The knowledge and practices of South African Chiropractors in performing Basic Life Support

By

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I, Bongeka Caluza, do hereby declare that this dissertation is representative of my own work in both conception and execution (except where acknowledgements indicate to the contrary)

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DEDICATION

I dedicate this dissertation to:

My late grandmother – you showed me unconditional love and you encouraged me to always work harder in order to prosper in my life.

Khuzwayo

Qwabe

Phakathwayo

Yeyeye

Rest in peace - you will always be in my heart.

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ABSTRACT

Background: Basic Life Support is a set of emergency procedures used to keep a patient alive until advanced medical care arrives. Chiropractors are allied healthcare professionals who may encounter life-threatening medical emergencies such as cardiac arrest within their private practice, thus needing to initiate basic life support in certain circumstances.

Aim: The aim of this study was to determine the knowledge and practices of South African chiropractors in performing Basic Life Support.

Methodology: A QuestionPro® survey link was sent to Chiropractors practicing in South Africa who were registered with the Allied Health Professions Council of South Africa. A total of 160 participants completed the survey and data was captured for statistical analysis. Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) [IBM Corporation, Armonk NY] version 25.

Results: The results revealed that the level of Basic Life Support knowledge amongst chiropractors was low. Factors associated with good knowledge were: being female and completing a course in the last year or attending a refresher course within the last two years.

Conclusion: The majority of the data collected was in line with the literature on knowledge of Basic Life Support. However, those studies were conducted on other healthcare practitioners such as nurses, doctors, paramedics, physiotherapists and specialists. The findings of this study were unique to chiropractors in South Africa.

Key words: Basic Life Support, Cardiopulmonary resuscitation, Cardiac arrest, Chiropractors

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LIST OF ABBREVIATIONS

BLS: Basic Life Support

CPR: Cardio-pulmonary Resuscitation

SCA: Sudden Cardiac Arrest

AED: Automated External Defibrillator

AHPCSA: Allied Health Professions Council of South Africa

OHCA: Out-of-Hospital Cardiac Arrest

IHCA: In-Hospital Cardiac Arrest

AHA: American Heart Association

DUT: Durban University of South Africa

UJ: University of Johannesburg

ROC: Resuscitation Outcomes Consortium

US: United States

SSA: Sub-Saharan Africa

PASCAR: Pan African Society of Cardiology

EMS: Emergency Medical Services

EMC: Emergency Medical Care

ECC: Emergency Cardiovascular Care

ABC: Airway, Breathing and Circulation

CAB: Circulation, Airway and Breathing

CAM: Complementary and Alternative Medicine

CCEI: Chiropractic Education International Council

CCE: Council on Chiropractic Education

DC: Doctor of Chiropractic

UK: United Kingdom

GCC: General Chiropractic Council

AECC: Anglo-European College of Chiropractic

LSBU: London South Bank University

MCC: McTimoney College of Chiropractic

CPD: Continuing Professional Development

CMCC: Canadian Memorial Chiropractic College

UQTR: Toronto and the Université du Québec à Trois-Rivières

CFCREAB: Canadian Federation of Chiropractic Regulatory and Educational Accrediting Boards

SAQA: South African Qualifications Authority

CASA: Chiropractic Association of South Africa

ECCE: European Council on Chiropractic Education

M.Tech: Master of Technology

B.Tech: Bachelor of Technology

MHSc: Masters in Health Sciences

BHSc: Bachelor in Health Sciences

CHAPTER ONE
INTRODUCTION

1.1 INTRODUCTION AND BACKGROUND

Basic Life Support (BLS) is a set of emergency procedures used on a patient that includes techniques such as cardiopulmonary resuscitation (CPR), shocking and First Aid treatments to keep a patient alive until advanced medical care arrives, or the individual arrives at a hospital (Olasveengen 2020: 12). Basic Life Support, which includes CPR, is the first step in recognising and providing emergency ventilation and circulation support in the event of a respiratory or cardiac arrest. It includes techniques like mouth-to-mouth breathing and chest compression to restore blood flow to the brain and vital organs (Botha et al. 2012: 452).

It is particularly important that every person in the community has knowledge related to BLS in order to save lives and improve the quality of community health. All professional healthcare providers are expected to remain BLS current since they are frequently confronted with life-threatening circumstances, thus an understanding of BLS will be beneficial (Irfan et al. 2019: 865). According to Woo (2000: 646) and Rosenberg and Green (2002: 2), every chiropractor is likely to face traumatic and medical situations at some time throughout their professional career. Like any other primary healthcare provider, Chiropractors have a duty to their patients during crises. Therefore, they must build competencies in recognising, assessing and managing medical and traumatic conditions in their private practice. The aim of BLS or CPR in chiropractic settings is to preserve lives, protect the unconscious, prevent additional harm and promote recovery (Woo 2000: 646 and Rosenberg and Green 2002: 3).

1.2 RESEARCH PROBLEM, AIM AND OBJECTIVES

1.2.1 Research Problem

Since healthcare workers, including chiropractors, are likely to experience possible traumatic and medical crises at some time in their working lives, they must build competencies in responding to medical emergencies. Studies have revealed poor knowledge of BLS amongst healthcare professionals such as nurses, paramedics and medical students (Freund et al. 2013; Rajeswaran and Ehlers 2014; Veronese 2015). However, there is a paucity in the literature on assessing the knowledge of BLS amongst chiropractors globally, as well as in

SA. The purpose of the study was to determine the knowledge and practices of South African chiropractors in performing Basic Life Support.

1.2.2 Aim

The aim of the study was to determine the knowledge and practices of South African Chiropractors in performing Basic Life Support.

1.2.3 Objectives

The objectives of the study were:

I. To determine the knowledge of Chiropractors in performing Basic Life Support in South Africa and

II. To determine the performance of Basic Life Support in Chiropractic practices in South Africa.

1.3 RATIONALE

Basic Life Support is the detection of sudden cardiac arrest (SCA), followed by the activation of the emergency response system, early CPR and quick defibrillation with an automated external defibrillator (AED) (Irfan et al. 2019). Healthcare professionals use BLS as they often encounter emergencies (Irfan et al. 2019). Apart from doctors and nurses, Chiropractors are allied healthcare professionals who may face life-threatening medical emergencies such as cardiac arrest within their private practices. In South Africa, Chiropractic students have been provided the opportunity to do the BLS/CPR course during their second year of studies and after every two years until they graduate. Qualified Chiropractors are also required to remain current in BLS/CPR by the Allied Health Professions Council of South Africa (AHPCSA) as part of their continuing professional development (AHPCSA 2020). The BLS course helps Chiropractors to develop competencies in assessing and recognising potential traumatic and emergency situations should they happen in practice.

According to Grasner et al. (2011) and Körber et al. (2016), the annual incidence of out-of-hospital cardiac arrests handled by emergency medical services is 38 per 100 000, with a low proportion receiving bystander CPR. Early identification and rapid bystander CPR are key predictors of survival following out-of-hospital cardiac arrest, with high-quality BLS being the foundation of survival in cardiac arrest patients (Idris et al. 2015). Survival rates from out-of-hospital cardiac arrest (OHCA) depend on all the individual parts of the chain of survival, namely:

- Identification of cardiac arrest;
- activation of the emergency response system;
- early CPR to keep oxygen-rich blood flowing (and to help delay brain damage and death);
- early defibrillation with an AED to help restore an effective heart rhythm (thus significantly increasing the patient's chance for survival);
- enhanced life support, using advanced medical staff who can offer the necessary equipment and drugs to maintain life-saving treatment and post-care once spontaneous circulation is restored (Kanstad et al. 2011); and
- early rehabilitation (AHA 2020 updated guidelines).

The Cardiopulmonary resuscitation provided by medical professionals is often insufficient and is thus associated with poor patient outcomes (Körber et al. 2016). According to studies conducted by Cook et al. (2011) and Salameh et al. (2018), healthcare practitioners use what they have learned in clinical settings, but there is a danger that their knowledge and abilities will deteriorate with time. Several studies have been conducted to assess the knowledge of BLS in professions such as nurses (Ehlers and Rajeswaran 2014), paramedics (Veronese 2015), radiology staff (Vorster and Beningfield 2019), medical students (Freund et al. 2013) and doctors (Botha et al. 2012). The doctors were specialising in "anaesthesiology, emergency medicine, internal medicine, neurology, obstetrics and gynaecology, orthopaedics, paediatrics, general surgery, neurosurgery, thoracic surgery and urology" (Botha et al. 2012). However, globally, there is a paucity in the literature with respect to the knowledge and practices of Chiropractors in performing BLS, thus making a study of this nature necessary to conduct.

It is important for healthcare professionals, including Chiropractors, to have adequate knowledge of BLS. Therefore, they must learn to recognise, assess and manage potential emergency medical and traumatic situations in chiropractic in-office settings (Woo 2000: 647; Abolfotouh et al. 2017: 2). Additionally, there is a further need to investigate the knowledge and utilisation of BLS as Chiropractors, much like other healthcare providers, are likely to encounter potential traumatic and medical emergencies at some point in their professional lives. Hence, this study will be of benefit to Chiropractors practising in South Africa.

1.4 OUTLINE OF THE THESIS

Chapter One: This chapter introduced the study. The problem statement, aim, research questions and rationale were stated.

Chapter Two: Chapter Two is an extensive review of the literature relating to this study. This chapter also looks at the causes and risk factors of cardiac arrest, as well as the epidemiology of sudden cardiac arrest.

Chapter Three: The third chapter provides a detailed description of the research methodology used for data collection

Chapter Four: This chapter presents the findings/results of the study in order to answer the research question that was presented.

Chapter Five: The fifth chapter discusses the results found in this study.

Chapter Six: The final chapter presents the conclusions and recommendations of the study.

1.5 CONCLUSION

The background to the study, the aim and objectives and rationale were presented in this chapter. The next chapter will provide the literature review, which was obtained through a pre-defined search of available resource repositories.

CHAPTER TWO
LITERATURE REVIEW

2.1 INTRODUCTION

The second chapter is a review of the literature pertaining to this study. The search engines used in retrieving the literature for this study are Google Scholar, DUT Open Scholar, PubMed, ScienceDirect, eMedicine, ResearchGate and the Durban University of Technology's Institutional Repository. The keywords used in retrieving the relevant articles were "basic life support", "cardiopulmonary resuscitation", "cardiac arrest", "basic life support guidelines", "chiropractic education" and "Chiropractic AND basic life support." Fifty-two articles were retrieved, but some were excluded since they were not written in English and were published many years ago. The literature presented is intended to fully understand the foundation of BLS as a whole and concludes with highlighting the importance of Chiropractors in performing BLS.

2.2 CARDIAC ARREST

Cardiac Arrest Arrest (SCA) continues to be a serious public health issue and one of the leading causes of mortality in many areas of the world (Lloyd-Jones et al. 2010: 46). It is sudden mortality from cardiac arrest that is cause for concern, not only because of the large and rising number of instances each year, but also because of the social and economic effects thereof (Grasner and Bossaert 2013: 295). According to Grasner and Bossaert (2013: 295), the terms "sudden death" and "cardiac arrest" are linked. As a definition, "cardiac arrest generally refers to a potentially reversible and life-threatening cessation of effective cardiac mechanical activity that is associated with respiratory failure". In addition, "sudden death generally refers to the terminal stage of cardiac arrest with no attempts at resuscitation or unsuccessful attempts" (Grasner and Bossaert 2013: 295). The primary therapy is cardiopulmonary resuscitation, which comprises a sequence of life-saving treatments that increase the odds of survival following a cardiac arrest (Sasson et al. 2010: 66).

2.2.1 Cardiac arrest vs Heart attack

The following definitions explain the difference between cardiac arrest and heart attack:

- When the heart has an irregular rhythm and is unable to pump blood, this results in sudden cardiac arrest (Arrogante et al. 2020: 1).

- When blood flow to a portion of the heart muscle is obstructed, a heart attack develops (Basic Life Support Provider manual 2016: 9)

The following table explains the differences and the link between sudden cardiac arrest and a heart attack (American Heart Association 2021 and Basic Life Support Provider manual 2016: 5)

Table 2.1: Sudden Cardiac Arrest vs Heart Attack

	Sudden Cardiac Arrest	Heart Attack
What it is	When the heart loses its beat and is unable to pump blood, this is referred to as sudden cardiac arrest. An abnormal heart rhythm causes sudden cardiac arrest. The heart may twitch as a result of this irregular beat, and it may no longer be able to pump blood to the brain, lungs and other organs. Sudden cardiac arrest is generally the result of a "rhythmic" issue, although severe hypoxia can cause asystole.	A heart attack occurs when blood flow to a portion of the heart muscle is obstructed. A heart attack happens when a clot develops in a blood artery that transports oxygen-rich blood to the heart muscle. If the blocked vessel is not promptly reopened, the muscle is typically fed and the vessels begin to die. A heart attack is considered a "clot" condition.
What happens?	Within seconds, the individual becomes unresponsive and either stops breathing or gasps. If the victim does not get appropriate life-saving intervention, death happens within minutes.	The following symptoms of a heart attack may occur immediately or over a period of weeks or months: • Severe pain in the chest or other parts of the upper body • Shortness of breath • Cold chills • Nausea/vomiting The heart keeps pumping blood even during a heart attack. The longer a person with a heart attack continues without intervention, the more likely it is that the heart muscle may result in damage. The affected heart muscle can sometimes cause an irregular rhythm, which can lead to abrupt cardiac arrest. Women's heart attack symptoms may differ from men's, and women may be more prone to experience: • Jaw, arm, back,or neck pain • Light-headedness • Nausea/vomiting
What is the link?	Most heart attacks do not result in sudden cardiac arrest, although a tiny percentage of individuals who have a heart attack do experience SCA. A heart attack is a common cause of sudden cardiac arrest. Other diseases can also cause the heart's rhythm to alter, resulting in cardiac arrest.	

2.2.2 Causes of Sudden Cardiac Arrest

Individuals without known heart disease may experience SCA too. However, life-threatening arrhythmias usually occur in those with previous and undiagnosed heart disease (Arrogante et al. 2020: 1). These diseases include:

- **Coronary artery disease** - most sudden artery arrests occur in patients with coronary artery disease when the artery is blocked by cholesterol and other debris, which reduces the blood flow to the heart (Orban et al. 2018: 25).
- **Heart attack** - Orban et al. (2018: 25) pointed out that "heart attacks are usually caused by severe coronary artery disease, which can lead to ventricular fibrillation and cardiac arrest. Heart attacks can leave scar tissue in the heart". Electric short-circuits surrounding the scar tissue may also cause irregular heart rhythms.
- **Heart enlargement (cardiomyopathy)** - This mainly occurs when the muscle walls of the heart stretch, expand or thicken. Myocardial abnormalities occur, which usually cause arrhythmia (Orban et al. 2018: 26 and Vassallo et al. 2019: 438).
- **Heart valve disease** - Leaking or narrowing of the heart valves may stretch or thicken the heart muscle. If the chamber expands or weakens due to a valve that is too tight or leaking, the risk of arrhythmia increases (Carter and Cone 2017: 525).
- **Heart disease at birth (congenital heart disease)** - Congenital heart disease can cause sudden cardiac arrest in children or adolescents. For congenital heart disease, the risk of cardiac arrest increases (Arrogante et al. 2020: 2).
- According to Carter and Cone (2017: 525), "**Electrical problems of the heart** occur for some individuals, whereby the problem lies in the electrical system of the heart, which causes conditions such as primary arrhythmia, including Brugada syndrome and long QT syndrome".

2.2.3 Risk factors of Sudden Cardiac Arrest

According to Ohlsson and Melander (2020: 215), "sudden cardiac arrest is usually associated with coronary artery disease and the same factors that put an individual at risk for coronary artery disease may also expose an individual to sudden cardiac arrest". These include (Ohlsson and Melander 2020: 216 and Zhou and Tang 2020: 215):

- High blood pressure;
- Obesity;
- A history of coronary artery disease in the family;
- An inactive lifestyle;

- Smoking;
- Elevated cholesterol levels; and
- Diabetes.

Other factors that might increase the risk of SCA include (Zhou and Tang 2020: 216 and Ohlsson et al. 2020: 75):

- A family history of heart illness, particularly heart rhythm abnormalities, congenital heart defects, heart failure and cardiomyopathy;
- Illegal drug usage;
- Unbalanced nutrition, such as insufficient magnesium or potassium levels;
- Obstructive sleep apnoea; and
- Chronic kidney disease.

2.3 EPIDEMIOLOGY OF CARDIAC ARREST GLOBALLY

The American Heart Association (AHA) states that “Basic Life Support is the foundation for saving lives following cardiac arrest” (Berg et al. 2010: 686). The authors go on to emphasize that early CPR and fast defibrillation are two of the four basic components of BLS. Despite advancements in prevention, Sudden Cardiac Arrest (SCA) remains a significant cause of mortality globally.

A few studies on SCA have been noted in New Zealand and Australia. The data was taken from the Australian Resuscitation Outcomes Consortium's epidemiology registry. The overall incidence of sudden cardiac arrest was 99.4 per 100 000, and this study included 19 722 out-of-hospital cardiac arrests (Wong et al. 2019: 7). These findings were in contrast to East Asia where the incidents of sudden cardiac arrest were low. However, data from China, the region's most populated country, is sparse. Wong et al. (2019: 7) examined sudden cardiac death using death certificates, medical records and interviews with families, hospital workers and/or other witnesses to the death. In four distinct geographic groups, researchers discovered an overall incidence of 41.8 per 100 000 (Wong et al. 2019: 7).

According to Wong et al. (2019: 7), “the Resuscitation Outcomes Consortium (ROC) maintained a registry of out-of-hospital cardiac arrest in multiple regions throughout the United States (US) from 2005 to 2015. The incidence of all emergencies medical service assessed cardiac arrests was 110.8 per 100 000, which was higher than the incidence noted in East

Asia, New Zealand and Australia. In another prospective evaluation of a large population in Oregon, United States, the incidence of sudden cardiac arrest was 53 per 100 000 between 2002 and 2003".

The most recent study by Grasner et al. (2021: 63) on the epidemiology of cardiac arrest in Europe reported that "the annual incidence of out-of-hospital cardiac arrest (OHCA) in Europe is between 67 to 170 per 100 000 inhabitants, whereas the annual incidence of in-hospital cardiac arrest (IHCA) is between 1.5 and 2.8 per 1 000 hospital admissions". This was considered low in comparison to the incidence in New Zealand, Australia and China. The factors associated with survival are the initial rhythm, the place of arrest and the degree of monitoring at the time of collapse (Grasner et al. 2021: 64).

2.4 EPIDEMIOLOGY OF CARDIAC ARREST IN AFRICA

Data are scarce on the epidemiology of sudden cardiac mortality in the Black African ethnic group (Bonny et al. 2017: 1231). Despite the fact that sudden cardiac death has been documented amongst Africans, the epidemiology of the disease remains unclear in Sub-Saharan Africa (SSA) due to a paucity of prospective cohort surveys (Bonny et al. 2017: 1231). A study by Bonny et al. (2017) was conducted in Douala, which is the largest city in Cameroon, on behalf of the Pan African Society of Cardiology (PASCAR). The study was a cohort survey conducted over a period of 12 months in which the household administrative office and health community committee within neighbourhoods in two health areas of Douala documented all deaths amongst 86 1886 inhabitants aged 18 years and above.

The Emergency Medical Services (EMS), municipal medical examiners and district hospital mortuaries were examined as part of an extensive multi-source monitoring strategy. While two physicians looked at each natural death, two cardiologists looked into all unexpected natural deaths. The research showed that 37% of deaths happened at night, with 11% of patients dying while sleeping. In 63% of instances, SCA happened outside of the hospital, while 55.5% occurred at home. Only 3.7% of the 88.9% of cases of observed cardiac arrest occurred in the presence of a family member, and CPR was performed in only 6.3% of these cases.

