CHAPTER ONE

ORIENTATION TO THE STUDY

1.1 Introduction

Cardiopulmonary resuscitation (CPR) skill has been identified as a core skill that all health care professionals should be proficient in. The general public have a high regard for health care professionals' skills and often call upon them when emergencies arise in the out-of-hospital setting. Nurses by the nature of their work are often the first to initiate CPR when an emergency occurs. However, recent research has consistently demonstrated that nurses are not competent in CPR. These studies were mostly done in the developed world and the samples constituted mainly qualified nurses or student nurses undertaking basic training. This study focused on registered nurses who were undertaking advanced nursing courses in different specialties and who had undergone two different levels of CPR training in a Kenyan Medical Training College. The aim of the study was to determine, describe and compare CPR competence of the two groups of nursing students. Group I had undergone Advanced Life Support (ALS) and group II Basic Life Support (BLS). This chapter provides the reader with an overview of the background of the study and the history of modern CPR.

1.2 Background

Since the early eighties to date, CPR skills have been the focus of much research as evidenced by the vast amount of published research studies and the advances made in resuscitation approaches. The current practice of closed chest cardiopulmonary

resuscitation (CPR) has been practiced since the late 1950's. This was made possible by the rediscovery of expired air ventilation (mouth to mouth) by Safar and Reuben in the late 1950's and the documentation of closed chest cardiac massage (external chest compression) in 1960 by Kouwenhoven as cited by Davies and Gould (2000); The Basic Life Support Working Group of the European Resuscitation Council (1998) reports this finding. Before then, open chest cardiac massage was the preferred mode of resuscitation. The advent of closed chest resuscitation in combination with expired air ventilation revolutionized the management of cardiopulmonary arrest and recovery from such an event became a realistic possibility both in hospital and community settings. CPR has been and is now utilized as a standard first line management for a variety of acute life threatening medical conditions where death is likely if immediate intervention is not carried out (Vincent, 2003).

Ever since the advent of modern CPR, several countries in collaboration with professional bodies or associations (European Resuscitation Council, American Red Cross, American Heart Association, Australian Resuscitation Council, the Heart and Stroke Foundation of Canada, the Resuscitation Council of Southern Africa and Resuscitation Councils among many others) have come up with standardized guidelines and/or algorithms for conducting CPR.

There have been successful deliberations by the above mentioned bodies to build consensus and harmonize the steps that should guide basic CPR. This became necessary because there were variations and even differences in approach from one association/council to the next. These variations had the potential of creating confusion in resuscitation teams, whose team members were trained by different resuscitation councils or associations. The deliberations

resulted in the publication of the advisory statement by the Basic Life Support Working Group of the International Liaison committee on Resuscitation (ILCOR) (Handley, Becker and Allen et al. 1997). The need for standardization became necessary because at first the conduct of CPR was empirical and idiosyncratic and was led by medical officers who were not formally trained in the required CPR skills (Vincent, 2003).

Standard guidelines were seen as a means not only of putting together the best practice for any scenario or setting but also to remove doubt in decision making by those who resuscitate. These efforts therefore were aimed at equipping the health care professionals with the necessary knowledge and skills for safe and effective CPR. This was based on the premise that health care professionals have a duty to safeguard life and were therefore expected to be competent in resuscitation. Patients and the lay public have an inherent expectation that health care professionals are adequately prepared to provide safe and effective CPR when an emergency presents. The bodies/associations that have taken the lead in development of harmonized evidence-based guidelines on CPR include the American Heart Association, the European Resuscitation Council, the American Red Cross and the Resuscitation Council of the United Kingdom (Badger and Rawstorne, 1998; Garcia-Barbero and Cartula-Such, 1999; Assar, Chamberlain, Colquhon, et al, 2000).

Basic resuscitation involves maintaining an airway, breathing and circulation of a patient who has had cardiac or pulmonary arrest, without the use of equipment. Basic resuscitation has the following four components: initial assessment; airway maintenance; expired air ventilation; and closed chest compression. Some of the critical steps in CPR include:

- Removing danger to both rescuer and the patient (safety comes first)

- Noting the circumstances of the patient's collapse and his/her prior clinical state through rapid assessment without delaying treatment
- Delivery of adequate oxygen to the brain and the myocardium through chest compressions and expired air ventilation.
- Applying definitive treatment early i.e. defibrillation and advanced life support
- Providing post resuscitation care to maximize cerebral recovery and prevent recurrence of the arrest if CPR is successful.
- Judging when to discontinue the resuscitation attempt in case of failure in respond treatment (Vincent 2003:674)

Successful resuscitation depends on four links of "the chain of survival." The links are early access to the emergency services, early basic life support (BLS), early defibrillation and early advanced life support (Badger and Rawstorne, 1998). It has been demonstrated that manual chest compression by a bystander on an arrested victim improved resuscitation outcome both in terms of survival rate and maintaining a good neurological outcome, than the use of automated chest compression device (Hallstrom, Rea and Sayre et al. 2006). The following two representations (figure 1) of the "chain of survival illustrate the sequence of actions that, when complete and well linked, optimize the chance of survival from cardiac arrest." The two were derived from the American heart Association (AHA) and European Resuscitation Council (ERC) as presented in the study "Resuscitation" by Vincent (2003:674).

