	OTHER	
					Please specify

9. What is your current work title?

DUTY ALS	MANAGER	LECTURER	OTHER

Please specify

10. What is the primary description of the mode of your work?

ESV	RESPONSE CAR	HELICOPTER	FIXED WING	OTHER

Please specify

11. Please indicate the shift that you usually work.

DAY SHIFT	NIGHT SHIFT	DAY/NIGHT	OFFICE HOURS	OTHER

Please specify

12. a) Please indicate the frequency of performance for each of the skills below. Place an 'X' in the appropriate box.
b) Please use the same table to rate your personal level of confidence on a scale of 1 to 5 for each skill, using the following guide:
1 = POOR, 2 = FAIR, 3 = GOOD, 4 = V.GOOD and 5 = EXCELLENT

ADVANCED LIFE SUPPORT SKILL	How often have you performed the listed skills over the last twelve months?						CONFIDENCE LEVEL (1 to 5)
	Daily	2-6 times/week	Once a week	Once a month	Once in 6 mths	Other *(Specify)*	
Orotracheal intubation							
Nasotracheal intubation							
Blind nasotracheal intubation							
Laryngeal mask airway insertion							
Combitube insertion							
Retrograde intubation							
Digital tracheal intubation							
Needle cricothyrotomy							
Surgical cricothyrotomy							
Nebulization							
Mechanical ventilator application							
Nasogastric tube insertion							
Orogastric tube insertion							
Defibrillation							
Synchronized cardioversion							

CONT...

12. a) Please indicate the frequency of performance for each of the skills below. Place an 'X' in the appropriate box.

b) Please use the same table to rate your personal level of confidence on a scale of 1 to 5 for each skill, using the following guide:

1 = POOR, 2 = FAIR, 3 = GOOD, 4 = V.GOOD and 5 = EXCELLENT

ADVANCED LIFE SUPPORT SKILL	How often have you performed the listed skills over the last twelve months?						CONFIDENCE LEVEL
	Daily	2-6 times/week	Once a week	Once a month	Once in 6 mths	Other *(Specify)*	(1 to 5)
Vagal manoevres							
Peripheral vein cannulation							
External jugular vein cannulation							
Femoral vein cannulation							
Intraossoeus cannulation							
Umbilical vein cannulation							
Pressure infusion device application							
Capnography & capnography application							
Pulse oximetry application							
Care of central venous lines							
PASG application							
Needle thoracentesis							
Normal vaginal delivery							
Mal-presentation management							
Premature labour management							
Obstructed labour management							
Prolapsed cord management							
Urinary catherization							
Incubator transport and management							
Medication admin as per guidelines							
Use of three lead monitoring							
Use of twelve lead monitoring							
Intramuscular injections							
Subcutaneous injections							
Medication via endotracheal route							

13. With regard to the previous table of ALS skills, please indicate your reasons for a POOR(1) or FAIR(2) confidence level generally. Place an 'X' in the appropriate box. More than one response is allowed.

	YES	NO	MAYBE
You may be unsure of the technique.			
There are too many steps to remember when performing a skill.			
You want to observe these skills being performed in a real life situation.			
Lately you feel demotivated.			
You may be undertaking too many tasks and feel drained of energy.			
You may be exposed to these types of skills seldomly.			

Other additional reasons not listed above. Please elaborate where possible.

14. With regard to the previous table of ALS skills, please indicate your reasons for a GOOD(3), VERY GOOD(4) or EXCELLENT(5) confidence level generally. Please elaborate where possible.

15. If you believe that you are being exposed to certain ALS skills too seldomly, please list the possible reasons why?

16. With regard to continuous professional development (CPD), please list the type and content you attended in the last two years eg. Refresher course - latest CPR guidelines. Please also indicate WHERE these activities were undertaken eg. College/University/Medical School/etc and indicate your personal reason/s for attending. Please also indicate whether each activity was of benefit to your practice.

TYPE OF CPD ACTIVITY	CONTENT COVERED IN THE CPD ACTIVITY	WHERE WAS THE ACTIVITY UNDERTAKEN?	REASONS FOR ATTENDING	BENEFICIAL? YES/NO

17. What activities (not mentioned in the previous table) would you like to undertake to improve/maintain professional competence as an ALS provider?

18. **Why do you** want to undertake those specific activities mentioned in the previous question?

THANK YOU KINDLY FOR YOUR TIME

Annexure 6 : Skills frequency in the “Other” category- located on the CD.