Evidence shows that the prevalence of cardiac arrest is on the rise globally (Ahern et al. 2011) and that survival rates from out-of-hospital cardiac arrest (OHCA) can fall to exceptionally low

rates (Berdowski et al. 2010: 1482). Zheng et al. (2001: 2160) state that “the high incidence, low rate of survival and unpredictability of OHCA make it a significant public health issue”. Cardiovascular disease-related fatalities are amongst the top 10 causes of mortality in South Africa (Pillay and Sliwa 2016: 62). Moreover, cardiac arrest is a major killer in many parts of the world, including SA, which experiences a significantly high mortality rate as a result.

2.5 THE CHAIN OF SURVIVAL

According to the Basic Life Support Provider Manual (2016: 5), “the AHA has adopted, supported and helped develop the concept of emergency cardiovascular care (ECC) systems for many years. The term ‘chain of survival’ provides a useful metaphor for the elements of the ECC systems of care”. The system of care is different, depending on whether the patient has an arrest inside or outside of the hospital. These two systems are called In-Hospital Cardiac Arrest (IHCA) and Out-of-Hospital Cardiac Arrest (OHCA).

2.5.1 Chain of Survival for an In-hospital Cardiac Arrest

Tirkkonen et al. (2020: 1120) stated that cardiac arrest in adult patients generally occurs as a result of severe respiratory or circulatory problems that worsen. Most of these arrests can be predicted and avoided with thorough monitoring, prevention and the management of pre-arrest symptoms. When a primary care practitioner recognizes a cardiac arrest, the resuscitation team must be activated immediately, as must early high-quality CPR and prompt defibrillation. Patients rely on the seamless interaction of the institution's different departments and services, as well as a multidisciplinary team of professional providers that includes physicians, nurses and respiratory therapists, amongst others. In some cases, the initiation of CPR in-hospital is not appropriate – in the case of terminal disease, for example.

The links in the Chain of Survival for an adult who has a cardiac arrest in hospital are as follows (Basic Life Support Provider Manual 2016: 5):

- Surveillance, prevention and treatment of pre-arrest conditions;
- Immediate recognition of cardiac arrest and activation of the emergency response system;
- Early CPR with an emphasis on chest compressions;
- Rapid defibrillation;
- Multidisciplinary post-cardiac arrest care; and

- Recovery.

2.5.2 Chain of Survival for an Out-of-hospital Cardiac Arrest

Ong et al. (2018: 981) stated: “most out-of-hospital adult cardiac arrests happen unexpectedly and results from underlying cardiac problems”. A successful outcome depends on early bystander CPR and rapid defibrillation in the first few minutes after arrest (Ong et al. 2018: 984). Organised community programs that prepare the lay public to respond quickly to a cardiac arrest are critical to improving outcomes from OHCA. Lay rescuers are expected to recognise the victim’s distress, call for help, start CPR and initiate public access defibrillation until EMS arrives. Emergency medical support providers then take over resuscitation efforts.

The links in the Chain of Survival for an adult who has a cardiac arrest outside the hospital are as follows (Basic Life Support Provider Manual 2016: 6):

- Recognition of cardiac arrest and activation of the emergency response system as soon as possible;
- CPR should begin as soon as possible, with a focus on chest compressions;
- Rapid defibrillation with an automated external defibrillator (AED);
- Effective advanced life support;
- Multidisciplinary post-cardiac arrest care; and
- Recovery.

2.6 BASIC LIFE SUPPORT

Basic Life Support has been described as “the maintenance of a clear airway and support of breathing and circulation in cases of cardiac arrest, without the use of equipment other than a simple airway device or protective shield” (Handley 2014: 1730). The same author defines CPR as “the combination of chest compression and rescue breathing, which forms the basis of modern BLS”. Basic Life Support consists of recognising SCA; activating the emergency response system; performing early CPR; and performing rapid defibrillation with an automated external defibrillator (AED) [in the case of a shockable arrhythmia], which is used by healthcare professionals as they encounter emergencies often (Irfan et al. 2019: 865).

It is particularly important that each person within the community understand BLS in order to save many lives and improve the standard of community health. Irfan et al. (2019: 865) mentioned that “Doctors, nursing and paramedical staff are expected to understand about it, as they are often facing life-threatening situations and the knowledge of BLS is useful”. As mentioned by Lloyd-Jones et al. (2010: 46), “Although SCA has many causes, both cardiac and non-cardiac, the approach to resuscitation is still the same”.

2.6.1 American Heart Association guidelines for Basic Life Support

The 2019 updated American Heart Association guidelines for neo-natal resuscitation for in term and late-pre-term newborns (35 weeks or more of gestation) receiving respiratory support at birth recommend the first use of 21% of oxygen, as 100% oxygen should not be used to initiate resuscitation because it is associated with excess mortality (Escobedo et al. 2019: 3). Charlton et al. (2019: 6) stated that “if a first-aid provider recognises pre-syncope of suspected vasovagal or orthostatic origin in another individual, it may be reasonable for the first- aid provider to encourage that person to perform physical counter pressure manoeuvres until symptoms resolve or syncope occurs. If no improvement occurs within one to two minutes, or if symptoms worsen or recur, providers should start a call for additional help”.

According to Sekiguchi et al. (2020: 1438), the CPR procedure was changed from “Airway, Breathing and Circulation (ABC) to Circulation, Airway and Breathing (CAB)” in 2010. In the most recent revision in 2015, the concept of team dynamics with emphasis on chest compression fraction was added. According to BLS for healthcare providers (2015), when there is only one rescuer, the ratio of compressions to ventilations for a child is the same as for an adult, that is, 30 compressions to two ventilations (30:2). However, in two-rescuer situations, this ratio changes to 15 compressions to two ventilations (15:2).

According to Barker (2019: 227), “a collapsed patient should be assessed for response. This is done by placing hands on either side of the patient’s shoulders, shaking them and shouting in both ears, as it may not be known if the patient is deaf on one side. Basic Life Support is not needed if they respond. If the patient is unresponsive, further assessment is needed. The next step would be to check the patient’s mouth for any visible obstructions. The rescuer can now check whether the patient is breathing by checking the rise and fall of the chest”. Agonal breathing should not be confused with normal breathing, as agonal breaths are slow, deep and irregular, and are often accompanied by snoring (Perkins et al. 2015: 83). If the patient is not breathing regularly, he or she is in respiratory arrest, which can lead to cardiac arrest

(Barker 2019: 228). As a result, national guidelines recommend taking action without first checking for a pulse (Perkins et al. 2015: 83).

Barker (2019: 228) stated that emergency support must be summoned immediately via the ambulance service because BLS only buys a little time, which is insufficient, hence a proper call for help must be made so that a defibrillator is timeously available. Ideally, a bystander can make this call to allow the rescuer to begin CPR. However, if alone, it may be necessary for the rescuer to leave the patient to make this call. Once help has been called, CPR may begin. Idris et al. (2015: 843) mentioned that "the rescuer should continue BLS until any of the following endpoints are reached; Firstly, if the patient shows signs of life (e.g. spontaneous breathing), they should be re-assessed from the beginning and their condition checked until help arrives. Secondly, if appropriately qualified help arrives and instructs them to stop. Thirdly, if the rescuer is exhausted and cannot continue".

2.6.2 South African guidelines for Basic Life Support

According to Basic Life Support for Healthcare Providers (2021), the 2015 South African guidelines for BLS recommend checking for hazards, ensuring that the scene is safe before checking for a response, breathing and pulse. This is followed by calling for help from the emergency medical service. Thereafter, if the patient has a pulse and is breathing, the rescuer places the patient in the recovery position while checking for continued breathing and re-assessing continuously. If they have a pulse but no effective breathing, then rescue breaths are given. For an adult, rescue breaths are performed every five to six seconds, with every three to five seconds in children and infants. If they have no pulse or if the pulse rate is less than sixty beats per minute in children and infants, then chest compressions may begin.

The chest is compressed fast (two per second) while pushing hard, ensuring full chest recoil and minimising interruptions. The next step is giving two breaths at one breath per second with oxygen, if available, after every thirty compressions. The adult ratio is thirty compressions and two breaths. In children and infants, the ratio is the same as for adults, but if there are two rescuers at the scene, it changes to fifteen compressions and two breaths. If the rescuer is unable to perform breaths, continuous compressions are performed until the equipment arrives. Once the AED arrives at the scene, the pads are applied to the patient's chest ensuring that there is no water at the scene. Thereafter, the rhythm is analysed, and one shock is delivered. If signs of life present after the delivery of a shock, the patient is checked. However,

if they are absent, then CPR is resumed immediately starting with compressions and continuing for two minutes.

2.6.3 Science behind the Basic Life Support guidelines changes

According to Merchant et al. (2020: 338), “the first guidelines for CPR were published in 1966 by an ad hoc CPR Committee of the Division of Medical Sciences, National Academy of Sciences, National Research Council. This occurred in response to requests from several organisations and agencies about the need for standards and guidelines about training and response.”

Since then, the AHA has reviewed, revised and published CPR recommendations on a regular basis. In 2015, the five-year update process was converted to an online structure that uses a continuous evidence evaluation procedure, rather than periodic evaluations (Merchant et al. 2020: 344). According to Merchant et al. (2020: 344), this allowed important advances in research to be assessed quickly and then included directly into the recommendations, if deemed appropriate. The intention was to improve the possibility of quicker transfers from guidelines to bedside.

2.7 CARDIOPULMONARY RESUSCITATION

Cardiopulmonary resuscitation is a life-saving technique for victims of Sudden Cardiac Arrest (Kleinman et al. 2018: 3). Cardiopulmonary resuscitation is an emergency procedure that tries to restore spontaneous blood circulation in an individual who is in cardiac arrest (Embong et al. 2020: 44) and consists of the use of chest compressions and artificial ventilation to promote circulatory flow and oxygenation throughout cardiac arrest. Although survival rates and neurological outcomes are low for patients with cardiac arrest, early resuscitation including early defibrillation and adequate post-cardiac arrest treatment lead to improved survival and neurological outcomes (Bon et al. 2020: 1).

2.7.1 Chest compressions

According to the BLS Provider Manual (2016), each time the chest compressions are stopped during CPR, “the blood flow to the heart and brain decreases significantly. Once compressions are resumed, it takes several compressions to increase blood flow to the heart and brain back

to the levels present before the interruption. Thus, the more often chest compressions are interrupted and the longer the interruptions are, the lower the blood supply to the heart and brain".

The BLS Provider Manual (2016) states that single rescuers should use the compression-to-ventilation ratio of 30 compressions to two breaths when giving CPR to individuals of any age. When giving chest compressions, it is important to:

- Compress at a rate of 100 to 120 per minute;
- Compress the chest at least 5cm;
- Allow the chest to recoil completely after each compression; and
- Minimise interruptions in compressions.

2.7.2 Adult breaths

The BLS Provider Manual (2016) states that for breaths to be effective, the victim's airway must be open. Two methods for opening the airways are head tilt-chin lift and jaw thrust. If a head or neck injury is suspected (in other words, after a trauma incident), the jaw-thrust maneuverer is used to reduce neck and spine movements. If there are many rescuers present, one can do a jaw thrust while another takes breaths using a pocket mask or bag-mask device. Chest compressions can be administered by the third rescuer.

2.7.3 Automated Electronic Defibrillator

According to Nguyen et al. (2017: 3040), "an AED is a portable electronic device that analyses the cardiac rhythm of a patient and, if proper, advises and/or delivers electrical therapy to the patient". The AED is utilised in the event of a potentially life-threatening cardiac arrhythmia that might result in a cardiac arrest. Specifically, the AED can automatically identify and treat the patient's ventricular fibrillation and/or ventricular tachycardia with defibrillation. The application of the electrical therapy allows the heart of the patient to re-establish an effective rhythm through electrical termination of any contractility and allowing the normal cardiac automaticity to return (Nguyen et al. 2017: 3040).

Nguyen et al. (2017: 3041) state that AEDs make it possible for more individuals to respond to a medical emergency where defibrillation is needed. Since AEDs are portable, they can be used by non-medical individuals (lay-rescuers). They can also be made part of emergency

response programs that include calling an ambulance and the prompt delivery of CPR. All three of these activities are vital to improving survival from SCA.

According to Takamura et al. (2017: 353), “non-medical personnel such as police, fire service personnel, flight attendants, security guards and other lay rescuers who have been trained in CPR can use AEDs”. Although formal AED training is not required, it is advisable to assist the rescuer in order to enhance their comfort and level of confidence. AEDs are meant for use by the general population. To help the user through the process, most AEDs employ audible voice prompts. Basic Life Support instruction, including the use of AEDs, is especially vital in communities such as schools, nurseries and nursing homes to enhance survival rates. CPR standards in Japan recommend implementing CPR training in schools to systematically impart CPR information (Takamura et al. 2017: 353).

2.8 DEFINITION OF CHIROPRACTIC

The World Federation of Chiropractic (2001) describes the chiropractic profession as a “health care profession concerned with the diagnosis, treatment and prevention of musculoskeletal disorders and the effects of these disorders on the functioning of the nervous system and general health, with a focus on manual therapy, including spinal manipulation".

Chiropractic has been the biggest, most authorised and most well-known health profession traditionally performed outside of traditional medical institutions. As a result, chiropractic falls under the category of complementary and alternative medicine (CAM) (Meeker and Haldeman 2002: 220). ‘Chiropractic’ is derived from Greek origins (Chapman-Smith 2000). The words *cheir* and *praxis* mean "practice" or "hand care" (Chapman-Smith 2000). Chiropractic is a health profession that relies on the use of manual therapy by hand, including spinal manipulative therapy (Keating 1992; Plaugher 1993; Chapman-Smith 2000; Leach 2004).

2.9 CHIROPRACTIC TRAINING GLOBALLY

There are presently 45 Chiropractic institutions in 18 countries worldwide. Of these 45 institutions, eight are not globally accredited by the different accrediting agencies associated with the Chiropractic Education International Council (CCEI) (CCEI 2021).

The Council on Chiropractic Education (CCE-US) was founded in 1974 with the aim of improving the standard of Chiropractic education. The US Department of Education also recognises CCE-US. The primary task of the CCE-US was to introduce and develop educational quality for US Chiropractic schools in the curriculum and in the admissions process. Schools not compliant with the CCE-US requirements were forced to shut down when they had to follow the standards laid down by the CCE-US. By 1995, all Chiropractic colleges in the USA had been accredited by CCE-US (Phillips 1997). This later led to the formation of affiliated accreditation agencies in Canada (CCE-Canada), Europe (ECCE) and Australasia (CCEA) with the same primary role and goal in mind (Chapman-Smith 2000).

According to the CCEI website, "The Council on Chiropractic Education International is an organization of Chiropractic accrediting bodies worldwide. The Council on Chiropractic Education International is committed to excellence in Chiropractic education through emphasis on quality in its International Chiropractic Accreditation Standards, and by aiding in the development and recognition of new accrediting bodies in geographic regions where such agencies are not currently recognized" (CCEI 2021).

The CCEI website also states that it is responsible for offering accreditation services through its designated member organisations (Australasia, Europe and Canada) to Chiropractic education programs located in areas not currently served by the CCEI Member Agency. Recognition and accreditation of Chiropractic education programs are awarded equivalent degrees and endorsed based on membership of the CCEI (CCEI 2021).

The CCEI achieves its aims through the following functions and goals (CCEI 2021):

- Defining Chiropractic educational standards that are adopted and supported by accrediting agencies worldwide;

- Defining the process of accreditation and ensuring that the implementation and administration of the process by accrediting agencies worldwide is proper;

- Verifying that the educational standards and accreditation process utilised by the CCEI is set up and maintained by CCEI member accrediting agencies worldwide;

- Aiding in the development of accrediting agencies toward autonomy and membership within CCEI;

- Promoting the improvement of international educational standards and recognising the educational, cultural and legislative diversity of regions included within the CCEI; and

- The dissemination and promotion of information to governments, professional organisations and regulators by advocating quality education.

2.9.1 Chiropractic education in the United States of America

Chiropractic education in the United States of America (USA) has seen schools emerge and close under the CCE-US. There are now 17 Chiropractic institutions in the United States that provide a Doctor of Chiropractic (DC) certification, all of which are recognized by the CCE-US (CCEI 2021). Palmer College of Chiropractic (Davenport, San Jose, Port Orange), Parker University, Sherman College of Chiropractic, Texas Chiropractic College, University of Bridgeport, University of Western States, D'Youville College, Life University (Georgia), Life Chiropractic College West, Cleveland Chiropractic College (Kansas), Logan College of Chiropractic, Southern California University of Health Sciences, National University of Health Sciences, New York Chiropractic College and North-Western Health Sciences University are amongst them.

In the USA, completion of three academic years of undergraduate training (90 semester hours) at a recognised and accredited institution leading with specific science and humanity course credits, together with the lowest grade average of 3.0 on a scale of 4.0, are required before entering into an accredited Chiropractic programme, which must cover 24 hours of life and physical science courses. Accredited Chiropractic college courses typically consist of four to five academic years, with the final academic year often distributed to clinical internship that involves the supervised treatment of patients and clinical rotation at a healthcare facility. In the USA, the Doctor of Chiropractic (D.C) degree is awarded upon graduation (Christensen et al. 2005).

A variety of speciality post-doctoral training options are available and recognised in the USA, either as part time or full-time programmes. According to Christensen et al. (2005), the Chiropractic speciality training programmes available include the following:

- Applied chiropractic sciences;
- Acupuncture;

- Diagnostic imaging;
- Diagnosis and internal disorders;
- Forensics;
- Neurology;
- Nutrition;
- Occupational Health;
- Paediatrics;
- Physiological therapeutics and rehabilitation;;
- Research; and
- Chiropractic orthopaedics and sports.

2.9.2 Chiropractic education in the United Kingdom

In the United Kingdom (UK) currently, there are five colleges recognised by the General Chiropractic Council (GCC), which offer a four-year (three academic years and one clinical training) integrated undergraduate Master's in Chiropractic degree. According to GCC (2021a), these colleges are:

- Anglo-European College of Chiropractic (AECC);
- London South Bank University (LSBU);
- McTimoney College of Chiropractic (MCC);
- Teesside University; and
- The University of South Wales (The Welsh Institute of Chiropractic).

The entry requirement into these colleges include the completion of secondary education at A-level, allowing further studies at the higher education level. To qualify for A-level entry into these Chiropractic programmes, English, Biology and Science subjects must be covered during secondary education. Additionally, either Mathematics or other subjects such as Chemistry or Physics must be covered, and this excludes general studies (AECC 2021; LSBU 2021; MCC 2021; Teesside University 2021 and University of South Wales 2021).

Qualified chiropractors in the UK registered with the GCC are bound to complete Continuing Professional Development (CPD) as set out in the General Chiropractic Council Rules Order of Council 2004 for Continuing Professional Development in order to keep their registration (GCC 2021b). With the aim of maintaining professional knowledge and skills current, registered chiropractors are required to complete one learning cycle of 30 hours in one CPD year, 15 hours of which must be allocated to learning with others (GCC 2021b).

2.9.3 Chiropractic education in Australia

According to the Council on Chiropractic Education Australia (2021), there are four Chiropractic programmes in Australia that hold accredited status with the Council on Chiropractic Education Australia (CCEA), namely:

- Macquarie University;
- Murdoch University;
- Royal Melbourne Institute of Technology (RMIT University); and
- Central Queensland University.

All four universities offer a Bachelor of Health Science (Chiropractic), which is three years long, followed by a Master of Clinical Chiropractic, which is two years long (Australian Chiropractors Association 2021). Once qualified, it is a requirement that chiropractors undertake Continued Professional Development (CPD) training on an annual basis (Chiropractic Australia 2021).