Figure 1.1 The four key links of the chain of survival.

All nurses need to be well equipped with resuscitation skills whichever sphere of work they operate in, because more often than not they are the first responders in the hospital setting when emergencies arise. This is important because CPR on it own helps in preserving vital life functions until defibrillation and definitive treatment is given to reverse the arrest (Badger and Rawstorne, 1998). Badger and Rawstorne (1998) argue that the emphasis on technical interventions as advocated for in advanced life support (ALS) should not take precedence over BLS skills.

It is currently an accepted practice in most countries all over the world that all students pursuing basic training in health care related courses receive compulsory BLS training before being allowed into the clinical areas and in some cases students are also required to undergo advanced life support (ALS) training before they graduate (Jordan and Bradley, 2000).

CPR training without formal assessment often impacts negatively on knowledge acquisition and retention of skills by the trainees and can be blamed for the poor performance. A report of the Royal College of Physicians (1992) recommends that nursing students should receive mandatory BLS training including the use of airway adjuncts, suction equipment, oxygen administration and defibrillation. They further recommend that once the knowledge and skills have been mastered regular retraining and reassessment be done in order to prevent deterioration of both knowledge and skills.

Despite advances in CPR, studies conducted to assess nurses' and other health care professionals' CPR competence in developed countries from 1980's to date have consistently demonstrated marked deterioration of both CPR knowledge and skills from the second week post training and by the sixth month competence is in doubt. Three areas that are thought to contribute to this deterioration include; instructor competence, teaching methodologies and frequency of updates. The problematic areas in CPR performance include: not following the steps of CPR sequentially, missing critical steps, inadequate or inappropriate intervention, taking too much time during resuscitation, not attaining the recommended ventilation compression ratio and failure to integrate physiology into practice

during CPR (Badger and Rawstorne, 1998; Boyde and Wotton, 2001; Broomfield, 1996; Hamilton, 2005; Nyman and Sihvonen, 2000).

Few studies have been done in Africa to assess CPR competence of health care professionals and students taking health related courses in middle level colleges and in the Universities. It can be argued that the scenario could be the same as that existing in the developed world or even worse due the limited resources available for training. In Kenya middle level colleges and universities that train nurses are required by the licensing body Nursing Council of Kenya (NCK) to offer basic life support training to their students.

The NCK provides guidelines and standards used for training and the requirements for those doing the training (Nursing Council of Kenya, 2006). However, implementation of the guidelines in the training colleges is not uniform. This is problematic in that students graduating from these colleges emerge with differing levels of competence. It is important to note that very few hospitals in Kenya, both in the public and the private sector, organize in-house training or retraining of staff on CPR. Therefore it is important that students emerge from the colleges with the necessary CPR skills.

1.3. Problem Statement

The role of the nurse in resuscitation is critical for patient survival following cardiopulmonary arrest. Nurses who have been trained as advanced practice nurses are expected to practice at a higher level in order to provide leadership to junior nurses during resuscitation interventions. However, registered nurses undergoing post basic training in various nursing specialties are not taken through the same CPR course. That is, only those

studying Intensive Care Nursing (ICU) are taught ALS (group I); while those studying Midwifery, Ophthalmic, Psychiatry and Community health nursing receive basic life support training only (group II). This has the potential of creating differences in the level of competence, yet both groups are being prepared as advanced practice nurses. Once they graduate they will be expected to lead the other nurses in case of emergencies regardless of the specialty or the level of CPR training.

1.4. The Study Hypothesis

The following hypotheses were formed to guide the study;

- Research hypothesis: Advanced student nurses who received ALS training (Group I) will perform better than those who receive BLS training only (Group II).
- The null hypothesis: Their will be no difference in CPR competence between the two groups.

1.5. The Aim of the Study

The aim of this study was to determine, describe and compare CPR competence of advanced nursing students who had undergone two different levels of CPR training. Group I comprised those who received ALS training, and Group II comprised those who received BLS training only.

1.6. The Study Objectives

The objectives for this study were as follows:

- To determine and describe the demographic profile of advanced student nurses

- To assess advanced nursing students' level of CPR competence
- To examine differences in CPR competence between the two groups of advanced student nurses

1.7. Definition of Terms

1.7.1. Cardiopulmonary Resuscitation

Cardiopulmonary Resuscitation (CPR) is defined as "the application of emergency artificial ventilation and external cardiac compression in victims with cardiopulmonary arrest to provide adequate circulation to support life by health care professionals, paramedics or trained lay people (Thygerson, 2001:439)." In this study it refers to the performance of one rescuer adult CPR on a resusci Anne manikin.