Annexure 7: Clinical skills never done in the ALS providers registered time period, including the 12 month study period – located on the CD

Annexure 8: Chi-square values for demographic variables and CPD-located on the CD

Annexure 9: Type, content and CPD venue attended – located on the CD

Annexure 10: Chi-square values for frequency of clinical skills and confidence – located on the CD

LIST OF REFERENCES

Al-Shaqsi, S. 2010. Model of International Emergency Services (EMS) Systems. *Oman Medical Journal*. 25 (4): 320-323.

American Heart Association. 2010. Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation ,*Supplement. 122 (18).

Atack, L. and Maher, J. 2010. Emergency Medical and Health Provider's perceptions of Key issues in Prehospital Patient Safety. *American Journal of Emergency Medicine*. 14 (1): 95-102.

Bandura, A. 1977. Social learning theory. *Journal of communication*. 28 (3): 12-29.

Bandura, A.1995. *Self –Efficacy in changing Societies*. Cambridge: Cambridge University Press.

Barron, R. 2010. *Paramedic Job Description* (online). Available http://www.thehealthjob.com (Accessed 08 July 2011).

Beachamp, T.L. and Childress, J.F. 2002. Principles of Biomedical Ethics. *Journal of Medical ethics*. 28 (5): 332.

Bernhard, M. and Bottiger, B.W. 2011. Out-of-hospital endotracheal intubation of trauma patients: straight back and forward to the gold standard! *European Journal of Anaesthesiology*. 28 (2): 75-76.

Billington, D.D. 2000. Seven Characteristics of Highly Effective Adult Learning Programs (online). Available from WWW: http://www.newhorizons.com. (Accessed 07July 2011)

Bosk, C.L. 2003. *"Forgive and Remember, Managing Medical Failure".* Chicago: Chicago Press.

Brink, H. 2006. *Fundamentals of research methodology for health care professionals*. Second ed. Cape Town: Juta & Company.

Charles, D.D., Clarke, T., Nolan, J., Zideman, D.A., Gwinnutt , C., Moore, F., Ward, M., Keeble, C., Blancke, W. 2010. A critical reassessment of ambulance service airway management in prehospital care: Joint Royal Colleges Ambulance Liaison Committee Airway Working Group. *Emergency Medicine Journal*. 27 (3): 226-233.

Christopher, L.D. 2007. An investigation into the non-compliance of advanced life support practitioners with the guidelines and protocols of the Professional Board for Emergency Care Practitioners. Master of Technology dissertation, Durban University of Technology.

Claassen, N.J.B. and Verschoor, T. 1992. *Medical negligence in South Africa*. Pretoria Gigma.

Clements, M.R. 2005. Competence in prehospital care: Evolving concepts. *Emergency Medical Journal*. 03 (22): 516-519.

Croskerry, P. 2003. "Cognitive forcing strategies in clinical decision making" *Annals Emergency Medicine*. 01 (43): 110-120.

De Vos, A.S., Strydom,H., Fouche, C.B., Delport, C.S.L. 2005. *Research at grass roots.* Pretoria: Van Shaick Publishers.

Deakin, C.D., King, P., Thompson, F. 2009. Prehospital advanced airway management by ambulance technicians and paramedics: is clinical practice sufficient to maintain skills? *Emergency Medical Journal*. 12 (26): 888-891.

DeMeulenaere, S. 2007. Pulse Oximetry: Uses and Limitations. *The Journal for Nurse Practitioners*. 03 (5): 312-317.

Deepak, S. 2010. (SinghD@dut.ac.za). Senior lecturer of physics and study appointed statistician.

Dick, W. 2003. Anglo-American Vs Franco-German Emergency Service System. *Prehospital Disaster Medicine*. 01 (18): 29-35.

Dickinson, K., Roberts, I. 2000. Medical anti-shock trousers (pneumatic anti-ahock garments) for circulatory support in patients with trauma. *Cochrane Data Base Systematic Review*. 2 (1): 170 175.

Drey, N., Gould, D., Allan, T. 2009. The relationship between continuing professional education and commitment to nursing. *Nurse Education Today*. 29 (7): 740-745.

Dreyfus, H. and Dreyfus S. E. 1986. *Mind over Machine: the power of human intuition and expertise in the era of the computer*. Oxford: Basil Blackwell.