2.9.4 Chiropractic education in Canada

According to the Canadian Chiropractic Association (2021) "the Canadian Memorial Chiropractic College (CMCC) in Toronto and the Université du Québec à Trois-Rivières (UQTR) both offer programs accredited by the Canadian Federation of Chiropractic Regulatory and Educational Accrediting Boards (CFCREAB) and Council on Chiropractic Education Canada (CCEC)". Entrance criteria are high. Therefore, only students with the highest academic rankings who have completed a three-year university degree or equivalent are accepted. The CMCC program requires four years of full-time study and UQTR requires five, following a graduation from a Collège d'enseignement General et Professionnel (CÉGEP) (which translates to General and Professional teaching college) health science program.

There are five post-graduate specialist institutions in Canada where chiropractors can pursue extra study to enhance their abilities. Sports sciences, radiology, clinical sciences, orthopaedics and rehabilitation are amongst the specialties offered at these institutions. These institutions are as follows (Canadian Chiropractic Association 2021):

- Royal College of Chiropractic Sports Sciences;
- Chiropractic College of Radiologists;
- College of Chiropractic Sciences;
- College of Chiropractic Orthopaedists; and

- Canadian Chiropractic Specialty College of Physical & Occupational Rehabilitation.

2.10 CHIROPRACTIC EDUCATION IN AFRICA

In Africa, two institutions offer the Chiropractic qualification, with both of these institutions being based in South Africa, namely the Durban University of Technology (DUT) (in the province of KwaZulu-Natal) and the University of Johannesburg (UJ) (in the province of Gauteng). Both institutions are accredited by the Council for Higher Education and registered with the South African Qualifications Authority (SAQA), which allow registration as a diagnostic allied health professional in South Africa (AHPCSA 2020). According to the Chiropractic Association of South Africa (CASA) (CASA 2020), the first established Chiropractic training facility in South Africa (SA) was the Technikon Natal, which was opened in 1989 (now known as the Durban University of Technology), followed by the Technikon Witwatersrand (now known as the University of Johannesburg) in 1993. Today, both the Durban University of Technology (DUT) and University of Johannesburg (UJ) Chiropractic educational programmes have international accreditation with the European Council on Chiropractic Education (ECCE) (CASA 2020).

The educational model implemented consists of a five to six-year master's degree, including a two-year basic science course offered at both DUT (DUT 2020) and UJ (UJ 2020). The entry for both university programmes is a senior certificate obtained on completion of secondary education with matriculation exemption. Selection criteria are based on the academic merit obtained, a personal interview, a recommendation by a qualified Chiropractor, as well as secondary education covering the following compulsory subjects passed with level four:

- English (First Additional Language);
- Mathematics;
- Life-orientation;
- Life sciences and/or Physical Science; and
- Another two 20-credit subjects (only one of the two can be another language).

Broken down to its core components, the Master of Technology (MTech) programme entails a three-year National Diploma plus a one-year Bachelor of Technology (BTech) degree, followed by one to two years on the master's level (DUT 2020 and UJ 2020) during which a dissertation in partial fulfilment of the qualification is to be completed (AHPCSA 2020). The Bachelor in Health Sciences (MHSc) programme was introduced in 2020. This new

programme entails a four-year degree and replaces the National Diploma in Chiropractic and Bachelors in Technology. In addition to core modules for this degree, students will register for research modules and general education modules offered by both the faculty and the institution. Upon completion, the successful candidate may articulate into the Master of Health Sciences in Chiropractic which commenced in 2021 (Durban University of Technology Chiropractic Handbook 2021: 8). On completion of the academic requirements, Chiropractic students are required to register as interns with the AHPCSA to complete the Chiropractic internship programme, enabling full registration with the Council as a Chiropractic practitioner.

The national internship programme for chiropractors has been in effect since 2001 under the AHPCSA's professional board for Chiropractors and Osteopathy. This programme consists of academic components of a minimum of 75 hours and work experience components of a minimum of 600 hours (AHPCSA 2020). Students graduate with a master's degree in Chiropractic after five years of higher education and clinical training (Durban University of Technology Chiropractic Handbook 2021; University of Johannesburg Chiropractic Handbook 2021). Chiropractic training at these institutions ensures that graduates can work within multi-disciplinary teams, through evidence-based practice and the application of primary healthcare principles and practices in a bio-psychosocial model for the furtherance of holistic patient care (Durban University of Technology 2021: 28; University of Johannesburg 2021).

2.11 BASIC LIFE SUPPORT COMPETENCY AMONGST HEALTHCARE PRACTITIONERS

Basic Life Support and CPR competency is defined as having the cognitive knowledge and psychomotor skills necessary for the effective performance of CPR in cardiac arrest situations (Ehlers and Rajeswaran 2014: 1)

2.11.1 Global studies

A study by Silverplats et al. (2020: 368) was conducted on 3044 healthcare professionals in Sweden. Healthcare professionals included those involved in patient contact such as nurses, nursing assistants, physicians, other university educated health professionals and administrative professionals. This survey-style study was designed to measure CPR skills as well as theoretical knowledge. Nine multiple-choice questions about fundamental CPR skills were used to assess theoretical knowledge. Two questions on a Likert scale were used to assess self-assessed ability in “compression, ventilation, defibrillation and leadership” (Silverplats et al. 2020: 368).

The Likert scale ranged from one to seven, with one being "I strongly disagree” and seven being “I strongly agree”. According to Silverplats et al. (2020: 370), the findings revealed that theoretical knowledge was lacking and the self-assessed ability to administer CPR was inadequate. Working on a monitored ward; having recently completed CPR training; and being a nurse or physician were all linked with greater theoretical knowledge and a better self-assessed ability to do CPR. Silverplats et al. (2020: 371) went on to explain that “respondents on monitored wards, as well as nurses and physicians, had more correct answers and higher ratings of abilities, which could be attributed to a higher incidence rate of cardiac arrest per in-patient bed in monitored wards and experience with cardiac arrests”. Experience in cardiac arrest circumstances appears to be an important element in determining knowledge and confidence (Silverplats et al. 2020: 370).

A similar study by Harvey et al. (2019) looked at the knowledge and perceptions of cardiopulmonary resuscitation amongst New Zealand physiotherapists. Data was collected from 588 registered physiotherapists in New Zealand using a survey administered through SurveyMonkey. According to Harvey et al. (2019: 99), physiotherapists in general demonstrated a solid theoretical understanding of CPR, with the proportion of accurate answers ranging from 62% to 94% for seven of the total CPR statements. Harvey et al. (2019: 99) also found some clear variations in CPR knowledge. When the comments were analysed by age, older physiotherapists were more likely to be wrong than younger physiotherapists in terms of the AED suggesting a shock for all patients of cardiac arrest; AED usage on babies and children; and the proper compression to ventilation ratio. The majority of physiotherapists (92 %) thought that their CPR skill was good or better, with those above 39 years old and those with 16 years or more of experience more likely to feel that they had effective CPR capacity (Harvey et al. 2019: 100).

2.11.2 African studies

A study by Ehlers and Rajeswaran (2014) looked at the CPR knowledge and skills of registered nurses in Botswana. They used a pre-test, intervention and re-test time-series research design. A multiple-choice questionnaire and checklist were used to collect data from 102 nurses from two referral hospitals in Botswana. The researchers reported that all nurses failed the pre-test; that their knowledge and abilities improved following training; but that it worsened throughout the three months until the post-test. Ehlers and Rajeswaran (2014) reported that their study had a high drop-out rate of participants between the initial pre-test and the post-test phase three months after the re-test. This may have been due to 32 of the registered nurses having left the services of these two hospitals when the re-test was done three months after the BLS training. The researchers concluded that these differences may have affected the accuracy of the findings.

A study by Botha et al. (2012) at a South African tertiary hospital to assess the knowledge of CPR in clinicians revealed that the participants' knowledge was poor. The participants were doctors who worked in clinical disciplines. The researchers invited 100 doctors from each clinical discipline (Anaesthesiology, Emergency Medicine, Internal Medicine, Neurology, Obstetrics and Gynaecology, Orthopaedics, Paediatrics, General Surgery, Neurosurgery, Thoracic Surgery and Urology) to participate in the study. They concluded that those doctors who participated early in October 2010 might have had more experience than those who participated late in January 2011 as they had more hospital rounds, which might have affected the outcomes of the study.

A similar study was conducted by Veronese (2015) using a descriptive analytical study design to assess medical service personnel (basic ambulance assistant, ambulance emergency assistant and advanced life support qualified personnel) in the Western Cape province of South Africa. An assessment questionnaire from a "BLS for healthcare providers" course was used to determine theoretical knowledge. Cardiac arrest simulations were video recorded to assess psychomotor skills. The results of this study revealed that overall competency in BLS and CPR amongst the participants was poor.

The author further explained that the factors affecting the participants in their knowledge and skill of BLS and CPR were "unacceptably long periods of time since they were last trained, and some were never updated to the latest CPR guidelines" (Veronese 2015). Another study

by Vorster and Beningfield (2019) evaluated self-reported confidence amongst Radiology staff in initiating Basic Life Support across hospitals in the Cape Town region and found that there was a substantial lack of confidence in providing BLS. The study revealed that the participants indicated that regular training and improved support systems would increase confidence levels and improve skills.

2.12 BASIC LIFE SUPPORT AND CARDIOPULMONARY RESUSCITATION COMPETENCY IN THE SOUTH AFRICAN CHIROPRACTIC PROFESSION

Chiropractic students do their BLS training for the first time at the end of the second level of study and every two years after that. It is a requirement as they often do practical work. The DUT Chiropractic Handbook (2021: 27) states, according to Rule G16*, that the following programme rule applies: "A student shall not be allowed to register for any module which has an associated Clinical Practical Component in the third year of the BHSc (Bachelor in Health Sciences): Chiropractic if he/she has not completed an accredited course in Basic Life Support, as approved by the Head of Department". This course is offered internally through the DUT Emergency Medical Care (EMC) Department or externally by a private company. A qualified EMC personnel member facilitates the training offered by DUT's EMC department. The training duration is three days and at the end of training, students write a theoretical and a practical examination. A certificate in BLS, valid for two years, is provided on passing the examination. However, upon failing, students would need to attend another training session.

In the United States, chiropractors are increasingly being placed in roles as team doctors and donating their time and services for community-oriented athletic events such as fun runs and football games. They can face traumatic or medical emergencies in these events (Rosenberg and Green 2002: 2 and Woo 2000: 646). Chiropractors are fulfilling these roles for a variety of reasons. Therefore, it is important for them to be confident in performing BLS or CPR. One motivation is that the need for basic emergency care and first-aid at athletic events is compelling and has prompted many healthcare professionals to begin contributing to this area of need (Rosenberg and Green 2002: 2).

The legal responsibilities of practising chiropractors are to recognise an emergency and respond to it; check and record the patient's vital signs; document and transmit a report on the incident; and to follow the case (Woo 2000: 646). Chiropractors are increasingly involved in

supplying care at sports events. Although the treatment of athletes is the main concern for sports chiropractors, care of a spectator in a potential medical emergency, such as acute myocardial infarction, might also be needed (Halkin et al. 2002: 10). According to Halkin et al. (2002: 10), “Since the sports chiropractor can be called on to provide BLS for both athletes and spectators, knowledge of the latest CPR protocol is essential in developing an emergency response plan. Training in CPR and advanced first-aid is necessary for competent and confident participation of the sports chiropractor as an on-field provider of emergency services”. The knowledge of BLS by chiropractors in private practice in SA were found to be lacking in the literature search, thus this study aimed to fill the gaps in that knowledge.

2.13 CONCLUSION

Relevant literature pertaining to the topic was extensively reviewed and described in this chapter. The literature presented in this chapter outlined the causes and risk factors of cardiac arrest, as well as the epidemiology of Sudden Cardiac Arrest. The basic life support foundation for saving lives after cardiac arrest was discussed and this included two guidelines, which are the South African and America Heart Association guidelines. The following chapter will describe the methodology used in this study.

CHAPTER THREE
METHODOLOGY

3.1 INTRODUCTION

This chapter describes the study design, study population, participant recruitment, sample size and sample characteristics. It also provides an in-depth overview of the measurement tool used, the research procedure, data analysis and ethical considerations specific to this study.

3.2 STUDY DESIGN

The study design was quantitative in nature, with a descriptive design using a cross-sectional survey method to collect data. According to Babbie (2010), quantitative approaches emphasize objective measurements and the statistical, mathematical or numerical analysis of data gathered through polls, questionnaires and surveys, as well as through altering pre-existing statistical data using computer tools. Quantitative research is concerned with accumulating numerical data and generalising it across groups of individuals, or explaining a phenomenon (Babbie 2010).

According to Kothari (2004), the primary goal of descriptive research is to characterise the existing condition of affairs. Moreover, Setia (2016: 262) states that in cross-sectional research, the investigator assesses both the outcomes and the exposure in study participants at the same time. In addition, individuals in this type of study are chosen based on specific characteristics of interest. This study design was suitable for this study because the researcher measured the outcomes of the survey at the same time and the participants selected were variables of interest.

3.3 STUDY POPULATION

All practising chiropractors need to be registered with the AHPCSA in order to legally practice in South Africa. According to the AHPCSA (2020), as of 16th January 2021, 892 chiropractors were registered in South Africa and the list of registered practitioners is updated once a month. The study population included all chiropractors practising in South Africa, as well as foreign chiropractors who had authority to practice in South Africa.

3.4 PERMISSIONS

A letter requesting permission and assistance to distribute the survey to chiropractors in South Africa was emailed to the AHPCSA (Appendix A). Once permission was granted (Appendix B), the researcher sent the survey link to the AHPCSA for email distribution.

3.5 PARTICIPANT RECRUITMENT

The Registrar of the AHPCSA was approached via email (Appendix A) to distribute the documentation to chiropractors currently registered with the AHPCSA. The researcher emailed the pre-survey notification (Appendix C) and the Question Pro survey link containing the letters of information (Appendix D) and consent (Appendix E), as well as the final questionnaire (Appendix F) to the registrar of the AHPCSA for bulk distribution to all registered chiropractors via a single email. The pre-survey notification provided the chiropractors with information regarding the survey, emphasising its importance and inviting them to participate. This notification was an integral part of the administration process, aiming to maximise the response rate and minimise bias in the data collection process (Christensen et al. 2005).

3.6 SAMPLING

For this study, total population sampling was used. According to Etikan et al. (2016: 3), total population sampling is a type of purposive sampling method where the entire population that meets the criteria are included in the research being conducted. Total population sampling is more commonly used where the number of cases being investigated is small. This sampling design was suitable for this study because the researcher targeted all chiropractors who were registered and practising in South Africa meeting the inclusion criteria.

3.6.1 Sample size

Total population convenience sampling was used. The sample size included all 892 chiropractors registered with the AHPCSA in South Africa who met the inclusion criteria at the time of the study. A minimum sample size for power purposes was not required since the study was descriptive (Esterhuizen 2020).

3.6.2 Sample characteristics

3.6.2.1 Inclusion criteria

- All registered chiropractors practising in South Africa, inclusive of foreign qualified chiropractors who were registered with the AHPCSA.
- The knowledge questions needed to be completed in full to be included in the data analysis.

3.6.2.2 Exclusion criteria

- Chiropractors who were not willing to sign the informed consent form.
- Chiropractors who participated in the focus group and pilot study.

3.6.3 Measurement tools

Data was collected using a questionnaire (Appendix E) which was administered through the QuestionPro® [QuestionPro Inc, Austin USA] online survey. The survey included questions and statements relating to the practices and knowledge of BLS to order to meet the study objectives. The questionnaire was derived from a standard reference, namely the American Heart Association (AHA) guidelines for CPR (American Heart Association 2015). The questions are based on the course content of the AHA BLS course and were validated by an experienced AHA BLS instructor and subsequently pilot-tested on a select expert group of professionals practicing healthcare in various disciplines. A minimum score of 80% is defined as adequate knowledge (as outlined in the AHA BLS courses).

The types of questions employed included closed-ended questions and multiple-choice questions. The questionnaire was divided into three sections in order to obtain the required data for the study. The sections included demographics (Section A), practices of BLS (Section B) and knowledge of BLS (Section C). The demographic questions were derived from reviewing the work of Johl et al. (2017) and Salameh et al. (2018), and all knowledge questions (Section C) were derived from the American Heart Association (2015). The questions about the performance of BLS (Section B) were developed by reviewing the work of Chandrasekaran et al. (2010).

Table 3.1 Questionnaire reference list

Section	Reference
Section A: Demographics (age, province of practice, highest level of non-chiropractic education attained, institution trained in)	Salameh et al. (2018) and Johl et al. (2017)
Section B: Performance of BLS	Chandrasekaran et al. (2010)
Section C: Knowledge of BLS by Chiropractors	American Heart Association (2015)

3.7 RESEARCH PROCEDURE

3.7.1 Expert group

An expert group can be defined as “a group of interacting individuals having some common interest or characteristics, brought together by a moderator who uses the group and its interaction as a way to gain information about a specific or focused issue” (Marczak and Sewell 2007). The expert group is composed of individuals who evaluate the questionnaire for potential problems and misunderstandings prior to conducting the main study.

An expert group assesses the questions in the questionnaire for ease of understanding, language errors and format/layout. For the expert group meeting in this study, all members were encouraged to make suggestions about the questionnaire content in order to ensure that the pre-expert group questionnaire (Appendix G) was critically assessed.

3.7.1.1 Procedure for the expert group

The expert group was run according to the structure presented in the work of Silverman (2016). The expert group for this study was conducted as follows:

- A date and time were set for the expert group meeting via Zoom;
- Participants included two qualified chiropractors in practice, the researcher, the research supervisors, a master’s student currently conducting a survey type of research and a healthcare professional involved in Basic Life Support (paramedic);
- The participants were contacted and asked if they would like to be part of the expert group;
- The participants were welcomed upon logging in to the Zoom meeting;
- Thereafter, the researcher asked them to read the letter of Information (Appendix H), the confidentiality agreement (Appendix I) and informed consent form (Appendix J);
- The participants were given an opportunity to ask any questions regarding the expert group procedure and given time to sign the informed consent form (Appendix J) as well as

the confidentiality agreement (Appendix I), which stated that they would keep confidential any discussion within and regarding the expert group;

- The expert group proceeded with the discussion of the pre-expert group questionnaire (Appendix G);
- The researcher, as the chair of the meeting, sequentially read the questions out aloud prior to the group discussing the relevance of the question in relation to the aim and objectives of the study, as well as deciding whether the questions were understandable;
- The expert group participants were allowed to agree, to disagree with or be undecided about the inclusion of questions in the questionnaire. In order for the questions to be included or excluded, the group was required to be unanimous in their agreement to include or exclude questions. For those questions where there was indecision about the relevance or inclusion of the question, the researcher resorted to a simple vote with a majority, or the question could be deferred for purposes of being reviewed by the researcher in the context of the literature available on BLS;
- Once the expert group completed reviewing the questionnaire, the participants were thanked for their participation;
- The researcher ensured that the expert group discussion was written down on paper, such that the researcher had sufficient reference points to update the pre-expert group questionnaire; and
- The post-expert group questionnaire was then developed (Appendix K).

3.7.1.2 Inclusion criteria for the expert group

- Participants who were over the age of eighteen years.
- Participants who read the letter of information (Appendix H) and signed the confidentiality agreement (Appendix I) and informed consent (Appendix J) were allowed to participate.

3.7.2 Pilot study

According to In (2017: 601), the pilot study is a smaller-sized study assisting in the planning and modification of the main study. A pilot study asks whether something can be done, should the researcher proceed with it and if so, how. It is important for the improvement of the quality and efficiency of the main study.