1.7.2. Competence

Competence is defined as the ability to perform an activity to a prescribed standard or the quality of being able to perform (Badger and Rawstorne, 1998). In this study a subject was judged to be competent if the competence score was equal to or greater than 90%, measured against the standards of America Heart Association (AHA).

1.7.3. Basic Life Support

Basic Life Support (BLS) is defined as maintaining a patent airway, supporting breathing and circulation without the use of equipment other than a simple airway device or protective shield (Basic Life Support Working Group of the European Resuscitation, 1998).

1.7.4. Advanced Life Support

Advanced Life Support is defined as emergency medical care for sustaining life that includes: defibrillation, airway management and drug administration. ALS presumes that basic CPR is administered (Basic Life Support Working Group of the European Resuscitation, 1998).

1.7.5. Advanced Student Nurse

An advanced student nurse is a registered nurse undertaking specialist course in nursing that will lead to registration as an advanced practice nurse. In this study the advanced student nurse refers to qualified registered nurses who, at the time of this study, were undergoing a one-year diploma in advanced nursing.

1.8. Significance of this Study

Competence in CPR is a mandatory requirement for all health care professionals and more so for the nurses who provide 24 hour coverage at the bedside of the patient. Even though more than 60% of cardiopulmonary arrests occur outside hospital, and in the instances where the arrest is witnessed and CPR is commenced promptly and effectively there is a good chance of successful resuscitation (Broomfield, 1996; Yakel, 1989). CPR training is now a requirement in all colleges/universities that offer health related courses. A once-off CPR training session with evaluation is effective in providing the requisite knowledge and skills. However, studies done in the developed world have shown that although initial mastery of skills is achieved, retention of skills is poor and inadequacy in performance is noted as early as the second week post training and thus the need for regular updates and

reassessment (Badger and Rawstorne, 1998; Perkins et al, 1999; Hollis and Gillespie, 2000; Jordan and Bradley, 2000).

The samples of the above mentioned studies, constituted student nurses undergoing basic training or qualified nurses who were practicing or a mix of the two. A search of literature using CINAHL, Medline and Google search engines using the following phrases; advanced student nurses' CPR competence, post basic nurses' CPR competence, CPR competence of advanced student nurses, basic life support and advanced student nurses CPR training by the researcher did not yield any published CPR studies on professional advanced student nurses pursuing training in various nursing specialties. Thus the researcher decided to determine describe and compare CPR competence of advanced student nurses. The intention was to shed more light on the adequacy of the current CPR training given to advanced nursing students in Kenya. It was anticipated that the study would demonstrate the need to apply CPR training uniformly for all advanced student nurses.

1.9. Conclusion

The study background and the problem statement confirms the disparities that exist in CPR training despite advances in CPR approaches and the development of standardized guidelines. The need to uniformly apply CPR training for health care professionals is still a pipe dream both in the developed world and in the developing world. The expectation is that health care professionals are well prepared to give CPR adequately but previous studies have demonstrated that this is not the case. In order to provide a background and theoretical context for this study, literature on CPR was reviewed extensively and described in chapter two.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

The advent of closed chest resuscitation combined with expired air ventilation in the late 1950's served as milestone and revolutionized the resuscitation approach. With the adoption of the new approach the focus of research on CPR shifted from open chest cardiac massage that was prevalent then to closed chest resuscitation The Basic Life Support Working Group of the European Resuscitation Council (1998). During those formative stages (1950 to the late 1960's) very little was documented about this new method of resuscitation. This changed dramatically in the late seventies when modern CPR became the main focus of many research studies and this has persisted to date. Most of the published studies on CPR focus mainly on the impact of the new mode of resuscitation in optimizing survival indices, new developments or adjuncts in resuscitation, and the level of preparedness of health care professionals and that of the lay public in providing effective CPR (Hamilton, 2005).

In this chapter a review of literature is presented in order to provide a theoretical basis for the study. It outlines CPR standards and algorithms, the theories that underlie the practice of modern CPR, problem areas in CPR and the factors that contribute to poor performance, current CPR guidelines and future trends in CPR.