Dudzinski, D.M. 2006. Practicing Moral Medicine: Patient care to Public Health. *American Journal of Bioethics*. 01 (6): 75-76.

DuRandt, S. 2009. Personal communication with BC Pillay. Shift hours. ALS Provider, Netcare EMS ed. Durban.

Fricker, J.P., Kiley, M., Townsend, G., Trevitt, C. 2011. Professionalism: what is it, why should we have it and how can we achieve it? *Australian Dental Journal*. 56 (1): 92-96.

Fullerton, J.N., Roberts, K.J., Wyse, M. 2009. Can experienced paramedics perform tracheal intubation at cardiac arrests? Five years' experience of a regional air ambulance service in the UK. *Resucitation*. 80 (12): 1342-1345.

Gibbs, V. 2011. An investigation into the challenges facing the future provision of continuing professional development for allied health professionals in a changing healthcare environment. *Radiography*. 17 (2): 152-157.

Gosling, S. 2005. CPD and Competence: Related but Different: An initial; consideration of concepts. *Physiotherapy*. 85 (10): 536-540.

Grantcharov, T.P. and Reznick, R.K. 2008. Teaching Procedural Skills. *British Medical Journal*. 76 (336): 1129.

Greco, M., Spike, N., Powell, R., Brownlea, A. 2002. Assessing communication skills of GP registrars: a comparison of patient and GP examiner rating. *Medical Education.* 36 (2): 366-376.

Griscti, O. and Jacono, J. 2006. Effectiveness of continuing education programmes in nursing: literature review. *Journal of Advanced Nursing*. 04 (55): 449-456.

Guly, H. 2000. Continuing professional development for doctors in accident and emergency. *Emergency medicine*. 2 (17): 12-14.

Hammond, F., Saba, M., Simes, T., Cross., R., Teach, B. 2000. Advanced Life Support: Retention of registered nurses knowledge 18 months after initial training. *Australian Critical Care*. 03 (13): 123-128.

Hein, C., Owen, H., Plummer, J. 2008. A 12-month audit of laryngeal mask airway (LMA) use in a South Australian ambulance service. *Resuscitation*. 79 (02): 219-224.

Hodkinson, P. 1995. *The challenge of competence: Professionalism through vocational education and training*. London: Redwood Books.

Health Professions Council of South Africa. 2006. *Continuing Professional Development Guidelines for Health Care Professions* (online). Available from: http://www.hpcsa.co.za (Accessed: 14 July 2010).

Health Professions Council of South Africa. 2007. *Seeking patient's informed consent: The ethical considerations* (online). Available from: http://www.hpcsa.co.za (Accessed: 14 July 2010).

Health Professions Council of South Africa. 2008. *Standards of good practice* (online). Available from: http://www.hpcsa.co.za (Accessed: 14 July 2010).

Health Professions Council of South Africa. 2009. *The Continuous Professional Guidelines for the health care professionals* (online). Available from: http://www.hpcsa.co.za (Accessed: 14 July 2010).

Health Professions Council of South Africa. 2011. *History of the Professional Board of Emergency care* (online). Available from: http://www.hpcsa.co.za (Accessed: 2 April 2011)

Hubble, M.W, Paschal, K.R., Sanders, T.A. 2000. Medication calculation skills of practicing paramedics. *Prehospital Emergency Care.* 4 (3): 140-143.

Hulme, J., Perkins, G.D., Baldock, C., McNamara, A. 2003. Use of advanced life support skills. *Resuscitation*. 1 (58): 77-81.

Ireland, J., Bryers, H., Van Teijinger, E., Hundley, V., Farmer, J., Harris, F., Tucker, J., Kiger, A., Cadlow, J. 2007. Competencies and skills for remote and rural maternity care: a review of the literature. *Journal of Advanced Nursing*. 58 (2): 105-115.

Jacques, A. 2003. Maintaining competence: A professional challenge. *Bulletin of the Kuwait Institution of Medical Specialities*. 02 (7): 5-10.

Jo Su, E., Mann N.C., McCall, M., Hedges, J.R. 2007. Use of resuscitation skills by paramedics caring for critically injured patients in Oregon. *The American Journal of Emergency Medicine*. 01 (3): 123-127.

Kaplin, D.M. 2009. *Readings in the Philosophy of Technology*. Maryland: Rowman and Littlefield incorporated.

Katos, M.G. and Goldenberg, D. 2007. Emergency cricothyrotomy. *Operative Techniques in Otolaryngology-Head and Neck Surgery*. 18 (2): 110-114.