For the pilot study, the questionnaire was completed by two chiropractors who read the letter of information (Appendix L) and signed the informed consent form (Appendix M). The pilot

study ensured that the questionnaire was tested for feasibility and that any flaws were identified before the study commenced.

3.7.2.1 Procedure for the pilot study

Participants read the letter of information (Appendix L) and signed the informed consent form (Appendix M). Thereafter, participants completed the post-expert group questionnaire (Appendix K). A questionnaire evaluation form (Appendix N) was given to the participants to complete if they detected any problems with the questionnaire. The final questionnaire (Appendix B) was then developed.

3.7.2.2 Inclusion criteria for the pilot study

- Chiropractors with a South African qualification and who were registered with the AHPCSA;
- Chiropractors within private practice in South Africa; and
- Participants who read the letter of information (Appendix L) and signed the informed consent form (Appendix M).

3.7.2.3 Exclusion criteria for the pilot study

- Participants who no longer wished to participate in the pilot study were excluded and replaced.
- Participants in the expert group were excluded.

3.7.3 Main study

After the study was given ethical approval from DUT's Institutional Research Ethics Committee (Ethics Reference Number: IREC 098/20) (Appendix O), the researcher contacted the Registrar of the AHPCSA (Appendix A) and requested for the distribution of the questionnaire via an online QuestionPro® survey link to all registered chiropractors practising within South Africa. A letter of information (Appendix C) and informed consent form (Appendix D) were made available at the start of the online QuestionPro® survey. Consent was obtained via the first question in the survey which asked whether or not participants gave consent to participate.. Those who clicked on 'Yes' were then allowed to move on and those who clicked on 'No' were not allowed to proceed any further.

The researcher contacted the administrator for 'QuestionPro®' at DUT to help enable the "validated setting" on QuestionPro®. This option forced respondents to answer the question

before they could proceed to the next question of the survey. If they tried to proceed without answering the question, a message informed them that they must answer the question in order to proceed. These questions were marked with an asterisk (QuestionPro® 2020). A record was kept of all completed questionnaires to ensure that study participants could not complete the questionnaire more than once. According to Rodriques (2020), the Anti-Ballot Box Stuffing Feature (ABBS) on "QuestionPro® settings" disables the respondent from completing the survey multiple times. Once the respondent started the survey, a unique response ID was generated and assigned. When the respondent clicked on 'submit', cookies were saved on the browser, thereby disallowing the respondent to take the survey multiple times. The Anti-Ballot Box Stuffing is triggered when the survey is completed for the first time. If the respondent started the survey and did not complete it, they were still able to access the survey by clicking on the link they received via email. The link was disabled once the respondent completed the survey. If the participant completed the survey and tried to access the same link again, they received an error message.

3.8 ETHICAL CONSIDERATIONS

The ethical issues that applied to the study included:

- IREC approval (Appendix O) was sought before data collection commenced for this study (IREC approval Reference No. 098/20);
- All participants were required to sign an informed consent form (Appendices E, J and M) as a prerequisite for inclusion;
- Participants' names were not included in the questionnaire, thereby ensuring their anonymity and confidentiality. All questionnaires (Appendix F) were coded using the unique response ID. Privacy was guaranteed (only the registrar had access to the practitioners' email addresses) through anonymity (practitioners' responses to the questionnaire were converted into data) and confidentiality was maintained in the research procedure;
- Autonomy was accounted for as no participants were coerced into participating in the study and participation in the questionnaire was done without the researcher present. The participants were assured of the voluntary nature of their participation;
- Non-maleficence was accounted for by ensuring that participation in the study was voluntary and participants who no longer wished to participate could withdraw at any point without the fear of any consequences;
- Justice was accounted for as all participants were treated equally and with respect; and

- Upon completion of the survey, the participants used a participant information form to claim their allocated CPD point by the researcher and they benefited from research outcomes regarding the importance of regular BLS training, thus accounting for beneficence.

3.9 DATA ANALYSIS

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) [IBM Corporation, Armonk NY] version 25. Participant demographics were described using frequency tables. The performance was described using frequency tables and bar charts. Knowledge was scored by summing up each respondent's correct answers to the knowledge questions. This was expressed as a percentage correct out of the total knowledge questions. Knowledge was summarised and described using means, standard deviations and ranges (Esterhuizen 2020).

3.10 CONCLUSION

This chapter outlined the research methodology used in this study. It described the sampling and statistical methods, the development of the questionnaire, the ethical considerations and the methods used to statistically analyse the data. Chapter Four will present the results of this study.

CHAPTER FOUR
RESULTS

4.1 INTRODUCTION

This chapter summarises the statistical information and results on the data collected from the questionnaire survey. The study aimed to provide current information with regard to the knowledge and practices of Basic Life Support by chiropractic practitioners in South Africa.

4.2 SAMPLE SIZE AND RESPONSE RATE

The data collected from participants who satisfied the inclusion and exclusion criteria of the study were analysed. Of the 897 actively practicing registered chiropractors in South Africa contacted via email by the AHPCSA to participate in the BLS survey, 892 practitioners with current information received the email (N=892). A total of 160 practitioners accessed the online survey, which yielded a 17.9% response rate. This survey had a success rate of 100%, calculated from the number of chiropractors that completed 100% of the survey divided by practitioners who accessed the survey (160/160). The researcher did not have direct contact with the participants, which was a potential reason for the lack of a 50% response rate.

4.3 THE DEMOGRAPHICS OF CHIROPRACTORS IN SOUTH AFRICA

The first section of the survey addressed the characteristics of the Chiropractic practitioner, including information on demographics, institution they trained at, years in practice, province of practice and the highest levels of non-chiropractic education attained.

4.3.1 Age

Of the 160 respondents, the results in **Figure 4.1** show that a majority (30%) of chiropractors (n=48) were between the ages of 26 to 30 years, followed by 21.9% (n=35) who were between the ages of 31 to 35 years. An equal proportion of 13.8% (n=22) were between the ages of 41 to 45 and 46 to 50 years. Chiropractors between the ages of 36 to 40 years made up 11.9% (n=19) of the sample, while chiropractors between the age of 21 to 25 years made up 4.4% (n=7). Chiropractors who were older than 51 years of age (n=7) made up 4.4% of the sample.

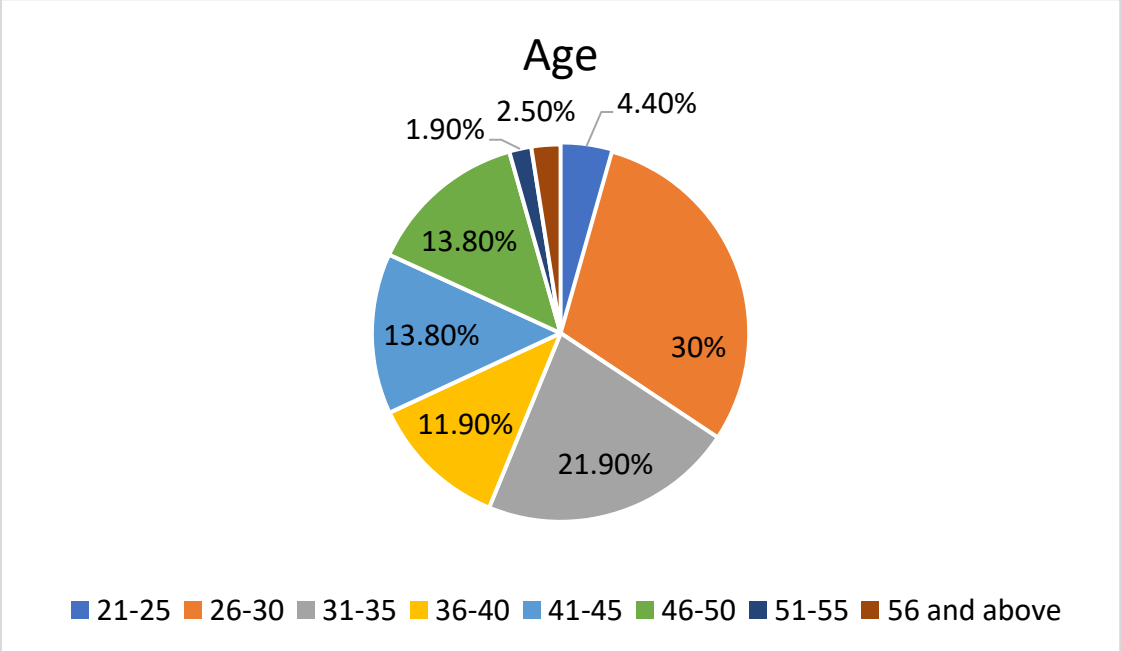

Figure 4.1: Age of chiropractors (N=160)

4.3.2 Sex

The findings on the sex of chiropractors showed that of the 160 responses, 38.8% (n= 62) of respondents were male, while 61% (n=98) of participants in this study were female, as shown in **Figure 4.2** below.

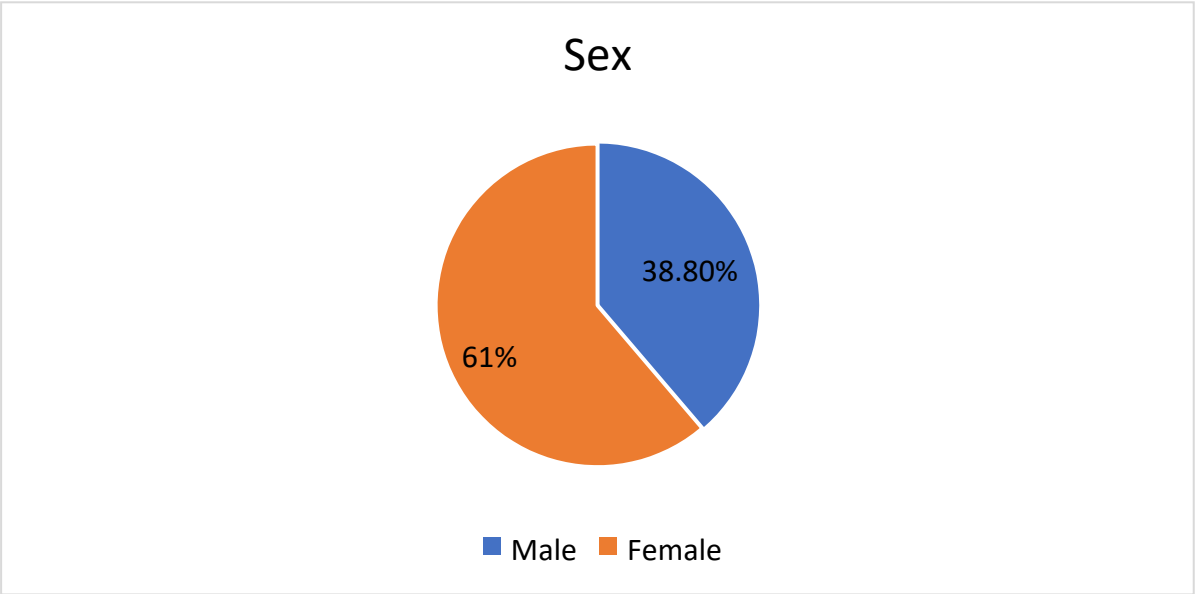

Figure 4.2: Sex of chiropractors (N=160)

4.3.3. Training Centre

The data indicated that 48.8% (n=78) of chiropractors graduated from the Durban University of Technology and 47.5% (n=76) from the University of Johannesburg in South Africa, while the remaining 3.8% (n=6) graduated from Palmer College and Western State Chiropractic College in the United States of America. This is shown in **Figure 4.3**.

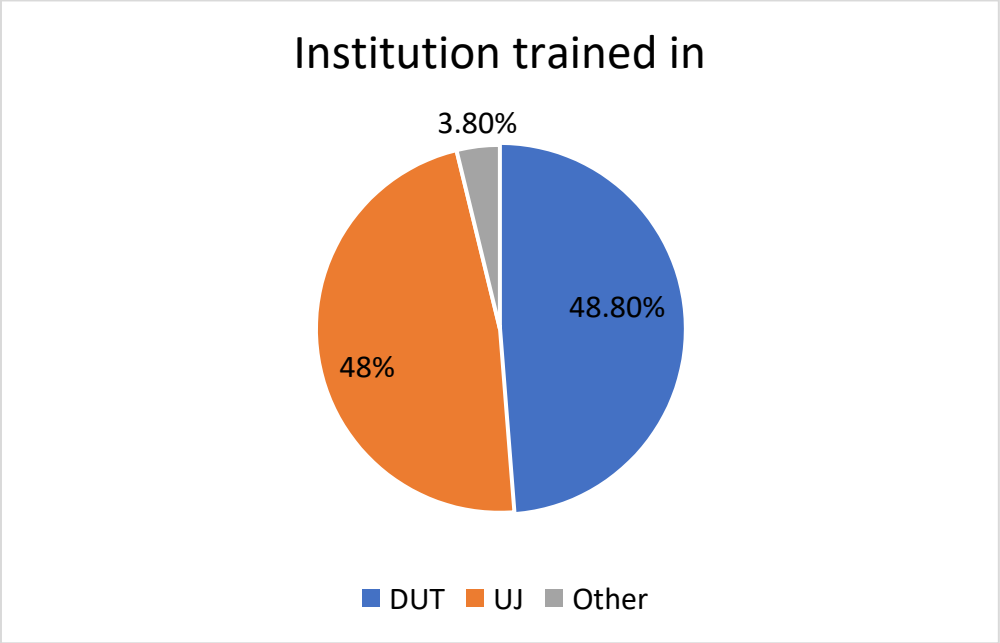

Figure 4.3: Training institution of chiropractors (N=160)

4.3.4 Duration in Practice

Chiropractors were asked to indicate how long they had been practicing for. Of the 160 respondents shown in **Table 4.1**, the highest number of chiropractors (36.3%, n=58) reported that they have been practicing less than five years; 21.9% (n=35) reported between five to nine years; and 15% (n=24) between sixteen to twenty years. The lowest number of chiropractors (13.8%, n=22) reported that they have been practicing for twenty-one years and more and 13.1% (n=21) between ten to fifteen years. This information was important when comparing the relationship between the years in practice and knowledge of Basic Life Support.

Table 4.1: Number of years chiropractors are in practice

	Count	Column N %
Less than 5 years	58	36.3%
5-9 years	35	21.9%
10-15 years	21	13.1%
16-20 years	24	15.0%
21 years and more	22	13.8%
Total	**160**	**100.0%**

4.3.5 Location of Practice

Of the 160 responses received with regard to the province in which practitioners are actively practicing as shown in **Figure 4.4**, the highest numbers came from Gauteng (46.9%, n=75), followed by KwaZulu-Natal (33.1%, n=53) and the Western Cape (12%, n=19). The lowest numbers of chiropractors who answered the survey were found in the Eastern Cape (3.1%, n=5), North West (1.9%, n=3), Free States (1.3%, n=2), Mpumalanga (1.3%, n=2) and Limpopo (0.6%, n=1).

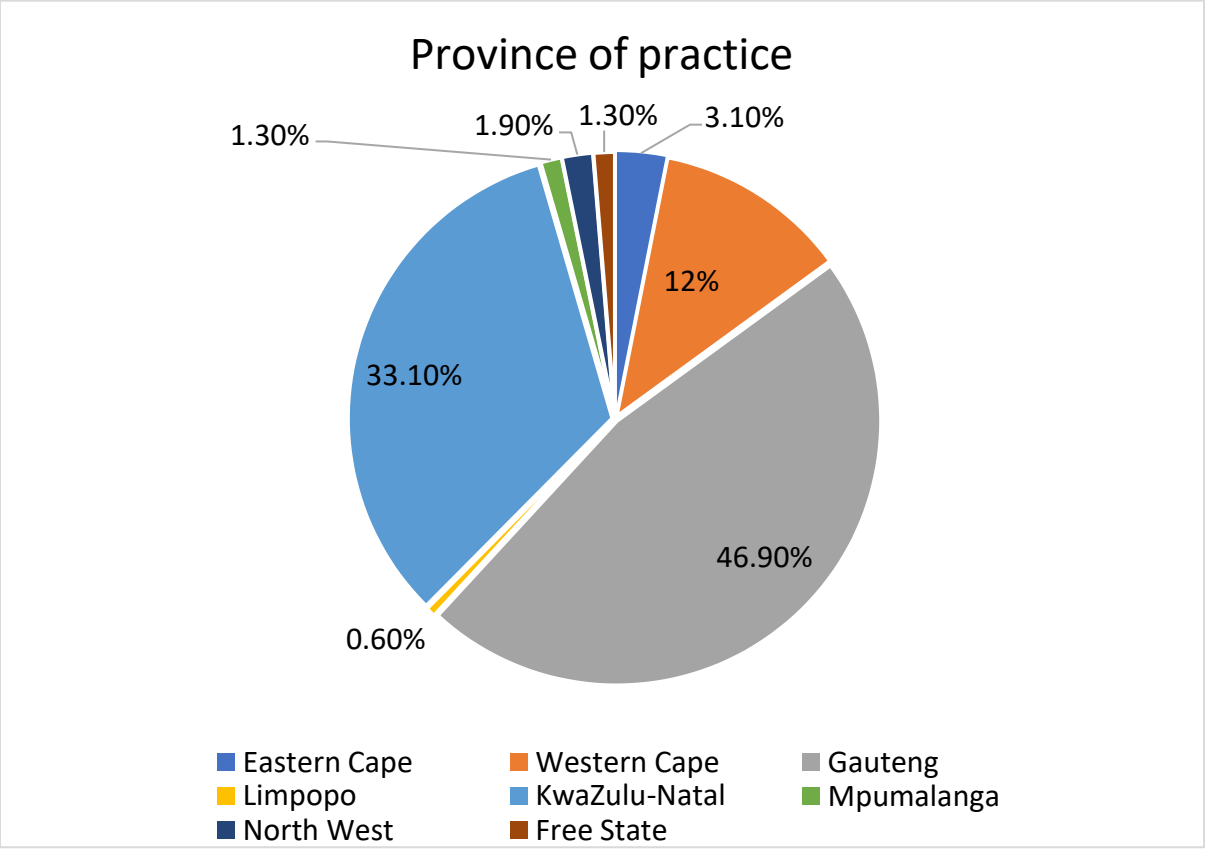

Figure 4.4: Provincial location of chiropractors (N=160)

4.3.6 Other additional qualifications

Chiropractors were requested to indicate the highest level of non-Chiropractic education attained. The results in Table 4.2 show that 61.3% (n=98) of practitioners had matric; 21.9% (n=35) had a master's degree; 8.8% (n=14) had a diploma; 2.5% (n=4) had a Bachelor of Technology/Honours degree; and 0.6% (n=1) had a Doctor of Philosophy degree outside of a Chiropractic qualification. Eight respondents specified another qualification under the "Other" category, which included: Cambridge A level, Master's in Homeopathy, Bachelor of Science, Bachelor of Arts and Doctor of Chiropractic. From the information above, it is clear that the relationship between different models of educational training and knowledge of Basic Life Support must be considered.

Table 4.2: Highest level of non-Chiropractic education attained

	Count	Column N %
Matric	98	61.3%
Diploma	14	8.8%
B.Tech/Honours	4	2.5%
Masters degree	35	21.9%
PhD	1	0.6%
Other (Specify)	8	5.0%
Total	**160**	**100.0%**

4.4 PRACTICE OF BASIC LIFE SUPPORT BY CHIROPRACTORS

The next section of the questionnaire focused on questions regarding the time that had elapsed since they did a Basic Life Support/Cardiopulmonary course; whether they had done a refresher course in the last two years; the type of course attended; and information, if any, about their experience with a case of an unconscious patient in practice.