2.2. CPR Standards

2.2.1. Algorithms

An algorithm is defined as a procedure or formula for solving a problem (Tawfiq and Ali, 2006). For this study the procedure for performing CPR is referred to as an algorithm or guideline. CPR is a life saving measure that consists of a series of sequential assessments and interventions aimed at supplying oxygen to vital organs. Standardized algorithms for the conduct of CPR were developed and are continually being evaluated and revised based on the difference in need for the various emergency situations that arise e.g. sudden cardiac arrest (SCA), heart attack, stroke, trauma and foreign-body airway obstruction (FBAO). It is also important to note that asystole and Pulseless electrical activity cause cardiac standstill but the two are not as responsive to resuscitation like the other conditions mentioned earlier. The algorithms include Advanced Trauma Life Support; Advanced Life Support, Cardiac Life Support, Pediatric Life Support, Choking Algorithm and Basic Life Support. Resuscitation algorithms are also categorized as either basic or advanced depending on the utilization or non-utilization of equipment and drugs and the expertise of the person(s) performing the procedure. There are also variations in the algorithms depending on the age of the casualty, the extent of injury, whether the casualty is pregnant, and the cause of injury such as trauma. Even with the variations in CPR algorithms the ultimate goal of any resuscitation attempt is maintenance of circulation and delivery of oxygen to the vital organs (brain and myocardium) in order to sustain basic life functions (A Report of the Royal College of Physicians, 1992; Planta and Trillo, 1994; Basic Life Support Working Group of the European Resuscitation Council, 1998).

2.2.2. Components of CPR

Coady (1994:36) in her paper examining the rationale for CPR actions states that "artificial ventilation and chest compression are central to CPR and in combination serve to restore oxygen delivery to the vital organs." She emphasizes that the vital organs i.e. the brain and the heart are very sensitive and require more oxygen than any other organs and the lack of oxygen supply to these two organs even for short durations can lead to irreversible damage to the vital organs and death is likely to ensue. The value of CPR then lies in delaying as much as possible the inevitable deterioration of organ function that arises due to hypoxia and build up of lactic acids that is a product of anaerobic metabolism.

"CPR provided by a trained bystander or by a health care professional improves survival and optimizes the chance of having a successful defibrillation (Quan, 2006:96)." The two components of basic CPR therefore are artificial ventilation by use of expired air breath by the rescuer to deliver oxygen to the casualty and external chest compressions which is done as a means of maintaining circulation and perfusion. Before any resuscitation intervention is done the rescuer needs to perform a quick assessment of the casualty. This is important because it is through assessment that the rescuer ascertains the immediate mechanism of a condition requiring resuscitation its cause and any other co-morbidity. The assessment findings will then determine the best approach to utilize in handling the presenting situation (Vincent, 2003).

The other important determinant of survival from SCA or heart attack is the presence of a trained rescuer who is ready, willing, able and equipped to act. Unless the initial attendant is well versed in CPR technique then immediate secondary help will be required if the life

of the casualty is to be saved. Time is critical when it comes to CPR, for each minute lost before commencing basic CPR or delay in defibrillation in case of ventricular fibrillation reduces the chance of survival by 7-10%. Brain death occurs within minutes of anoxia and cardiovascular shock then becomes irreversible (Vincent, 2003).

The Basic Life Support Working Group of the European Resuscitation Council of 1998 agrees to the above stated sequence of events. The key steps of CPR are represented figuratively in the AHA "Chain of survival" as illustrated in figure 1.1. For resuscitation to achieve its maximum benefit the chain of survival needs to be implemented appropriately and in a timely manner for a positive outcome. The chain is as strong as its weakest link, it is therefore important to maintain the chain. Each action in the chain plays a critical role and its application, misapplication or omission will definitely affect the outcome of resuscitation. The study by Heller, Steele and Fisher et al. (1995) did show that survival rates post CPR at 28 days after the event was 12% and 39% for cases outside hospital and in hospital respectively. Two studies reviewed by Olson and Fontanarosa (1999) showed survival rates of lower than 10% for victims of cardiac arrests who received CPR in the out of hospital setting. The study by Buist, Moore and Bennard et al. (2002) found that mortality rate after cardiac arrest within the hospital setting despite implementation of an early warning system and timely CPR was 50%-80%.

2.2.3. Theories of Circulation and Perfusion during CPR

Two theories are thought to play a key role during resuscitation. The two theories were first described in detail by Rudicoff, Maugnon and Effron et al. (1980). The theories are thought to underlie the mechanism of external chest compression. The Cardiac Pump Theory works

on the premise that external chest compression causes direct squeezing of the ventricles of the heart between the sternum and the vertebral bodies thus producing an artificial systole. This theory has been supported by the ehcocardiographic study by Kuhn, Juchems, and Frese (1991). The study showed that during compression the mitral and the tricuspid valves are closed and the aortic valve and the pulmonic valve are open allowing blood to flow forwards. When external chest compression pressure is released the pulmonic and aortic valves close and the mitral and tricuspid valves open allowing the atria and ventricles to fill up with blood thus mimicking the normal cardiac cycle.

The second theory that explains the mechanism of external chest compression is the thoracic pump theory. This theory postulates that the thoracic pressures resulting from the action of external cardiac massage are thought to cause the forward blood flow. The lungs then act as a sponge filling with blood during artificial diastole and empty during artificial systole created by the action of compression and release (Coady, 1994).