Kelley, K., Clark, B., Brown, V., Sitza, J. 2003. Good practice in the conduct and reporting of survey research. *International journal for Quality in Health Care*. 15 (03): 261-266.

Knowles, M.K. 1976. *The Modern Practice of Adult Education: Andragogy versus Pedagogy*. New York: Association Press.

Kovacs, G., Bullock, G., Ackroyd-Stolarz, S., Cain, E., Petrie. D. 2007. A randomized control trial on the effect of educational interventions in promoting airway management skill maintenance. *Emergency Medicine Journal*. 01 (36): 118-129.

Krathwohl, D.R. 2002. A revision of Bloom's Taxonomy: An overview. *Theory into Practice*. 41 (4): 212-218.

Lammers R.L., Byrwa, M.J., Fales, W.D., Hale, R.A. 2009. Simulation-based assessment of paramedic peadiatric resuscitation skills. *Prehospital Emergency Care.* 03 (13): 345-356.

Langley, D.M. and Moran, M. 2008. Intraosseous Needles: They're Not just for Kids. *Journal of Emergency Nursing*. 10 (34): 12-16.

Latman, N.S. and Wooley, K. 2005. Knowledge and skill retention of emergency care attendants, EMT-A and EMT-Ps. *Annals of Emergency Medicine*. 04 (9): 71-77.

Laxmisan, A., Hakimzada, F., Sayan, O.R., Green, R., Zhang. J., Patel, V. 2006. The multitasking clinician: Decision making and cognitive demand during and after team handoffs in emergency care. *Resuscitation*. 09 (19).

Losek, J.D, Szewczuga, D., Glaeser, P.W. 1994. Improved prehospital peadiatric ALS care after an EMT-paramedic clinical training course. *The American Journal of Emergency Medicine*. 12 (04): 429-432.

Macfarlane, C., Van Loggerenberg, C., Kloeck, W. 2005. International EMS systems in South Africa. *Resuscitation*. 64 (02): 212-219.

Marais, B.J., De Villiers, M., Kruger, J., Conradie, H., Jenkins, L., Rueter, H. 2007. The role of educational strategies to reverse the inverse performance spiral in academically-isolated rural hospitals. *South African Family Practice*. 49 (7):15-19.

Martin, J. 2006. The challenge of introducing continuous professional development for paramedics. *Journal of Emergency Primary Health Care*. 04 (2): 70-73.

Mcnamara, K., Marriot, J.L., Duncan, G.J. 2010. What makes CPD effective, perspectives of community pharmacists. *International Journal of Pharmacy Practice*. 15 (4): 313-317.

McSwain, M.J. and McSwain, N.E. 2000. Pneumatic antishock garment: state of the art at the turn of the century. *Trauma*. 2 (1): 63-75.

Meisal, Z.F., Hargarten, S., Jon Vernick, J.D. 2008. Addressing Prehospital Patient Safety Using the Science of Injury Prevention and Control. *The American Journal of Emergency Medicine*. 12 (04): 411-416.

Miller, G., Issenberg, B, S., Petrusa, E. R., Gordon, D. L., Scott, J. A. 2004. Analysis of emergency management of acute myocardial infarction knowledge and skill decay. *Prehospital Emergency Care.* 04 (08): 217-224.

Mulholland, P. 2010. A comparison of practice of rural and urban paramedics: Bridging the gap between education, training and practice. Master of Medical Science thesis. University of Tasmania.

Mouton, J. 2001. *How to succeed in your Masters & Doctoral Studies*. First ed. Pretoria: Van Schaik.

Naude, J. and Rothman, S. 2006. Work-related well-being of emergency workers in Gauteng. *Emergency Medicine Journal*. 01 (36): 12-14.

Nirel, N, Goldwag, R., Feiganberg, Z., Abadi, D., Halpern, P. 2008. Stress, work overload, burnout and satisfaction among paramedics in Israel. *Prehospital and Disaster Medicine*. 23 (06): 538-546.

O'Donald, C.P.F., Omar, C., Kamlin, F., Davis, P.G., Marley, C.J. 2006. Endotracheal Intubation Attempts During Neonatal Resuscitation: Success Rates, Duration, and Adverse Effects. *Peadiatrics*. 117 (01): 16-21.

O'Meara, P. 2009. Paramedics marching towards professionalism. *Journal of Emergency Primary Health Care*. 07 (01): 15-17.