4.4.1 Time lapse since the Basic Life Support and/or Cardiopulmonary course was completed

Chiropractors were asked to indicate the time that had elapsed since a BLS and/or CPR course was done. The results in **Table 4.3** show that of the 160 respondents, most chiropractors (40%, n=64) reported that they had done the course between one to two years previously, followed by 25.6% (n=41) who reported that they had done the course less than one year previously. Additionally, 20% (n=32) reported that they did the course two to three years ago, and 14.4% (n=23) had done the course more than three years ago.

Table 4.3: Time lapse since the last BLS and/or CPR course certification

	Count	Column N %
Less than 1 year	41	25.6%
1-2 years	64	40.0%
2-3 years	32	20.0%
More than 3 years	23	14.4%
Total	**160**	**100.0%**

4.4.2 The Refresher course

Chiropractors were asked to indicate whether they had completed a BLS/CPR refresher course in the last two years. The results in **Table 4.4** show that 59.4% (n=95) of participants completed the refresher course and 40.6% (n=65) of participants did not do the refresher course..

Table 4.4: Chiropractors' responses to completing the BLS/CPR refresher course

	Count	Column N %
Yes	95	59.4%
No	65	40.6%
Total	**160**	**100.0%**

4.4.3 Type of courses attended by chiropractors

Chiropractors were asked to indicate the courses they had completed. Of the 160 participants, 78.8% (n= 126) completed the BLS/CPR course as shown in **Table 4.5**. Furthermore, **Table 4.6** shows that 43% (n=68) of respondents completed the first-aid certificate and 1.9% (n=3) respondents completed other courses, which included CPR for Health Professionals, CPR course and level 3 first-aid, as shown in **Table 4.7**.

Table 4.5: Percentage of participants who did the BLS/CPR course

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	BLS/CPR	126	78.8	100.0	100.0
Missing	System	34	21.3		
Total		**160**	**100.0**		

Table 4.6: Percentage of participants who did a first-aid certificate course

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	First aid certificate	68	42.5	100.0	100.0
Missing	System	92	57.5		
Total		**160**	**100.0**		

Table 4.7: Percentage of participants who did other courses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other (Specify)	3	1.9	100.0	100.0
Missing	System	157	98.1		
Total		**160**	**100.0**		

4.4.4 Experience with an unconscious patient

The results of this study revealed that only 21.9% (n=35) of 160 participants in this study had ever experienced an unconscious patient. Of these 35, 28.6% (n=10) called for help or an ambulance; 37.1% (n=13) applied BLS; 8.6% (n=3) called for an ambulance and applied BLS, while 25.7% (n=9) used another method. Other methods included “administering glucose to a diabetic coma patient, the patient came around after a few seconds”, “lifted the patient's legs and took blood pressure measurements” and “waited for the patient to gain consciousness after a grand mal epileptic fit”.

4.5 KNOWLEDGE OF BASIC LIFE SUPPORT

The final section of the questionnaire addressed the questions on the knowledge of Basic Life Support. This was asked in a multiple-choice format where participants had to choose the correct answer. Eleven questions were used to score participants' knowledge of performing Basic Life Support. The score was expressed as a percentage out of 11 and then categorised as <80% (poor knowledge) or >= 80% (good knowledge). The responses to the 11 individual knowledge questions are shown below and are expressed as a percentage for each question. The results are also described based on the participants' answers to the question.

4.5.1 Prescription of BLS in South Africa

Chiropractors were asked to indicate who prescribes BLS in South Africa. The results in **Table 4.8** show that most chiropractors (56.9%, n=91) indicated that they do not know who prescribes BLS in South Africa, followed by 28.1% (n=45) who indicated that it is prescribed by the Resuscitation Council of Southern Africa. Another 6.3% (n=10) indicated that it is prescribed by the World Health Organization; 5.6% (n=9) indicated that BLS is prescribed by Academic Emergency Medicine; and 3.1% (n=5) indicated that it is prescribed by the South African Resuscitation Community. Forty-five (28.1%) out of 160 chiropractors who participated got the correct answer, which is "Resuscitation Council of Southern Africa".

Table 4.8: Prescription of BLS in South Africa

	Count	Column N %
South African Resuscitation Community	5	3.1%
World Health Organization	10	6.3%
Academic Emergency Medicine	9	5.6%
Resuscitation Council of Southern Africa	45	28.1%
I do not know	91	56.9%
Total	**160**	**100.0%**

4.5.2 The order of steps for initiating CPR in BLS

Chiropractors were asked to indicate the order of steps for initiating CPR according to Basic Life Support guidelines. The correct answer was “Circulation, Airway, Breathing (CAB)”. The results in **Table 4.9** show that out of 160 respondents, 63.1% (n=101) indicated that the correct order of steps is “Airway, Breathing, Circulation (ABC)”, whilst 33.1% (n=53) indicated that the order of steps is “Circulation, Airway, Breathing (CAB)”, which is the correct answer. The remaining 2.5% (n=4) indicated that the order is “Airway, Circulation, Breathing” and 1.3% (n=2) indicated that the order of steps is “Breathing, Circulation, Airway”. Of 160 respondents, only 53 chiropractors (33.1%) got the correct answer.

Table 4.9: In Basic Life Support guidelines, the order for initiating CPR is?

	Count	Column N %
Circulation, Airway, Breathing (CAB)	53	33.1%
Airway, Circulation, Breathing (ACB)	4	2.5%
Airway, Breathing, Circulation (ABC)	101	63.1%
Breathing, Circulation, Airway (BCA)	2	1.3%
I do not know	0	0.0%
Total	**160**	**100.0%**

4.5.3 The first step taken when a person is lying unconscious in a safe place

Chiropractors were asked what they would do if they saw a person lying unconscious in a safe place. The results in **Table 4.10** show that the majority of chiropractors (53.8%, n=86) got the correct answer, which is to check for responsiveness; whereas 31.3% (n=50) indicated that they would call for EMS help and 15% (n=24) indicated they would check for a pulse.

Table 4.10: The first step taken when a person is lying unconscious in a safe place

	Count	Column N %
Call for EMS help	50	31.3%
Check for responsiveness	86	53.8%
Initiate rescue breaths	0%	0.0%
Check for a pulse	24	15.0%
I do not know	0	0.0%
Total	**160**	**100.0%**

4.5.4 The best site to assess for the pulse in an unconscious adult

Chiropractors were asked to identify the best site to check for a pulse in an adult who is unconscious. The results in **Table 4.11** show that the majority of chiropractors, 86.3% (n=138), responded that they would check for the carotid artery pulse, which was the correct answer. Other 12.5% (n=20) participants responded that they would check for the radial artery pulse and 1.3% (n=2) responded that they would check for the brachial artery pulse.

Table 4.11: Identify the best site to assess for the pulse in an unconscious adult

	Count	Column N %
Aortic artery pulse	0	0.0%
Brachial artery pulse	2	1.3%
Carotid artery pulse	138	86.3%
Radial artery pulse	20	12.5%
I do not know	0	0.0%
Total	**160**	**100.0%**

4.5.5 During CPR, when should you re-assess for a pulse?

Chiropractors were asked to indicate when they would re-assess for a pulse during CPR. The results in **Table 4.12** show that 29.4% (n=47) indicated they would re-assess every 1 minute, whilst 11.3% (n=18) indicated they would reassess every five minutes. In addition, 8.1% (n=13) responded that they do not know and 3.8% (n=6) indicated that they would re-assess every three minutes for a pulse. Most chiropractors, 47.5% (29.4%), got the correct answer which is “every two minutes”.

Table 4.12: Re-assessment for a pulse during CPR

	Count	Column N %
Every 1 minute	47	29.4%
Every 2 minutes	76	47.5%
Every 3 minutes	6	3.8%
Every 5 minutes	18	11.3%
I do not know	13	8.1%
Total	**160**	**100.0%**

4.5.6 Time taken to assess a pulse

Chiropractors were asked to indicate how long they should take when checking for a pulse. The results in **Table 4.13** show that out of 160 respondents, 37.5% (n=60) indicated that checking a pulse should take between six to ten seconds, whilst 31.3% (n=50) indicated that it should take between one to five seconds; 12.5% (n=20) indicated that it should take between eleven to twenty seconds; and 12.5% (n=20) indicated that it should take between thirty to sixty seconds. A small percentage of 6.3% (n=10) of chiropractors indicated that they do not

know the answer. Most chiropractors (37.5%, n=60) got the correct answer, which is “6 to 10 seconds”.

Table 4.13: Time taken to assess a pulse

	Count	Column N %
1-5 seconds	50	31.3%
6-10 seconds	60	37.5%
11-20 seconds	20	12.5%
30-60 seconds	20	12.5%
I do not know	10	6.3%
Total	**160**	**100.0%**

4.5.7 Procedure when no pulse is found in a patient

Chiropractors were asked what they would do if they found that the patient does not have a pulse. The results in **Table 4.14** show that out of 160 respondents, 83.8% (n=134) responded that they would call for help and start CPR. A further 11.3% (n=18) responded that they would initiate chest compression; 3.8% (n=6) responded they would initiate rescue breaths; and 1.3% (n=2) responded that they would call for Emergency Medical Service (EMS) help. A high percentage of 83.8% (n=134) of chiropractors got the correct answer, which is to call for help and start CPR.

Table 4.14: Procedure when no pulse is found in a patient

	Count	Column N %
Call for EMS help	2	1.3%
Call for help and start CPR	134	83.8%
Check for responsiveness	0	0.0%
Initiate rescue breaths	6	3.8%
Initiate chest compression	18	11.3%
I do not know	0	0.0%
Total	**160**	**100.0%**

4.5.8 Procedure when patient has no pulse when re-assessing the pulse during CPR

Chiropractors were asked to indicate what they would do if the patient had no pulse while re-assessing for it during CPR. The results in **Table 4.15** show that a high percentage of 88.8% (n=142) responded that they would continue with CPR, which is the correct answer. A small percentage of 8.8% (n=14) responded that they would give chest compressions only and the remaining 2.5% (n=4) responded that they will check pupils.

Table 4.15: Procedure when patient has no pulse when re-assessing the pulse during CPR

	Count	Column N %
Ventilate only	0	0.0%
Continue CPR	142	88.8%
Give chest compressions only	14	8.8%
Check pupils	4	2.5%
I do not know	0	0.0%
Total	**160**	**100.0%**

4.5.9 Manoeuvres used to open the airways of an unresponsive patient

Chiropractors were asked to indicate which manoeuvres they would use to open the airways of an unresponsive patient. The results in **Table 4.16** show that out of 160 respondents, 52.5% (n=84) responded that they would use the head tilt and chin lift. In addition, 43.1% (n=69) responded that they would do head tilt, chin lift and jaw thrust, which is the correct answer. A small percentage of 3.1% (n=5) responded that they would do jaw thrust, 0.6% (n=1) responded that they would do neck flexion, while 0.6% (n=1) responded that they did not know the answer.

Table 4.16: Manoeuvres used to open the airways of an unresponsive patient

	Count	Column N %
Head tilt and chin lift	84	52.5%
Jaw thrust	5	3.1%
Neck flexion	1	0.6%
Both option A and B	69	43.1%
I do not know	1	0.6%
Total	**160**	**100.0%**

4.5.10 The compression to ventilation ratio for a child when two individuals are administering CPR

Chiropractors were asked what compression to ventilation ratio they would use in a child when two people are administering CPR. The results in **Table 4.17** show that most chiropractors, 48.1% (n=77), responded that they would use “15 compressions: 2 ventilations”, which is the correct answer; followed by 21.9% (n=35) who responded that they would use “30 compression: 2 ventilations”. An additional 19.4% (n=31) responded that they would use “15 compressions: 1 ventilation”; 6.9% (n=11) responded that they would use “3 compressions: 1 ventilation”; and 3.8% (n=6) responded that they do not know the answer.

Table 4.17: The compression to ventilation ratio for a child when two individuals are administering CPR

	Count	Column N %
3 compressions:1 ventilation	11	6.9%
15 compressions:1 ventilation	31	19.4%
15 compressions:2 ventilation	77	48.1%
30 compressions:2 ventilation	35	21.9%
I do not know	6	3.8%
Total	**160**	**100.0%**

4.5.11 The compression to ventilation ratio for adult CPR

Chiropractors were asked to indicate what compression to ventilation ratio they would use during CPR in an adult. The results in **Table 4.18** show that most chiropractors, 66.3% (n=106), got the correct answer, which is “30 compressions: 2 ventilations”. A further 18.8% (n=30) responded that they would use “15 compressions: 2 ventilations” and 8.8% (n=14) responded that they would use “15 compressions: 1 ventilation”. An equal proportion of 3.1%, which is five chiropractors, responded that they would use “8 compressions: 1 ventilation” and another five chiropractors responded that they do not know the answer.

Table 4.18: The compression to ventilation ratio for adult CPR

	Count	Column N %
8 compressions:1 ventilation	5	3.1%
15 compressions:1 ventilation	14	8.8%
15 compressions:2 ventilation	30	18.8%
30 compressions:2 ventilation	106	66.3%
I do not know	5	3.1%
Total	**160**	**100.0%**

4.5.12 Knowledge scores of 160 participants

The results of this study revealed that the knowledge scores were normally distributed, with a mean of 56% and a standard deviation of 20%. The range was 18% to 100, as shown in **Figure 4.5**. Only 16.25% (26/160) achieved an adequate level of knowledge (>=80%), as shown in **Figure 4.6**.

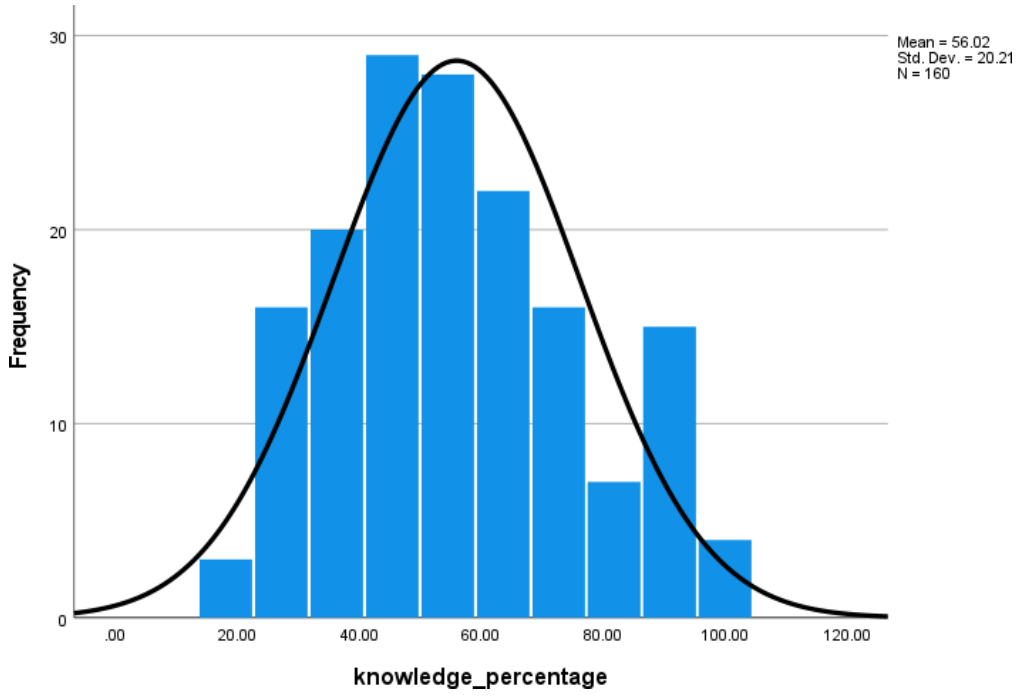

Figure 4.5: Knowledge scores of chiropractors

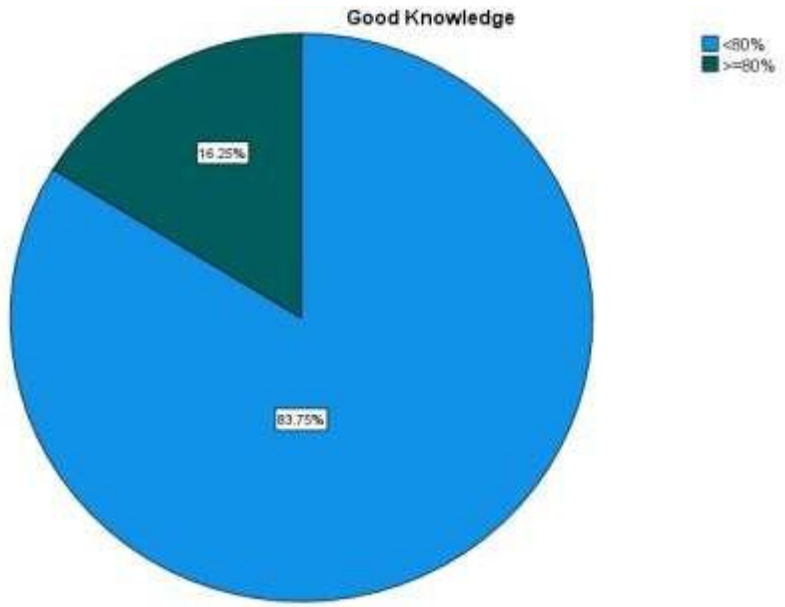

Figure 4.6: Frequency of BLS knowledge by chiropractors

4.6 RELATIONSHIP BETWEEN DEMOGRAPHICS AND KNOWLEDGE IN PERFORMING BASIC LIFE SUPPORT

The results of the relationship between demographics and knowledge in performing BLS was calculated using the Fisher Freeman Halton Exact Test.

4.6.1 Association between Age and Knowledge

A *p*-value of < 0.05 was considered highly statistically significant. The results of this study as shown in **Table 4.19** revealed that there was no significant association between age and knowledge (*p*-value= 0.257).

Table 4.19: Association between Age and Knowledge

	Value	Exact Sig. (2-sided)
Fisher-Freeman-Halton Exact Test	8.177	0.257
N of Valid Cases	160	

4.6.2 Association between Sex and Knowledge

Only 4 out of 62 males and 22 out of 98 females achieved adequate knowledge, as shown in **Table 4.20**. The results of this study, in **Table 4.21,** revealed that sex was significantly associated with knowledge (*p-value*=0.008), with females having higher levels of knowledge than males. Overall, 62 males and 98 females participated in this study.

Table 4.20: Association between Sex and Knowledge

Crosstab					
			Knowledge		Total
			<80%	>=80%	
Q5 – Sex	Male	Count	58	4	62
		Sex	93.5%	6.5%	100.0%
	Female	Count	76	22	98
		Sex	77.6%	22.4%	100.0%
Total		Count	134	26	160
		Sex	83.8%	16.3%	100.0%

Table 4.21: Association between Sex and Knowledge of BLS

	Value	Exact Sig. (2-sided)
Fisher's Exact Test		0.008
N of Valid Cases	160	

4.6.3 Association between Training institution and Knowledge

The results of this study, as shown in **Table 4.22,** revealed that the institution chiropractors trained in was not associated with nor had any impact on their knowledge of BLS (*p-value*=0.636).

Table 4.22 Association between Institution and Knowledge

	Value	Exact Sig. (2-sided)
Fisher-Freeman-Halton Exact Test	0.865	0.636
N of Valid Cases	160	

4.6.4 Correlation between Years in practice and Knowledge

The results of this study, as shown in **Table 4.23,** revealed that years in practice were not associated with knowledge (*p-value*=0.792).

Table 4.23: Association between Years in practice and Knowledge

	Value	Exact Sig. (2-sided)
Fisher-Freeman-Halton Exact Test	1.516	0.792
N of Valid Cases	160	

4.6.5 Province location and Knowledge

The results of the study, as shown in **Table 4.24,** revealed that the location of a practice in a particular province was not associated with knowledge of BLS amongst chiropractors (*p-value*=0.585).