It should be noted that earlier echocardiographic study by Werner, Green and Janko, et al. (1981) did not support the cardiac pump theory. They continue to say even if the theory works it cannot on its own explain all the blood flow that occurs during CPR. The current accepted position concerning the two theories suggests that a combination of both the cardiac and thoracic pump mechanisms are involved in the forward movement of blood during external chest compressions (Andreka and Frenneaux, 2006). It is important to note that even when chest compressions are done optimally and at the recommended rate of over 80 compressions per minute it can only achieve 30% of the normal cardiac output. Though this may seem inadequate it is sufficient in protecting the brain and the myocardium and

thus buying time for effective defibrillation (Coady, 1994; Planta and Trillo, 1994; Basic Life Support Working Group of the European Resuscitation Council, 1998).

2.2.4. Ventilation Technique

For gas exchange to occur at the alveoli level during resuscitation sufficient tidal volumes 800-1000ml of air which is equivalent to a deep breath is needed to ensure adequate oxygen delivery and removal of carbon dioxide. The fraction of inspired oxygen that is delivered by the rescuer to the casualty is 16% and is sufficient to support life for a short period of time and 100% oxygen if available should be given. Removal of carbon dioxide depends on the amount of ventilation. Thus it is important that enough tidal volume is delivered and at a rate that enables adequate minute ventilation to meet oxygenation needs and removal of carbon dioxide. The recommended rate is 10 breaths per minute. The inspiratory breath should be given over one second and passive expiration allowed for approximately 2 seconds. The breath should be blown in gently but firmly to avoid barotrauma and the chest should be observed to rise and fall before the next breath is attempted (Coady, 1994; Basic Life Support Working Group of the European Resuscitation Council, 1998; Planta and Trillo, 1994; Vincent, 2003).

2.2.5. External Chest Compression Technique

The aim here should be to exert sufficient pressure (pressure of 50 kg) to provide adequate cardiac output with minimal damage to the tissues. The recommended rate of compression is 80-100 per minute, the depth of compression for adults should be 4-5cm and the duration of the compression should be 50% of the compression relaxation cycle. This is important because blood flow is more dependent on compression duration than the rate. The pressure

applied should be firm, controlled and vertical in order to avoid fracturing the ribs or damaging the underlying organs. Coronary circulation which is a critical determinant of recovery during resuscitation is significantly enhanced when rapid compressions are done with minimum interruptions. Interruption for chest compression should only be allowed in the following instances during brief pulse checks, during defibrillation and when giving ventilation in a situation where the rescuer is one. The compression ventilation ratio should be maintained at 15:2 in an adult no matter the number of rescuers (Coady, 1994; Planta and Trillo, 1994; Basic Life Support Working Group of the European Resuscitation Council, 1998; Vincent, 2003). The current recommendation concerning the number of CPR compressions and breaths is presented later in section 2.6 of this chapter. The algorithm and the checklist that was used for this study utilized were the 2000 AHA guidelines. The students who took part in this study were trained under the 2000 guidelines.

2.2.6. The Sequence of CPR Actions

All the CPR algorithms are structured in a series of essential sequential steps that begin with the rescuer approaching the casualty, assessing the casualty, followed by the actual resuscitation actions. Success of CPR improves when cardiac arrest is witnessed, immediate by stander CPR is provided, adequate perfusion pressures are obtained during CPR, the initial rhythm is ventricular fibrillation and early defibrillation is provided. Omission of one step, incorrect performance of, and or delay in one or more of the steps will have a negative impact on the outcome of resuscitative efforts both to the rescuer and casualty. Time is of essence as far as CPR is concerned.

The American Heart Association (AHA), The American Red Cross (ARC), The European Resuscitation Council (ERC) and The Resuscitation Council of the United Kingdom among many other bodies charged with development of algorithms and CPR standards stress the importance of a sequential approach to any resuscitation effort. To ensure this is adhered to CPR training modules developed by these bodies emphasize a sequential approach during training and assessment of those undergoing CPR training in order to achieve consistency in training and practice. The European Resuscitation Council and the American Heart Association guidelines are similar (few variations) because of the collaboration between the two bodies (Basic Life Support Working Group of the European Resuscitation Council, 1998; American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, 2005a). One rescuer adult basic CPR algorithm adopted by consensus by the resuscitation councils and as presented by Resuscitation Council of Southern Africa (2006) is as shown in figure 2.1. Minor adjustments to the algorithm were made based on the algorithm presented in the study by Vincent (2003:676).