Pennington, H. 2011. Using a training needs analysis framework in career development. *Nursing Management.* 18 (2): 32-36.

Pillay, Y. 2008. Decision making by paramedics in emergency rapid sequence intubation. Master of Technology dissertation, Durban University of technology.

Polit, D. and Beck, C.T. 2010. *Essentials of nursing research - Appraising Evidence for Nursing Practice*. Seventh Edition ed. Philadelphia: Lippincott, Williams and Wilkins.

Ramduth, S. 2011. Personal communication with BC Pillay, ACLS courses Durban.

Redwood, C, Winning, T., Townsend, G. 2010. The missing link, self-assessment and CPD. *Australian Dental Journal*, 55 (01): 15-19.

Regehr, G. and Myopoulos, M. 2008. Maintaining competence in the field: learning about practice, through practice, in practice. *Continuing Education Health Professionals*. (1): 19-23.

Richman, J., Mason, T., Mason-Whitehead, E., Mcintosh ,A., Mercer, D. 2009. Social aspects of clinical error. *International Journal of Nursing Studies*. 46 (08): 1148-1155.

Ruetzier, K., Roessier, B., Potura, L., Priemayr, A., Robak, O. 2011. Performance and skill retention of intubation by paramedics using seven different airway devices -A manikin study. *Resuscitation*. 82 (5): 593-597.

Ryan, R.M. and Deci, E.L. 2000. Self-determination theory and the facilitation of intrinsic motivation, social development and well-being. *American Psychologist*. 55 (1): 68-78.

Schostack, 2009. *Effectiveness of Continuing Professional Development: a literature review.* Government Gazette no. 22. London: College of Emergency Medicine.

Schostak, J., Davis, M., Hanson, j., Schostak, J., Brown, T., Driscoll, P., Starke, J., Jenkins, N. 2010. College of Emergency Medicine, Federation of Royal Colleges of Physicians and Manchestor Metropolitan. *The Effectiveness of Continuing Professional Development*. Manchester University.

Smith, K.K., Gilcreast, D., Pierce, K. 2008. Evaluation of staffs retention of ACLS and BLS skills. *Resuscitation*. 78 (01): 59-65.

Smith, M.K. 2002. *'Malcolm Knowles, informal adult education, self-direction and andragogy'*. New York: Association Press.

Staniland, K., Rose, L., Wild, J. 2011. Staff support in continuing professional development. *Nursing management*. 18 (01): 33.

Starke, I. and Wade, W. 2005. Continuing Professional Development: Supporting the Delivery of Quality Healthcare. *Annals of Academic Medicine*. 34 (02): 715-718.

Stein, C. 2009. Out-of-hospital cardiac arrest in Johannesburg, South Africa: a first glimpse of short-term outcomes from a paramedic clinical learning database. *Emergency Medicine Journal*. (26): 670-674.

Turner, N.M., Dierselhuis, M.P., Draaisma, J.M., ten Cate, O. 2007. The effect of the Advanced Paediatric Life support Course on perceived self-efficacy and use of resuscitation skills *Resucitation*, 73 (03): 430-436.

Vilke, G.M., Tornabene, S.V., Stepanski, B. 2006. Paramedic Self-Reported Medication Errors. *American Journal of Emergency Medicine*, 10 (04): 457-462.

Vrostos, K.M., Pirallo, R.G., Guse, C.E., Aufderheide, T.P. 2008. Does the Number of Paramedics Affect Clinical Benchmark Thresholds? *Prehospital Emergency Care.* 12 (3): 302-306.

Walls, R.M. 2008. *Manual of Emergency Airway Management*. 2nd ed. Philadelphia: Lippincott Williams and Wilkins.

Wampler, D.W., Schwartz, D., Shumaker, J., Bolleter, S., Beckett, R., Manifold, C. 2011. Paramedics successfully perform humeral EZ-IO introsseous access in adult out-of- hospital cardiac arrest patients. *The American Journal of Emergency Medicine*. 10 (2): 128-131.

Wears, R.L. 2004. "The limits of techne and episteme". *Annals Emergency Medicine*. 01 (43): 15-17.

Willemse, I. 2009. *Statistical Methods and Calculation Skills*. 3rd ed. Cape Town: Juta & Company.

World Health Organization. .2006. *World Health Organization report.* (Online). Available from: http://www.who.int/whr/2006/en/index.html (Accessed 14 April 2010).