Table 4.24: Association between Province and Knowledge

	Value	Exact Sig. (2-sided)
Fisher-Freeman-Halton Exact Test	4.611	0.585
N of Valid Cases	160	

4.6.6 Education level and Knowledge

The results of this study, as shown in **Table 4.25**, revealed that the education level of chiropractors was not associated with their knowledge of BLS (*p-value*=0.429).

Table 4.25; Association between chiropractors' Education level and Knowledge

	Value	Exact Sig. (2-sided)
Fisher-Freeman-Halton Exact Test	4.713	0.429
N of Valid Cases	160	

4.6.7 Training and Knowledge

There was a borderline non-significant association between when the last course was done and knowledge. As shown in **Table 4.26**, 26.8% (n=11) of chiropractors had >80% of knowledge in this sample population when they had completed a course within a year, while

73.2% (n=30) of chiropractors who did not complete the course within a year had >80%. The results of this study, as shown in **Table 4.27,** revealed that chiropractors who completed a course in the last year had a significant association with good knowledge (>80%) (*p-value*=0.096).

Table 4.26: Association between doing a BLS/CPR course within a year and BLS knowledge

Crosstab					
			Knowledge		Total
			<80%	>=80%	
When was the last time you did a Basic Life Support (BLS) and/or Cardiopulmonary Resuscitation (CPR) course?	Less than 1 year	Count	30	11	41
		When was the last time you did a Basic Life Support (BLS) and/or Cardiopulmonary Resuscitation (CPR) course?	73.2%	26.8%	100.0%
	1-2 years	Count	53	11	64
		When was the last time you did a Basic Life Support (BLS) and/or Cardiopulmonary Resuscitation (CPR) course?	82.8%	17.2%	100.0%
	2-3 years	Count	30	2	32
		When was the last time you did a Basic Life Support (BLS) and/or Cardiopulmonary Resuscitation (CPR) course?	93.8%	6.3%	100.0%
	More than 3 years	Count	21	2	23
		When was the last time you did a Basic Life Support (BLS) and/or Cardiopulmonary Resuscitation (CPR) course?	91.3%	8.7%	100.0%
Total		Count	134	26	160
		When was the last time you did a Basic Life Support (BLS) and/or Cardiopulmonary Resuscitation (CPR) course?	83.8%	16.3%	100.0%

Table 4.27: Association between BLS/CPR course completed within a year and Knowledge

	Value	Exact Sig. (2-sided)
Fisher-Freeman-Halton Exact Test	6.263	0.096
N of Valid Cases	160	

As shown in **Table 4.28**, 21/95 participants who responded that they have done a refresher course within two years achieved adequate knowledge, while 5/65 participants who responded that they did not do a refresher course within two years also achieved adequate knowledge. Doing a refresher course within the last two years was associated with good knowledge. This was calculated using Fisher's exact test (*p-value*=0.017), as shown in **Table 4.29**.

Table 4.28: Association between refresher course completed within two years and knowledge of BLS

Crosstab

			Knowledge		Total
			<80%	>=80%	
Have you done a BLS/CPR refresher course in the last 2 years?	Yes	Count	74	21	95
		Have you done a BLS/CPR refresher course in the last 2 years?	77.9%	22.1%	100.0%
	No	Count	60	5	65
		Have you done a BLS/CPR refresher course in the last 2 years?	92.3%	7.7%	100.0%
Total		Count	134	26	160
		Have you done a BLS/CPR refresher course in the last 2 years?	83.8%	16.3%	100.0%

Table 4.29: Association between Refresher course and Knowledge

	Value	Exact Sig. (2-sided)
Fisher's Exact Test		0.024
N of Valid Cases	160	

4.7 SUMMARY OF CHAPTER

The overall level of knowledge in this population group was low. Factors associated with good knowledge were: being female and completing a course in the last year or attending a refresher course within the last two years. The results presented in this chapter will be discussed in Chapter Five, with comparisons being drawn in relation to the available literature.

CHAPTER FIVE
DISCUSSION

5.1 INTRODUCTION

This study investigated the knowledge and practices of South African chiropractors in performing Basic Life Support. The current chapter discusses the results that were presented in Chapter Four of this study. This includes the demographics of chiropractors and requirement of BLS in South Africa and other countries; BLS survey comparisons on chiropractors and various healthcare professionals; and BLS knowledge comparisons amongst South African chiropractors and various healthcare professionals.

5.2 DEMOGRAPHICS OF CHIROPRACTORS AND REQUIREMENTS OF BLS IN SOUTH AFRICA AND OTHER COUNTRIES

The demographic information showed that the majority of participants were females (61%), which is probably due to the slightly higher number of female chiropractors registered with the AHPCSA. The ratio of female chiropractors registered with the AHPCSA is marginally larger than that of males as there are 438 females and 429 males, which is almost a 50:50 mix, yet more female practitioners responded to the survey.

In addition, the majority of participants were reported to be in their late twenties, whereby the majority was in the 26 to 30 year old age range (30%). An equal proportion had trained at the University of Johannesburg and Durban University of Technology. Most were in practice for less than five years (36.3%). As mentioned in Chapter Two, the first Chiropractic teaching facility in SA, Technikon Natal (now known as the Durban University of Technology) was established in 1983, followed by the Technikon Witwatersrand (now known as the University of Johannesburg) in 1993 (Chiropractic Association of South Africa 2021). Technikon Natal produced their first graduate in 1994 and Technikon Witwatersrand in 1999, which was 27 years ago. These results give a plausible explanation that the duration in practice most indicated by chiropractors was less than five years compared to the more than 21 years' categories.

When looking at the requirements for Basic Life Support amongst chiropractors in other countries, the following was discovered: According to the Australian Chiropractors Association (2021), all chiropractors registered in Australia are required to maintain a first-aid qualification

as part of Continuing Professional Development (CPD). The first-aid qualification must be either “HLTAID001 Provide Cardiopulmonary Resuscitation (CPR), valid for one year and updated annually; or HLTAID003 Provide First Aid, which is valid for three years”. According to the General Chiropractic Council (GCC) (2021b) in the United Kingdom, “it was not compulsory for chiropractors to have a BLS or first-aid certificate. However, after the incident in November 2019 where a patient died in a Chiropractic clinic in York, the Coroner asked the GCC to consider making first-aid training a mandatory requirement for Chiropractic registrants”. It is unclear how the incident happened and what findings the coroner made as it was not mentioned on the GCC website.

The American Chiropractic Association (2021) recommends chiropractors to have up-to-date BLS or first-aid certificate as part of “guidelines for disaster service by Doctors of Chiropractic”. While there is not much information on BLS and Chiropractors in private practice, all sports Chiropractors who are registered with the International Federation of Sport Chiropractic (FICS) (2021) and Certified Chiropractic Sports Physicians (CCSP) (2021) are required to do a CPR course every two years, or the Emergency Medical Technician (EMT) qualification.

5.3 BASIC LIFE SUPPORT SURVEY COMPARISONS ON CHIROPRACTORS AND VARIOUS HEALTHCARE PROFESSIONALS

This study targeted the entire population of chiropractors registered with the AHPCSA. During data collection, there were 892 chiropractors registered with the AHPCSA. This study yielded a final response rate of 17.9%, which was low compared to a study by Roshana et al. (2012:142), which yielded a final response rate of 84%. Their study looked at the level of knowledge and attitude towards BLS amongst medical/paramedical staff in Nepal. The sample size was 150 and 127 participants responded, among those 127 questionnaires, six questionnaires were excluded from the study because participants left some questions incomplete. Of the 121 respondents, 27 were clinical faculty members, 21 were dental and basic sciences faculty members, 29 were house officers and 44 were nurses and health assistants (Roshana et al. 2012:142).

The reason for a high response rate in the study by Roshana et al. (2012) is possible a result of the questionnaires being physically distributed to participants and collected after an adequate amount of time was given in which to complete the survey. Their data collection technique was different compared to this current study, which was conducted in an online

capacity and which may have resulted in a low response rate, even though participants completed all questions.

A similar study by Pepera et al. (2019: 2) tested the knowledge of CPR amongst Greek physiotherapists. The study targeted the entire population of physiotherapists who were registered with the Pan-Hellenic Physiotherapy Association registry. This is the official body of registered physiotherapists within Greece, working either in the in-patient or out-patient departments in Greece. The total number of physiotherapists in Greece was 7000 and 5% was considered a representative of the entire population, which was 350 physiotherapists. The final response rate was 220 physiotherapists (63%), which was high compared to this study with its final response rate of 17.9% of chiropractors. Once again, these authors physically distributed questionnaires to physiotherapists based in various hospitals and private rehabilitation centres in Athens, Greece, similar to the data collection method of Roshana et al. (2012).

The current study revealed that the overall knowledge of BLS amongst chiropractors was low, with a mean score of 56%. Only 16.25 % (n=26) of 160 participants achieved an adequate level of knowledge which is equal to or above 80%. The percentage of correct answers for the knowledge questions ranged from 18% to 100%. The chiropractors who reported the correct answers on questions related to BLS knowledge were below half of all study participants (16.25%), while the majority did not correctly answer the knowledge questions (83.75%). This finding agrees with the study conducted by Xanthos et al. (2012: 30) in Greece to evaluate nurses' theoretical knowledge in BLS, which revealed low levels of BLS theoretical knowledge.

These findings are also consistent with a study by Yunus et al. (2015: 3647) on the knowledge, attitude and practice of BLS amongst junior doctors and students in a tertiary care medical institute, which revealed that the knowledge and practice skills of BLS/CPR are poor in medical and nursing students. Chaudhari et al. (2017: 196) showed a similar finding on healthcare providers (Doctors and nursing staff) in a tertiary care hospital in Western India.

A study conducted by Irfan et al. (2019: 4) to determine the current state of knowledge of BLS in healthcare professionals in Pakistan revealed that the level of awareness regarding BLS amongst doctors, dentists and nurses in a tertiary care setting was found to be inadequate. The doctors, dentists and nurses who participated in the study did not perform well when their knowledge of BLS was tested, with only 67.1% of doctors, 35% dentists and 22.9% of the

nurses having an adequate knowledge of BLS (score ≥ 50%). The findings in the study by Irfan et al. (2019: 4) are similar to the findings of this study. The only difference is that Irfan et al. (2019: 4) used 50% as the pass rate, whereas this study had an 80% pass rate.

In contrast, a recent study by Brenton-Rule et al. (2021: 6) to investigate the knowledge and perceptions of CPR amongst podiatrists revealed that the podiatrists had a sound theoretical knowledge of CPR. These findings were also similar to a study by Harvey et al. (2019: 100) amongst New Zealand physiotherapists, which revealed that physiotherapists had an average knowledge of CPR.

The findings in this study are consistent with the documented literature on poor knowledge and awareness of BLS amongst different populations/professions. These included nurses, nursing assistants, physicians, students, physiotherapists, medical doctors, specialists, radiology staff, basic ambulance assistants, ambulance emergency assistants and advanced life support qualified personnel, with recommendations that this knowledge needs to be improved (Chandrasekaran et al. 2010: 124; Botha et al. 2012: 450; Rajeswaran and Ehlers 2014: 5; Veronese 2015: 64; Mac Giolla Phadraig et al. 2016: 189; Chaudhari et al. 2017: 196; Harvey et al. 2019: 101; Vorster and Beningfield 2019:4; Silverplats et al. 2020: 370). These results are also in agreement with a study by Tripathi and Vyas (2021: 69:), which revealed that the “level of knowledge was low and this is something that needs to be considered when developing continuing education policies in order to ensure that the healthcare staff has updated knowledge and is prepared, both in theory and practice, to avoid complications and fatal outcomes”.

The current study compared participant knowledge against demographics (age group, sex, training institution, province location, education level and training), with the result that female chiropractors demonstrated higher levels of knowledge with more correct answers than male chiropractors. When comparing age and participants’ knowledge, this study revealed that there was no association between these two variables. Many studies did not compare participant knowledge to demographics (such as age and sex), thus comparisons were difficult to draw. However, one study did draw a comparison. Aroor et al (2014: 168) conducted a study to test the awareness of BLS and emergency medical services and its associated factors amongst students in a tertiary care hospital in South India. This author revealed that age, gender, level of training, the programme of study and previous exposure to BLS were significantly associated with knowledge level, a finding similar to the current study.

Other factors that significantly contributed to higher knowledge in the participants of the current study included completing a course in the last year or attending a refresher course within the last two years. Results from this current study revealed that refresher courses are necessary for better cognition. These findings are similar to a study by Abbas et al. (2011: 611), which stated that there was a higher level of knowledge and awareness of trained subjects in BLS versus untrained subjects. Various authors have recommended that healthcare professionals should have hands-on courses regularly in order to master their skills and refresh their knowledge about BLS (Aroor et al. 2014: 167; Ilyas et al. 2014: 44; Sangamesh et al. 2017: 166; Kaihula et al. 2018: 6; Saqueb et al. 2019: 6; Chandran and Abraham 2020: 334; Papi et al. 2020: 1197).

5.4 BASIC LIFE SUPPORT KNOWLEDGE AND PRACTICE COMPARISONS AMONGST SOUTH AFRICAN CHIROPRACTORS AND VARIOUS HEALTHCARE PROFESSIONALS

This study revealed that the refresher course significantly influenced the BLS knowledge of chiropractors. Chiropractors who did the refresher course received better knowledge scores than those who did not do the refresher course in the last two years. A recent study by Bhavar et al. (2021: 88) looked at the evaluation of the knowledge and skills of BLS amongst medical interns. In their study, they tested the interns before the BLS refresher training, immediately after the BLS training and six months after the training. They found that the interns performed better immediately after the training than before the training, but their retention of knowledge decreased after 6 months of training. They found that before training, all the participants were lacking in most of the essential skills required for saving the life of a person requiring CPR. The findings in the study by Bhavar et al. (2021: 88) are similar to the findings of this study.

Refresher courses help practitioners to have up-to-date knowledge of BLS, and the BLS guidelines are updated after every five years. Almost 10 years have elapsed after the 2010 American Heart Association guidelines in which Airway, Breathing and Compression (ABC) was converted into Compression, Airway and Breathing (CAB) for all age groups except new-borns. Unfortunately, only 33.1% of chiropractors in this study were aware of the current upgraded order of CPR intervention, being C-A-B from the previous A-B-C. Similar findings by Vural et al. (2017: 141) were recorded in their study titled “Cardiopulmonary resuscitation knowledge among nursing students: a questionnaire study” in which 78.3% of nursing students indicated ABC as the current order of CPR versus 21.8% of those who indicated CAB.

According to AHA guidelines, a pulse check should take between six to 10 seconds. The findings in this study revealed that only a small percentage of 37.5% of chiropractors were aware that a pulse assessment should take between six to 10 seconds, while the rest seem to have no clue of how long it should take to assess a pulse. The same trend can be seen in the study by Tripathi and Vyas (2021: 69), where only 30.5% of physiotherapy students were aware of how long it should take to assess a pulse. The findings regarding the manoeuvres that are used to open the airways of an unresponsive patient revealed that only 43.1% of chiropractors were aware of these manoeuvres. This is low compared to 80% of final-year physiotherapy students who are aware of the manoeuvres (Tripathi and Vyas 2021: 69).

Another important finding revealed by this study is that only 48.1% of chiropractors were aware that the rate of compression to ventilation ratio when performing CPR on a child along with an

additional rescuer is 15 compressions: 2 ventilations, which is higher compared to the findings by Tripathi and Vyas (2021: 69) whereby only 30.5% of final-year physiotherapy students who participated in the study were aware of the correct ratio. Although 21.9% of chiropractors thought that 30 compressions: 2 ventilations is the correct rate of compression to ventilation ratio, this would be true if there is only one individual administering CPR. This is an important finding as the majority of participants were not aware of the correct rate of compression to ventilation ratio, which is alarming.

CHAPTER SIX
CONCLUSION, LIMITATIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

This chapter outlines the conclusions, limitations and recommendations of this study. It begins with the research conclusion that relates to the study aim, followed by limitations that were experienced during the investigation. Finally, recommendations that could be used for future research are presented.

6.2 CONCLUSION

The aim of this study was to determine the knowledge and practices of South African chiropractors in performing BLS. The findings in this study suggest that chiropractors have low levels of knowledge of BLS. Factors that significantly contributed to higher knowledge in participants were completing a course in the last year or attending a refresher course within the last two years. Refresher courses on BLS should be done at least once every two years in order to improve the situation. In addition, public lectures on BLS at CASA regional events or regular workshops should be considered as it will also improve the knowledge of BLS amongst chiropractors, as studies revealed that knowledge of BLS deteriorates after six months of training.

6.3 LIMITATIONS

There were some limitations in this study. Firstly, the response rate was low, which is possibly because the researcher did not have direct contact with participants. Another limitation of the study is the absence of any possibility to compare the results of the questionnaire to other available studies on BLS, since the researcher specifically created the questionnaire based on the published American Heart Association (AHA) handbook guidelines. Questionnaires from other studies differed in content. Furthermore, the study also looked at chiropractors' theoretical knowledge, but no practical skills, such as CPR, were evaluated. Furthermore, healthcare professionals' CPR knowledge and skills vary by country. Chiropractors, on the other hand, should be evaluated on a global scale for providing high-quality cardiopulmonary resuscitation.

6.4 RECOMMENDATIONS

The following recommendations are made for more African and international studies as the literature is sparse on this topic:

I. A larger sample size should be used in future studies to further determine the trends observed in this study.
II. Future studies should look at both the theoretical knowledge of BLS as well as practical skills on resuscitation.
III. Future studies should compare the knowledge of chiropractors in private practice with sports chiropractors.

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APPENDICES

Appendix A: Letter asking for permission from Allied Health Profession Council of South Africa

Dr L. Mullinder
AHPCSA Registrar

Request for Permission to distribute a survey to Chiropractors in South Africa

Dear Dr Mullinder

My name is Bongeka Caluza, an M. Tech Chiropractic student at the Durban University of Technology. The research I wish to conduct for my Masters dissertation involves: **The knowledge and practices of South African chiropractors in performing basic life support.**

I am hereby seeking your help to distribute the survey to fellow chiropractic practitioners registered with Allied Health Professions Council of South Africa.

I have provided you with a copy of my proposal which includes copies of the data collection tools and consent and/ or assent forms to be used in the research process, as well as a copy of the approval letter which I received from the Institutional Research Ethics Committee (IREC).

If you require any further information, please do not hesitate to contact me on 073 957 4686 or email at caluzabongeka@gmail.com. Thank you for your time and consideration in this matter.

Yours sincerely,

Bongeka Caluza
Durban University of Technology

Appendix B

Permission letter from AHPCSA

RE: Permission to distribute questionnaires for research and obtain a CPD point upon completion

Bongeka Caluza <caluzabongeka@gmail.com> May 13, 2020, 6:37 AM

to registrar, Yomika, Desiree

Date: 13 May 2020

Dear Dr Mullinder

I trust this email finds you well.

My name is Bongeka Caluza and I am a registered M.Tech Chiropractic student at the Durban University of Technology.

The title for my proposed research is:

""“The knowledge and practices of South African chiropractors in performing basic life support”

I am hereby seeking your help with the distribution of the questionnaires to chiropractors who are registered with the Allied Health Professions Council of South Africa. The software to be used to complete the questionnaire online is QuestionPro which is the software that DUT prescribes to.

I would also like to enquire whether one CPD point can be allocated to chiropractors who complete the questionnaire.

Thanking you in advance.

Kind regards
Ms. Bongeka Caluza

registrar@ahpcsa.co.za May 14, 2020, 10:15 AM

to me, Yomika, Desiree

Dear Ms Caluza

The AHPCSA bulk email facility has limitations, regrettably, and I am only able to forward to all chiropractors the text of a Word document (to be prepared by yourself)

- an example follows below, which you must adapt for your profession and your institution of higher education and training, particularly where the example text has been high highlighted. Once you have prepared this Word Document relating to your research please return this to me and I will forward to all registered chiropractors, thank you.