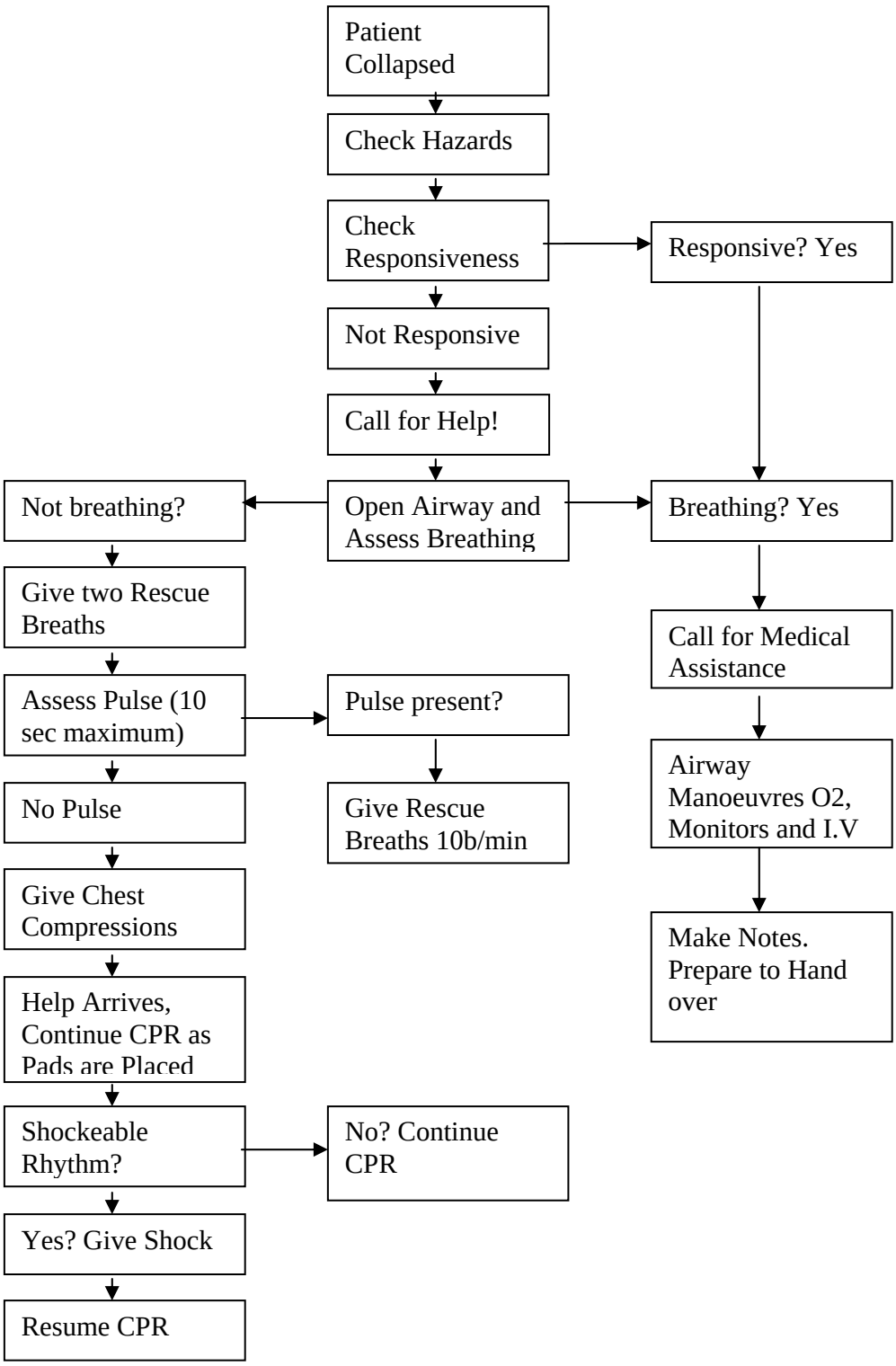

Figure 2.1 Basic Life Support (BLS) Algorithm

The need for health care professionals to be proficient in CPR is mandatory. Despite the huge investment both in time and material resources in the training of both the lay public and the health care professionals in CPR, proficiency in both knowledge and skill dexterity remains elusive. The studies done to assess CPR competence on those already trained have demonstrated performance that is below the expectation. This prompted the recommendation that after the initial CPR training and assessment, regular retraining at short intervals should be done to curb deterioration of skills. Though there is no agreement on how often this CPR retraining should occur most studies have recommended that it should be within 3-6 months intervals (Basic Life Support Working Group of the European Resuscitation Council, 1998; American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, 2005a).

2.3. CPR and Nursing Practice

The ability of qualified nurses to manage cardiopulmonary arrest competently is of considerable importance for a number of reasons. The most important being the fact that nurses by the nature of their work spend most of their time at the bedside of the patient and are the first to discover and/or recognize cardiac arrests and by extension will be the first responders to commence resuscitative efforts in case of such an eventuality. In sudden death situations prompt and high quality CPR is vital for patient survival. This can only be achieved by ensuring that nurses, and by extension, other health care professionals acquire the requisite CPR knowledge and skills through training. This is achievable if CPR is taught; utilizing the correct method, by trained instructors and retraining is factored in to ensure retention of acquired knowledge and skills. Poor performance on CPR by the health care professionals has been blamed on non acquisition of skills during training and rapid

deterioration of the skills with time (Yakel 1989; Kaye, Mancini and Giuliano, et al. 1995; Davies and Gould, 2000).