DEPARTMENT OF CHIROPRACTIC: DURBAN UNIVERSITY OF TECHNOLOGY

RESEARCH STUDY INFORMATION LETTER

[Date]

Good Day

My name is [……]. **I WOULD LIKE TO INVITE YOU TO PARTICIPATE** in a research study on [……].

Before you decide on whether to participate, I would like to explain to you why the research is being done and what it will involve for you**.** The study is part of a research project being completed as a requirement for a Master's Degree in chiropractic through the Durban University of Technology

THE PURPOSE OF THIS STUDY is to assess [what ever you are assessing]. An online survey will be used for those purposes.

Below, I have compiled a set of questions and answers that I believe will assist you in understanding the relevant details of participation in this research study. Please read through these.

1. **DO I HAVE TO TAKE PART?** No, you don't have to. It is up to you to decide to participate in the study. I will describe the study and go through this information sheet. If you agree to take part, I will then ask you give consent.
2. **WHAT EXACTLY WILL I BE EXPECTED TO DO IF I AGREE TO PARTICIPATE?** If you wish to participate, you may go through and read the rest of the letter. Once you are done you can click on the following link: [INSERT LINK] to take part in the study. Upon arrival you will be directed to an eligibility assessment page that determines if you are eligible to take part. Upon successful completion you will be directed to give your consent in order to proceed. Once you consent to taking part, you can complete the online survey. After completion of the survey you will be directed to a "participant information" page which you have to complete. Identifying data is required to ensure single-participation and eligibility. It will take 10-15 minutes to complete the survey. The survey will be available online for three weeks, which means you can complete the survey any day in that three-week period.
3. **APPROXIMATELY HOW LONG WILL MY PARTICIPATION TAKE?** Your participation will take approximately 10-15 minutes.
4. **WHAT WILL HAPPEN IF I WANT TO WITHDRAW FROM THE STUDY?** If you decide to participate, you are free to withdraw your consent at any time **prior to submitting your survey responses** without giving a reason and without any consequences.
5. **IF I CHOOSE TO PARTICIPATE, WILL THERE BE ANY EXPENSES FOR ME OR PAYMENT DUE TO ME?**: Since the survey will be conducted online, you will bear internet-related expenses should you participate. Expenses will vary depending on your internet provider. You will not be paid to take part in the study.
6. **IF I CHOOSE TO PARTICIPATE, WHAT ARE THE RISKS INVOLVED?** There are no anticipated risks involved should you take part in the study.
7. **IF I CHOOSE TO PARTICIPATE, WHAT ARE THE BENEFITS INVOLVED?** The results of the study would allow for determination of what extent chiropractors [insert relevant phrase and explanation]. For the practitioner this means opportunities to receive ADR reporting training should it be determined to be a necessity. From the AHPCSA, upon completion of the survey you become eligible to receive 1 CEU for taking part in research. To claim, make sure you print the "participant

information" page with your details provided on it. This can then be presented to the AHPCSA to redeem your point.

8. **WILL MY PARTICIPATION IN THIS STUDY BE KEPT CONFIDENTIAL?** All reasonable efforts will be made to keep your personal information confidential and respect your right to privacy. Your responses to the questionnaire will in no way be linked to your personal information i.e your responses will be anonymous. You will not be identified in any research reports that are published. Under some circumstances, such as when required to do so by a court of law, I may have to disclose your personal information. In addition, it may happen that your information will need to be reviewed by another organisation for quality assurance purposes. In either case, your responses to the survey will remain anonymous.
9. **WHAT WILL HAPPEN TO THE RESULTS OF THE RESEARCH STUDY?** The results will be written into a research report that will be assessed. In some cases, results may also be published in a scientific journal. In either case, you will not be identifiable in any documents, reports or publications. You will be given access to the results of this if you would like to see them, by contacting me.
10. **WHAT WILL YOUR RESPONSIBILITIES BE, AS THE RESEARCHER? :** As the researcher I will be responsible for answering any questions you might have regarding the study and collecting and analyzing the data once you have completed the survey. I will also be responsible for writing the research report.
11. **WHO IS ORGANISING AND FUNDING THIS RESEARCH STUDY?** The study is being organised by me, under the guidance of my research supervisor at the Department of Chiropractic at the Durban University of Technology. The study will be funded from the DUT supervisor-linked bursary.
12. **WHO HAS REVIEWED AND APPROVED THIS STUDY?** Before this study was allowed to start, it was reviewed in order to protect your interests. This review was done first by the Department of Chiropractic, and then secondly by the Faculty of Health Sciences Research Ethics Committee at the Durban University of Technology. In both cases, the study was approved.
13. **WHAT IF THERE IS A PROBLEM?** If you have any concerns or complaints about this research study, its procedures or risks and benefits, you should ask me. You should contact me at any time if you feel you have any concerns about being a part of this study. My contact details are:

[name of researcher ie your name]
[mobile number]
[email address]

You may also contact my research supervisor:

[Name of supervisor]
[email address of supervisor]

If you feel that any questions or complaints regarding your participation in this study have not been dealt with adequately, you may contact the Chairperson of the Faculty of Health Sciences Research Ethics Committee at the Durban University of Technology:

[Name of chairperson]
[office telephone number of chairperson]
[email address of chairperson]

FURTHER INFORMATION AND CONTACT DETAILS: Should you wish to have more specific information about this research project information, have any questions, concerns or complaints about this research study, its procedures, risks and benefits, you should communicate with me using any of the contact details given above.

Researcher:

[Your name]

With kind regards

LEGAL NOTICE | PRIVACY POLICY | AHPCSA WEBSITE

DR LOUIS MULLINDER

REGISTRAR: ALLIED HEALTH PROFESSIONS COUNCIL OF SOUTH AFRICA

6 Castelli, Il Villaggio,
5 De Havilland Crescent South,
Persequor Technopark, Pretoria 0184

Private Bag X28
Lynnwood Ridge, Pretoria 0040

012 349 2331/2332/2333
registrar@ahpcsa

012 349 2327

086 507 4092

Appendix C: Pre-survey notification

Pre-survey notification

Dear valued chiropractor

Over the past century the chiropractic profession has globally advanced from an unregulated health profession to becoming part of a more fully integrated health care system. Since then, continual professional development has been implemented to make sure that chiropractors are up to date with current information. Basic life support certificate is part of continual professional development chiropractors needs to hold.

In order to elicit the input of all practitioners in the field I would like to invite you to participate in a survey entitled: **The knowledge and practices of South African chiropractors in performing basic life support**, which forms part of my master's degree at the Durban University of Technology. Your participation will help ensure that the survey will provide up to date information about the knowledge and practices of basic life support among chiropractors.

Should you agree to participate, you will find the link to the survey at the bottom of this email notification containing clear instructions. Your participation in this survey is important and will be greatly appreciated.

Sincerely,
Bongeka Caluza

Appendix D: Letter of information for the main study

LETTER OF INFORMATION

Dear participant. I wish to welcome you to my research study and thank you for your co-operation.

Title of the Research Study: The knowledge and practices of South African chiropractors in performing basic life support.

Principal Investigator/s/researcher: Bongeka Caluza, (BTech Chiropractic)

Co-Investigator/s/supervisor/s: Dr Y Venketsamy, (M.Tech: Chiropractic), Dr D Varatharajullu, (M.Tech: Chiropractic) and Prof TC Hardcastle, (MBChB, MMed(Chir), FCS(SA), PhD)

Brief Introduction and Purpose of the Study: The purpose of this study is to determine the knowledge and practices of chiropractors in performing basic life support in South Africa. Basic life support (BLS) has been described as 'maintenance of a clear airway and support of breathing and the circulation in cases of cardiac arrest, without the use of equipment other than a simple airway device or protective shield'. Cardiopulmonary resuscitation (CPR) is defined as 'the combination of chest compression and rescue breathing and forms the basis of modern BLS'. It is important for health care professionals including chiropractors to have knowledge of BLS because they are likely to encounter potential traumatic and medical emergencies at some point in their professional life, therefore they must develop competencies in recognising medical emergencies.

Outline of the Procedures: You will be invited to participate in this study via email communication. You will be required to read a letter of information and sign an informed consent form. You will then be required to complete a questionnaire which will take approximately 10-15 minutes of your time. The questionnaire is divided into three sections in order to obtain the required data for this study. These sections include demographics; Performance of BLS; and Knowledge of BLS.

Risks or Discomforts to the Participant: This research study is a questionnaire-based study and therefore poses no anticipated risks or discomfort to you. All questionnaires will be anonymous. No names will appear on the questionnaire.

Benefits: Completing this survey may prompt you to update your BLS certificates and skills and may also make you aware of any additional training you may require. There will be one CPD point allocated by the AHPCSA to you should you complete the survey.

Reason/s why the Participant May Be Withdrawn from the Study: You may withdraw from the research study at any given time without penalty/ consequence

Remuneration: There will be one CPD point allocated by the AHPCSA to you should you complete the survey.

Costs of the Study: Since the survey will be conducted online, you will bear internet-related expenses should you participate. Expenses will vary depending on your internet provider.

Confidentiality: all questionnaires will be allocated a code. The information provided by you will be treated as highly confidential and will always remain anonymous. You will not be required to include your name or any identifiable details when completing the questionnaire.

Research-related Injury: None to be expected

Persons to Contact in the Event of Any Problems or Queries:

Please contact the researcher (Bongeka Caluza, 073 957 4686), my supervisors (Dr Y Venketsamy, 031 373 2588), (Dr D Varatharajullu, 031 373 2533) and (Prof T.C Hardcastle, 031 240 2389), or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the DVC: Research, Innovation and Engagement Prof S Moyo on 031 373 2577 or moyos@dut.ac.za.

Appendix E: Consent form for the main study

CONSENT

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Bongeka Caluza, about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: _____,
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____	_____	_____	_____
Full Name of Participant	**Date**	**Time**	**Signature/Right Thumbprint**

I, Bongeka Caluza herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Bongeka Caluza

_____	_____	_____
Full Name of Researcher	**Date**	**Signature**
_____	_____	_____
Full Name of Witness (If applicable)	**Date**	**Signature**
_____	_____	_____
Full Name of Legal Guardian (If applicable)	**Date**	**Signature**

Appendix F: Final Questionnaire

27 Questions

DURBAN UNIVERSITY OF TECHNOLOGY
INYUVESI YASETHEKWINI YEZOBUCHWEPHESHE

Knowledge and practices of basic life support

Add Question

Letter of information

DUT DURBAN UNIVERSITY OF TECHNOLOGY — INSTITUTIONAL RESEARCH ETHICS COMMITTEE

Dear participant. I wish to welcome you to my research study and thank you for your co-operation.

Title of the Research Study: The knowledge and practices of South African chiropractors in performing basic life support.

Principal Investigator/s/researcher: Bongeka Caluza, (BTech Chiropractic)

Co-Investigator/s/supervisor/s: Dr Y Venketsamy, (M.Tech: Chiropractic), Dr D Varatharajullu, (M.Tech: Chiropractic) and Prof TC Hardcastle, (MBChB, MMed(Chir), FCS(SA), PhD)

Brief Introduction and Purpose of the Study: The purpose of this study is to determine the knowledge and practices of chiropractors in performing basic life support in South Africa. Basic life support (BLS) has been described as 'maintenance of a clear airway and support of breathing and the circulation in cases of

been described as "maintenance of a clear airway and support of breathing and the circulation in cases of cardiac arrest, without the use of equipment other than a simple airway device or protective shield'. Cardiopulmonary resuscitation (CPR) is defined as 'the combination of chest compression and rescue breathing and forms the basis of modern BLS'. It is important for health care professionals including chiropractors to have knowledge of BLS because they are likely to encounter potential traumatic and medical emergencies at some point in their professional life, therefore they must develop competencies in recognising medical emergencies.

Inclusion Criteria:
All registered chiropractors practicing in South Africa, inclusive of foreign qualified chiropractors who are registered with AHPCSA

Exclusion Criteria:
Chiropractors who are not willing to sign an informed consent
Chiropractors who have participated in the focus group and pilot study

Outline of the Procedures: You will be invited to participate in this study via email communication. You will be required to read a letter of information and sign an informed consent form. You will then be required to complete a questionnaire which will take approximately 10-15 minutes of your time. The questionnaire is divided into three sections in order to obtain the required data for this study. These sections include demographics; Practices of BLS; and Knowledge of BLS.

Risks or Discomforts to the Participant: This research study is a questionnaire-based study and therefore poses no anticipated risks or discomfort to you. All questionnaires will be anonymous. No names will appear on the questionnaire.

Benefits: Completing this survey may prompt you to update your BLS certificates and skills and may also make you aware of any additional training you may require. There will be one CPD point allocated by the AHPCSA to you should you complete the survey.

Reason/s why the Participant May Be Withdrawn from the Study: You may withdraw from the research study at any given time without penalty/ consequence
Remuneration: There will be one CPD point allocated by the AHPCSA to you should you complete the survey.

Costs of the Study: Since the survey will be conducted online, you will bear internet-related expenses should you participate. Expenses will vary depending on your internet provider.
Confidentiality: all questionnaires will be allocated a code. The information provided by you will be treated as highly confidential and will always remain anonymous. You will not be required to include your name or any identifiable details when completing the questionnaire.

Research-related Injury: None to be expected

Persons to Contact in the Event of Any Problems or Queries:
Please contact the researcher (Bongeka Caluza, 073 957 4686), my supervisors (Dr Y Venketsamy, 031 373 2588), (Dr D Varatharajullu, 031 373 2533) and (Prof T.C Hardcastle, 031 240 2389), or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the DVC: Research, Innovation and Engagement Prof S Moyo on 031 373 2577 or moyos@dut.ac.za.

Consent form

Statement of Agreement to Participate in the Research Study

· I hereby confirm that I have been informed by the researcher, Bongeka Caluza, about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: **IREC 098/20**
· I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
· I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
· In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
· I may, at any stage, without prejudice, withdraw my consent and participation in the study.
· I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
· I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

I, Bongeka Caluza herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Add Question Page Break Separator

* Do you give consent to participate in this study

- ◯ Yes
- ◯ No

Add Option | Add Other | Add N/A Option

Add Question Page Break Separator

Section A: Demographics

Add Question Page Break Separator

* Age

- 21-25
- 26-30
- 31-35
- 36-40
- 41-45
- 46-50
- 51-55
- 56 and above

Add Question Page Break Separator

* Sex

- Male
- Female

Add Question Page Break Separator

* Institution trained in

- DUT
- UJ

- ◯ Other

Add Question | Page Break | Separator

* Years in practice

- ◯ Less than 5 years
- ◯ 5-9 years
- ◯ 10-15 years
- ◯ 16-20 years
- ◯ 21 years and more

Add Question | Page Break | Separator

* Province of practice

- ◯ Eastern Cape
- ◯ Western Cape
- ◯ Gauteng
- ◯ Limpopo
- ◯ KwaZulu-Natal
- ◯ Mpumalanga
- ◯ North West
- ◯ Free State

Add Question | Page Break | Separator

* Highest level of Non-chiropractic education attained

- ◯ Matric
- ◯ Diploma
- ◯ B.Tech/Honours
- ◯ Masters degree
- ◯ PhD
- ◯ Other (Specify)

Add Question | Page Break | Separator

Section B: Practices of Basic Life Support by Chiropractors

Add Question | Page Break | Separator

* When was the last time you did a Basic Life Support (BLS) and/or Cardiopulmonary Resuscitation (CPR) course?

- ◯ Less than 1 year
- ◯ 1-2 years
- ◯ 2-3 years
- ◯ More than 3 years

Add Question | Page Break | Separator

* Have you done a BLS/CPR refresher course in the last 2 years?

* Have you done a BLS/ CPR refresher course in the last 2 years?

- ◯ Yes
- ◯ No

Add Question | Page Break | Separator

* Which of the following course/s did you partake in? (You may choose more than one)

- ☐ BLS/CPR
- ☐ First aid certificate
- ☐ Other (Specify)

Add Question | Page Break | Separator

* Have you ever experienced a case of an unconscious patient? (If No, please move to section C)

- ◯ Yes
- ◯ No

Add Question | Page Break | Separator

If answered yes, how did you deal with the situation? (You may choose more than one)

- ☐ Call for help/ambulance
- ☐ Take the patient to the hospital
- ☐ Applied BLS
- ☐ All of the above

Other (Specify)

Add Question | Page Break | Separator

Section C: Knowledge of Basic Life Support by Chiropractors

Add Question | Page Break | Separator

* In South Africa, BLS is prescribed by?

- South African Resuscitation Community
- World Health Organization
- Academic Emergency Medicine
- Resuscitation Council of Southern Africa
- I do not know

Add Question | Page Break | Separator

* In Basic Life Support guidelines, the order of steps for initiating CPR is?

- Circulation, Airway, Breathing (CAB)
- Airway, Circulation, Breathing (ACB)
- Airway, Breathing, Circulation (ABC)
- Breathing, Circulation, Airway (BCA)
- I do not know

Add Question Page Break Separator

* What is the first step to do when you see a person lying unconscious in a safe place?

- ◯ Call for EMS help
- ◯ Check for responsiveness
- ◯ Initiate rescue breaths
- ◯ Check for a pulse
- ◯ I do not know

Add Question Page Break Separator

* Identify the best site to assess for the pulse in an unconscious adult.

- ◯ Aortic artery pulse
- ◯ Brachial artery pulse
- ◯ Carotid artery pulse
- ◯ Radial artery pulse
- ◯ I do not know

Add Question Page Break Separator

* During CPR, when should you reassess for a pulse?

- ◯ Every 1 minute
- ◯ Every 2 minutes
- ◯ Every 3 minutes

- ◯ Every 5 minutes
- ◯ I do not know

Add Question | Page Break | Separator

* In BLS, how much time should a pulse check take?

- ◯ 1-5 seconds
- ◯ 6-10 seconds
- ◯ 11-20 seconds
- ◯ 30-60 seconds
- ◯ I do not know

Add Question | Page Break | Separator

* If you found the patient had no pulse, how would you proceed?

- ◯ Call for EMS help
- ◯ Call for help and start CPR
- ◯ Check for responsiveness
- ◯ Initiate rescue breaths
- ◯ Initiate chest compression
- ◯ I do not know

Add Question | Page Break | Separator

* When reassessing the pulse, during CPR, you find that the patient had no pulse. How would you then proceed?

- ◯ Ventilate only
- ◯ Continue CPR
- ◯ Give chest compressions only
- ◯ Check pupils
- ◯ I do not know

Add Question | Page Break | Separator

* Which of the following maneuvers are used to open the airways of an unresponsive patient?