A statement by the Basic Life Support Working Party of the European Resuscitation Council (1992) recognized the need for compulsory BLS training in all medical schools and nursing colleges. They further recommended that all hospitals in Europe should integrate compulsory CPR training and retraining for all staff involved in direct patient care. Godkin and Toth (1994) found in their study on the role of nurses in CPR decision making that nurses are rarely explicitly involved in CPR decision making. This demonstrates the limited role that nurses are given and may as well be the contributing factor to the poor performance in CPR by nurses. With this limitation, nurses will then expect the doctors who take the leading role in CPR decision making, to also lead them during actual resuscitation. Dwyer and Williams (2002:87) argue that "while some nurses may be willing and competent to perform CPR their role is sometimes relegated to the periphery when the resuscitation team arrives." This has a negative impact on their performance and attitude toward CPR.

It has been documented (Yakel, 1989; Lewis, Kee, and Minick, 1993) that 33% to 40% of cardiac arrests in developed countries occur in the hospital setting, and of the arrests that occur in the hospital setting more than 60% are first recognized by nurses. Therefore in order to ensure patient survival, nurses who are often the first responders in resuscitation should be adequately prepared to provide effective CPR. To ensure good results and optimize survival to discharge, basic CPR must be commenced within the first four minutes of cardiac arrest and to be followed within 10-12 minutes by Advanced Life Support

measures. CPR training is aimed at providing the health care professional with the basic level of competence to assess, diagnose and utilize the CPR skills to maintain vital life functions on an arrested patient as advanced help is mobilized or as the patient is transported to the nearest health facility where advanced life support will be provided. Therefore Basic Life Support (BLS) is a holding procedure aimed at maintaining ventilation and circulation to vital organs until definitive treatment can be accessed to treat or reverse the underlying cause of the arrest. Once CPR knowledge and skills has been taught it is imperative that retraining should be conducted as frequently as is necessary to ensure retention. This is essential because previous studies have demonstrated rapid decline in both knowledge and skills over time and yet minimal review or retraining of skills has demonstrated improved results (Yakel 1989; Grunden, 1991; Jordan and Bradley, 2000; Nyman and Sihvonen, 2000; Boyde and Wotton, 2001).

2.4. Problem Areas in CPR Performance

The nurse's primary duty to the patient is to promote and safeguard life. However, research has shown that the majority of nurses are at best ineffective in CPR, a skill that is meant to save lives. This is despite the fact that they receive mandatory CPR training and are required to update their CPR skills (Broomfield, 1996; Moule and Knight, 1997). Badger and Rawstorne (1998) in their study found that student nurses and qualified nurses perform CPR poorly but they also acknowledge that the same scenario is evident in other health care professionals. The study by Holis and Gillespie, (2000), assessing the adequacy of general practitioners CPR performance in Herefordshire area of London demonstrated that more than 90% percent of GP'S were ineffective. The researcher states that BLS skills form a critical aspect of the doctor's duty of care to their patients and it is therefore necessary for

them to be proficient in both CPR knowledge and skill. The public have high regard for nurses CPR skills and often call upon them in the out of hospital setting whenever an emergency arises. Although this public expectation represents the ideal, nurses often are unable to provide the requisite skills (Badger and Rawstorne, 1998).

Several areas of weakness in CPR performance have been noted and these include failure to follow the correct sequence during CPR, missing critical steps, performing faulty compressions, giving in inadequate ventilations, taking too much time during resuscitation, not attaining the recommended ventilation compression ratio and failure to integrate physiology into practice during CPR (Lewis et al., 1993).

Curry and Gass as cited in Moule and Knight (1997) found in their study that nurses who work in areas in which CPR is performed on a daily basis do not perform any better than those who seldom use their skills or rarely have the opportunity to resuscitate. Studies (Yakel 1989; Grunden 1991; Broomfield 1996; Greig, Elliot and Parboteeah et al., 1996) agree that both CPR knowledge and skills deteriorate rapidly following training. Skill deterioration is evident from the second week post training and by the fourth month competence is in doubt. Cognitive knowledge is retained for a longer period as compared to skills, but marked deterioration in knowledge is noted six months post training.

Badger and Rawstorne (1998) in their study of pre-registration nursing students to evaluate their BLS skills found that no student achieved optimum performance as was expected. Performance was generally poor and was consistent with findings from previous research. They acknowledge that this poor performance is also found in other health care related

disciplines. The researchers recommend that CPR teaching should impart both knowledge and skills after which formal assessment should be done to ensure that those trained have acquired knowledge and skills taught. To curb deterioration they recommend open access to skills laboratory to encourage self directed learning by staff, but under the supervision of a qualified instructor.