- ◯ Head tilt and chin lift
- ◯ Jaw thrust
- ◯ Neck flexion
- ◯ Both option A and B
- ◯ I do not know

Add Question | Page Break | Separator

* The compression: ventilation ratio for a child when 2 individuals are administering CPR is:

- ◯ 3 compression:1 ventilation
- ◯ 15 compression:1 ventilation
- ◯ 15 compression:2 ventilation
- ◯ 30 compression:2 ventilation
- ◯ I do not know

Add Question Page Break Separator

* The compression: ventilation ratio for adult CPR is:

- ◯ 8 compression:1 ventilation
- ◯ 15 compression:1 ventilation
- ◯ 15 compression:2 ventilation
- ◯ 30 compression:2 ventilation
- ◯ I do not know

Add Question Page Break Separator

Edit Footer Thank You Page

27 Questions

Appendix G: Pre-expert group questionnaire

Section A: Demographics

1. Age:
21- 29 years ☐ 30- 39 years ☐ 40- 49 years ☐ 50 and above ☐

2. Sex:
Male ☐ Female ☐

3. Institution trained in:
DUT ☐ UJ ☐ Other ☐

4. Years in practice:
Less than 5 years ☐ 5- 9 years ☐ 10- 15 years ☐ 16- 20 years ☐

21 and above ☐

5. Province of practice
Eastern Cape ☐ Western Cape ☐ Gauteng ☐ Limpopo ☐ KwaZulu-Natal ☐ Mpumalanga ☐ North West ☐ Free State ☐

6. Highest level of non-chiropractic education attained
Matric ☐ Diploma ☐ B.Tech/Honours ☐ Master's degree ☐ Doctorate ☐

Other (specify)----------

Section B: Practices of Basic Life Support by chiropractors

1) When was the last time you did a BLS/CPR course?
a. Less than 1 year ☐
b. 1- 2 years ☐
c. 2-3 years ☐
d. More than 3 years ☐

2) Have you done a BLS/CPR refresher course in the last 2 years?
a. Yes ☐
b. No ☐

3) Which of the following course/s did you partake in?
a. Basic Life Support ☐
b. Cardiopulmonary Resuscitation ☐
c. Both Basic Life Support and Cardiopulmonary Resuscitation ☐

b. First aid certificate ☐
c. Other (specify)----------

4) Have you ever experienced a case of an unconscious patient in your practice?
a. Yes ☐
b. No ☐
If no, please move to section C.

5) If yes, how did you deal with the situation?
a. Call for help/ambulance ☐
b. Take the patient to the hospital ☐
c. Applied Basic Life Support ☐
d. All of the above ☐
e. Other (specify)----------

Section C: Knowledge

1) Basic Life Support is advocated by?
a. American Thoracic Society ☐
b. World Health Organization ☐
c. Academic Emergency Medicine ☐
d. American Heart Association ☐
e. I don't know ☐

2) Full form of AED is?
a. Automatic electric defibrillator ☐
b. Autonomous electric defibrillator ☐
c. Automated external defibrillator ☐
d. Automated electric defibrillator ☐
e. I don't know ☐

3) What is the first step to do when you see a person lying unconscious in a safe place?
a. Call for help ☐
b. Check for response ☐
c. Give rescue breaths ☐
d. Check pulse ☐
e. I don't know ☐

4) What will you do next after you find the patient has no pulse in the above scenario?
a. Call for help/ get AED ☐

b. Check for response ☐
c. Give rescue breaths ☐
d. Start Cardiopulmonary Resuscitation ☐
e. I don't know ☐

5) In child Cardiopulmonary Resuscitation with 2 persons, the ratio of compression: ventilation is
a. 3:1 ☐
b. 15:1 ☐
c. 15:2 ☐
d. 30:2 ☐
e. I don't know ☐

6) Rate of compression: ventilation for adult Cardiopulmonary Resuscitation is
a. 8:1 ☐
b. 15:1 ☐
c. 15:2 ☐
d. 30:2 ☐
e. I don't know ☐

7) During CPR, when should you check for a pulse?
a. Every 1 minute ☐
b. Every 2 minutes ☐
c. Every 3 minutes ☐
d. Every 5 minutes ☐
e. I don't know ☐

8) What are the manoeuvres to open the airway in an unresponsive patient?
a. Head tilt ☐
b. Chin lift ☐
c. Neck flexion ☐
d. Jaw thrust ☐
e. I don't know ☐

9) What is the next step to do for a collapsed patient if there is no pulse while doing Cardiopulmonary Resuscitation?
a. Ventilate only ☐
b. Continue Cardiopulmonary Resuscitation ☐

c. Give chest compressions only ☐
d. Check pupil ☐
e. I don't know ☐

10) In Basic Life Support guidelines, the order of steps for initially starting Cardiopulmonary Resuscitation is?
a. Circulation, Airway, Breathing (CAB) ☐
b. Airway, Circulation, Breathing (ACB) ☐
c. Airway, Breathing, Circulation (ABC) ☐
d. Breathing, Circulation, Airway (BCA) ☐
e. I don't know ☐

11) In Basic Life Support, pulse check can take how much time?
a. 1-5 seconds ☐
b. 6-10 seconds ☐
c. 11-20 seconds ☐
d. 30-60 seconds ☐
e. I don't know ☐

12) Where is the best site to assess the pulse in adults?
a. Carotid pulse ☐
b. Brachial pulse ☐
c. Radial pulse ☐
d. Aortic pulse ☐
e. I don't know ☐

Thank you for taking part in this survey.

Appendix H: Letter of information for the Expert group

LETTER OF INFORMATION: FOCUS GROUP

Dear participant. I wish to welcome you to the focus group and thank you for your co-operation.

Title of the Research Study: The knowledge and practices of South African chiropractors in performing basic life support.

Principal Investigator/s/researcher: Bongeka Caluza, (BTech Chiropractic)

Co-Investigator/s/supervisor/s: Dr Y Venketsamy, (M.Tech: Chiropractic), Dr D Varatharajullu, (M.Tech: Chiropractic) and Prof TC Hardcastle, (MBChB, MMed(Chir), FCS(SA), PhD)

Brief Introduction and Purpose of the Study: The purpose of this focus group is to establish "face validity" of the questionnaire that shall be used to develop a tool that could determine the knowledge and practices of chiropractors in performing BLS, as well as to adapt the questionnaire to suit the environment under which the study is to be conducted. Your participation is much appreciated, and it is assured that your comments and contributions will remain confidential. You are at any point permitted to disagree, however if this is the case, please give your reasons for this, as it will assist in the research process. The results of this focus group will only be used for research purposes. The material discussed will be kept confidential.

Outline of the Procedures: You will be asked to read the Letter of Information (Appendix G), the Confidentiality agreement (Appendix F) and Informed Consent (Appendix H). You will then be given an opportunity to ask any questions regarding the focus group procedure and have time to sign the Informed Consent (Appendix H) as well as (Appendix F) which states that you will keep confidential any discussion within and regarding the focus group. The focus group will then proceed with the discussion of the questionnaire. The researcher will read the questions out aloud before the group is asked to discuss the relevance of the question to the aims and objectives of the study as well as deciding whether the questions are understandable. Therefore, the focus group may agree to, disagree with or be undecided about the inclusion of questions in the questionnaire. For the questions to be included or excluded, the group is required to be unanimous in their agreement to include or exclude questions. If you are undecisive about the relevance or inclusion of the question, it may either need to reside to a simple vote with a majority or the question can be deferred for purposes of being reviewed by the researcher in the context of the literature available in BLS.

Risks or Discomforts to the Participant: This research study is a questionnaire-based study and therefore poses no anticipated risks or discomfort to you. Questionnaires will be anonymous. No names will appear on the questionnaire.

Benefits: Participation is voluntary with no benefits.

Reason/s why the Participant May Be Withdrawn from the Study: You may withdraw from the research study at any given time without penalty/ consequence

Remuneration: You will not receive any form of remuneration for your participation in this research study.

Costs of the Study: You will not be liable for any financial contribution/s towards this research study.

Confidentiality: The information provided by you will be treated as highly confidential and will always remain anonymous. You will not be required to include your name or any identifiable details when completing the questionnaire. Data records may be inspected for data analysis by relevant Ethics Committees.

Research-related Injury: None to be expected

Persons to Contact in the Event of Any Problems or Queries:

Please contact the researcher (Bongeka Caluza, 073 957 4686), my supervisors (Dr Y Venketsamy, 031 373 2588), (Dr D Varatharajullu, 031 373 2533) and (Prof T.C Hardcastle, 031 240 2389), or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the DVC: Research, Innovation and Engagement Prof S Moyo on 031 373 2577 or moyos@dut.ac.za.

Appendix I: Confidentiality statement and code of conduct for Expert group

IMPORTANT NOTICE: This form is to be read and filled in by every member participating in the focus group, before the meeting convenes.

CONFIDENTIALITY STATEMENT AND CODE OF CONDUCT: FOCUS GROUP

1. All information contained in the research documents and any information discussed during the focus group meeting must be kept private and confidential. This is especially binding to any information that may identify any of the participants in the expert group.

2. None of the information shall be communicated to any other individual or organisation outside of this specific focus group as to the decisions of this expert group.

3. The information from this focus group will be made public in terms of a dissertation/thesis and/or journal publication, which will in no way identify any of the participants involved in this expert group.

4. The returned questionnaires will be coded and kept anonymous in the research process.

5. All data generated from this expert group will be kept for five years in a secure location at Durban University of Technology and thereafter will be destroyed.

Once this form has been read and agreed to, please fill in the appropriate information below and sign to acknowledge agreement.

Please print in block letters:

FOCUS GROUP MEMBER: _____ **SIGNATURE:** _____

WITNESS NAME: _____ **SIGNATURE:** _____

RESEARCHER'S NAME: _____ **SIGNATURE:** _____

SUPERVISOR'S NAME: _____ **SIGNATURE:** _____

Appendix J: Consent form for the Expert group

CONSENT

Statement of Agreement to Participate in the Focus Group Study:

- I hereby confirm that I have been informed by the researcher, Bongeka Caluza, about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: _____,
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which mayrelate to my participation will be made available to me.

_____	_____	_____	_____
Full Name of Participant	**Date**	**Time**	**Signature / Right Thumbprint**

I, Bongeka Caluza herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Bongeka Caluza

_____	_____	_____
Full Name of Researcher	**Date**	**Signature**
_____	_____	_____
Full Name of Witness (If applicable)	**Date**	**Signature**
_____	_____	_____
Full Name of Legal Guardian (If applicable)	**Date**	**Signature**

Appendix K: Post-Expert group Questionnaire

Questionnaire

Section A: Demographics

1. Age:

21- 25 years ☐ 26- 30 years ☐ 31- 35 years ☐ 36-40 years ☐

41- 45 years ☐ 46- 50 years ☐ 51-55 years ☐ 56 years and above ☐

2. Sex:

Male ☐ Female ☐

3. Institution trained in:

DUT ☐ UJ ☐ Other ☐

4. Years in practice:

Less than 5 years ☐ 5- 9 years ☐ 10- 15 years ☐ 16- 20 years ☐

21 and more ☐

5. Province of practice

Eastern Cape ☐ Western Cape ☐ Gauteng ☐ Limpopo ☐

KwaZulu-Natal ☐ Mpumalanga ☐ North West ☐ Free State ☐

6. Highest level of non-chiropractic education attained

Matric ☐ Diploma ☐ B.Tech/Honours ☐ Master's degree ☐

PhD ☐ Other (specify)----------

Section B: Practices of Basic Life Support by chiropractors

1) When was the last time you did a Basic Life Support (BLS) and/or Cardiopulmonary Resuscitation (CPR) course?

a. Less than 1 year ☐

b. 1- 2 years ☐

c. 2-3 years ☐

d. More than 3 years ☐

2) Have you done a BLS/CPR refresher course in the last 2 years?

a. Yes ☐

b. No ☐

3) Which of the following course/s did you partake in? (You may choose more than one)

a. BLS/CPR ☐

b. First aid certificate ☐

c. Other (specify)----------

4) Have you ever experienced a case of an unconscious patient?

a. Yes ☐

b. No ☐

If no, please move to section C.

5) If yes, how did you deal with the situation? (You may choose more than one)

a. Call for help/ambulance ☐

b. Take the patient to the hospital ☐

c. Applied BLS ☐

d. All of the above ☐

e. Other (specify)----------

Section C: Knowledge

1) In South Africa, BLS is prescribed by?

a. South African Resuscitation Community ☐

b. World Health Organization ☐

c. Academic Emergency Medicine ☐

d. Resuscitation Council of Southern Africa ☐

e. I do not know ☐

2) In Basic Life Support guidelines, the order of steps for initiating CPR is?

a. Circulation, Airway, Breathing (CAB) ☐

b. Airway, Circulation, Breathing (ACB) ☐

c. Airway, Breathing, Circulation (ABC) ☐

d. Breathing, Circulation, Airway (BCA) ☐

e. I do not know ☐

3) What is the first step to do when you see a person lying unconscious in a safe place?

a. Call for EMS help ☐

b. Check for responsiveness ☐

c. Initiate rescue breaths ☐

d. Check for a pulse ☐

e. I do not know ☐

4) Identify the best site to assess for the pulse in an unconscious adult.

a. Aortic artery pulse ☐

b. Brachial artery pulse ☐

c. Carotid artery pulse ☐

d. Radial artery pulse ☐

e. I do not know ☐

5) During CPR, when should you reassess for a pulse?

a. Every 1 minute ☐

b. Every 2 minutes ☐

c. Every 3 minutes ☐

d. Every 5 minutes ☐

e. I do not know ☐

6) In BLS, how much time should a pulse check take?

a. 1-5 seconds ☐

b. 6-10 seconds ☐

c. 11-20 seconds ☐

d. 30-60 seconds ☐

e. I do not know ☐

7) If you found the patient had no pulse, how would you proceed?

a. Call for EMS help ☐

b. Call for help and start CPR ☐

c. Check for responsiveness ☐

d. Initiate rescue breaths ☐

e. Initiate chest compression ☐

f. I do not know ☐

8) When reassessing the pulse, during CPR, you find that the patient had no pulse. How would you then proceed?

a. Ventilate only ☐

b. Continue CPR ☐

c. Give chest compressions only ☐

d. Check pupils ☐

e. I do not know ☐

9) Which of the following manoeuvres are used to open the airways of an unresponsive patient?

a. Head tilt and chin lift ☐

b. Jaw thrust ☐

c. Neck flexion ☐

d. A and B ☐

e. I do not know ☐

10) The compression: ventilation ratio for a child when 2 individuals are administering CPR is:

a. 3 compression:1 ventilation ☐

b. 15 compression:1 ventilation ☐

c. 15 compression:2 ventilation ☐

d. 30 compression:2 ventilation ☐

e. I do not know ☐

11) The compression: ventilation ratio for adult CPR is:

a. 8 compression:1 ventilation ☐

b. 15 compression:1 ventilation ☐

c. 15 compression:2 ventilation ☐

d. 30 compression:2 ventilation ☐

e. I do not know ☐

Thank you for taking part in this survey.

Appendix L: Letter of information for pilot study

LETTER OF INFORMATION: PILOT STUDY

Dear participant. I wish to welcome you to my pilot study and thank you for your co-operation.

Title of the Research Study: The knowledge and practices of South African chiropractors in performing basic life support.

Principal Investigator/s/researcher: Bongeka Caluza, (BTech Chiropractic)

Co-Investigator/s/supervisor/s: Dr Y Venketsamy, (M.Tech: Chiropractic), Dr D Varatharajullu, (M.Tech: Chiropractic) and Prof TC Hardcastle, (MBChB, MMed(Chir), FCS(SA), PhD)

Brief Introduction and Purpose of the Study: The aim of this study is to determine the knowledge and practices of chiropractors in performing basic life support in South Africa.

Outline of the Procedures: You will be required to read and complete the Letter of Information (Appendix I) and Informed Consent (Appendix J). Thereafter you will be required to complete the questionnaire (post-focus group). A questionnaire evaluation form will be given to you to complete in case you detected any problems with the questionnaire (Appendix K).

Risks or Discomforts to the Participant: This research study is a questionnaire-based study and therefore poses no anticipated risks or discomfort to you. Questionnaires will be anonymous. No names will appear on the questionnaire.

Benefits: Participation is voluntary with no benefits.

Reason/s why the Participant May Be Withdrawn from the Study: You may withdraw from the research study at any given time without penalty/ consequence

Remuneration: You will not receive any form of remuneration for your participation in this research study.

Costs of the Study: You will not be liable for any financial contribution/s towards this research study.

Confidentiality: The information provided by you will be treated as highly confidential and will always remain anonymous. You will not be required to include your name or any identifiable details when completing the questionnaire. Data records may be inspected for data analysis by relevant Ethics Committees.

Research-related Injury: None to be expected

Persons to Contact in the Event of Any Problems or Queries:

Please contact the researcher (Bongeka Caluza, 073 957 4686), my supervisors (Dr Y Venketsamy, 031 373 2588), (Dr D Varatharajullu, 031 373 2533) and (Prof T.C Hardcastle, 031 240 2389), or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the DVC: Research, Innovation and Engagement Prof S Moyo on 031 373 2577 or moyos@dut.ac.za.

Appendix M: Consent form for the pilot study

CONSENT

Statement of Agreement to Participate in the Pilot Study:

- I hereby confirm that I have been informed by the researcher, Bongeka Caluza, about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: _____,
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

Full Name of Participant	**Date**	**Time**	**Signature / Right Thumbprint**	

I, Bongeka Caluza herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Bongeka Caluza

Full Name of Researcher	**Date**	**Signature**
Full Name of Witness (If applicable)	**Date**	**Signature**
Full Name of Legal Guardian (If applicable)	**Date**	**Signature**

Appendix N: Questionnaire evaluation form

1. What is your opinion of the subject presented in this questionnaire? (Please mark the most appropriate box)

1.1 Extremely interesting
1.2 Interesting
1.3 Average
1.4 Boring
1.5 Very boring

2. Do you think the topics raised in this questionnaire were adequately covered?

2.1 Yes
2.2 No

3. How would you describe the instructions accompanying each of the questions? (Please mark one box only)

4.1 Very clear
4.2 Clear
4.3 Adequate
4.4 Unclear
4.5 Needs revising

4. Do you think the questionnaire is too long?

5.1 Yes
5.2 No

5. What is your opinion of the wording of the questionnaire? (Please mark the appropriate box/es)

5.1 The meaning of all questions is absolutely clear
5.2 The meaning of most questions is clear
5.3 There is too much medical jargon
5.4The questionnaire needs to be revised because it is unclear

If you had any difficulty answering any question/s, please write the number/s of the question/s in the space below with a suggestion on how the question/s can be improved?

Thank you for your most valuable time in helping me with my research project.

Institutional Research Ethics Committee
Research and Postgraduate Support Directorate
2nd Floor, Berwyn Court
Gate 1, Steve Biko Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2375
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

2 December 2020

Miss B Caluza
25 Alexander Road
Westmead
Pinetown
3610

Dear Miss Caluza

The knowledge and practices of South African Chiropractors in performing basic life support.
Ethical Clearance Number IREC 098/20

The Institutional Research Ethics Committee acknowledges receipt of your final data collection tool for review.

We are pleased to inform you that the data collection tool has been approved. Kindly ensure that participants used for the pilot study are not part of the main study.

In addition, the IREC acknowledges receipt of your gatekeeper permission letter.

Please note that FULL APPROVAL is granted to your research proposal. You may proceed with data collection.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the IREC according to the IREC Standard Operating Procedures (SOP's).

Please note that any deviations from the approved proposal require the approval of the IREC as outlined in the IREC SOP's.

Yours Sincerely,

Professor J K Adam
Chairperson: IREC

Abstract and Chapters one to six

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www.dut.ac.za

Appendix Q: Ethics amendment approval letter

20 November 2020

Miss B Caluza
25 Alexander Road
Westmead
Pinetown
3610

Dear Miss Caluza

Application for Amendment of Approved Research Proposal

The knowledge and practices of South African chiropractors in performing basic life support

I am pleased to inform you that your application for amendment has been approved.

Yours Sincerely

Professor J K Adam
Chairperson: IREC

EDITING LETTER

696 Clare Road

Clare Estate

Durban

4091

30 October 2021

To: Whom it may concern

Editing of Masters thesis: Bongeka Caluza

The knowledge and practices of South African Chiropractors in performing Basic Life Support

This letter serves as confirmation that the aforementioned thesis has been language edited.

Any queries may be directed to the author of this letter.

Regards

MP MATHEWS

Lecturer and Language Editor

Mercimathews4@gmail.com

083 676 4778