The results of the study by Boyde and Wotton (2001) investigating nurses' ability to initiate and maintain effective CPR in 50 cardiac arrests real life situations, showed that in the majority of the cases nurses effectively managed all components of CPR. These findings are in agreement to findings that were done in simulated settings. Apart from recommending that CPR training to be conducted as it was the norm then (in simulated setting), they emphasized the need to incorporate critical thinking skills that encourage problem solving and promoting strategies that enable transfer of skills from simulated settings to the clinical arena. The two studies recommended the need to conduct studies that correlate classroom performance on a manikin and actual performance in actual cardiac arrest situations. The scenarios used in simulated settings should reflect real, life-threatening situations.

2.5. Factors Contributing to Poor CPR Performance

Several studies have attempted to find out the factors contributing to nurses' poor performance in CPR and came up with multiple reasons to explain the discrepancy. Nyman and Sihvonen (1998), in their study of 298 nursing students noted that poor CPR performance by nurses is not consistently related to quality or recency of CPR training and that individual self assessed ability was also unrelated to objective assessed performance.

Overall the students performed poorly than had been anticipated prior to the commencement of the study. This points out that there could be multifactorial influences that contribute to this deterioration which include; instructor competence, teaching methodologies and frequency of updates (Broomfield, 1996; Hamilton, 2005).

The study by Yakel (1989) on 106 registered nurses examining the relationships between the methods of instruction on quality of retention over time demonstrated that detailed training and frequent reviews as was provided during the study ensured acquisition of both knowledge and skills and the retention thereof. Thus the study recommended that CPR training should be detailed and that retraining should be done at least twice in a year in order to ensure retention. Emphasis should also be given to those steps that prove to be problematic so as to ensure that they are mastered.

According to the study by Lewis, et al. (1993) on 73 registered nurses, the number of CPR courses taken, certification as CPR instructor, the number of years certified and the time since last certification were significantly related to skill scores. This study also confirmed that cognitive knowledge is better retained over time than psychomotor skills. Those who scored well in the cognitive test also tended to do well in the skill test, even though the cognitive test was better performed over all. This study did demonstrate that neither the time spent in direct patient care nor the number of times CPR was actually done correlated with cognitive or skill scores. The researchers (Lewis, et al., 1993) note that most CPR training and assessment are done in simulated settings and therefore may not correlate well with the reality of an actual arrest situation. Therefore the poor performance on the simulated test being may not translate to poor performance in actual arrest situations. The

researchers recommended that future research and CPR training and assessment should focus on real life situations such as those that occur in the clinical arena.

Broomfield (1996:1022) in her quasi-experimental study of 19 qualified nurses found "deterioration in skills begins as early as the second week post training." This confirmed previous study findings. The study did also demonstrate that deterioration was related to the lack of regular updates, and recommended 3-6 months retraining periods. Davies and Gould (2000) recommend that training materials be provided at the ward level for staff to practice on the skills learned. The self practice sessions should be monitored from time to time by qualified CPR instructors to ensure that the correct skills are practiced and mandatory assessments should be done at regular intervals. The self-instruction practice provides an avenue to polish up on the skills learned. Making use of self-instruction re-training as a means of maintaining competence was also recommended in the following studies Graham and Scollon (1996), Badger and Rawstorne (1998), Davies and Gould (2000).

The study by Jordan and Bradley (2000) found that there was a great variation in CPR training in the various colleges in terms of timing, content, duration and assessment. The study recommends the use of standardized algorithms for training CPR that are developed from nationally or internationally accepted guidelines in order to improve CPR competence. Assessment should be mandatory and in addition those charged with the responsibility of training should be certified CPR trainers.

An experimental study on pre-registration nursing students by Greig et al (1996) found that students who were taught in small groups with a teacher student ratio of 1:6 acquired CPR

skills performed better in skill assessment six weeks post training than those who were taught in a bigger class of 1:15. The better performance was attributed to the individual support and coaching that is possible in a small class which ensures knowledge and skill acquisition. The researchers concluded that correct skill performance should be emphasized during training for this is the only way of maintaining effective cerebral perfusion and optimizing myocardial perfusion during the actual resuscitation. They also advocate for frequent practice as means to curb deterioration in CPR knowledge and skills.

Perkins, Hulme and Shore et al. (1999) demonstrated a new approach of teaching CPR that improved results. In this study senior students (peers) who had been taken through CPR training were recruited and trained as trainer of trainees (tutors) in order to teach CPR to junior students. The 'tutors' were then given the responsibility to select and prepare tutors for the next class from within the group of students that they had trained. This approach worked well and improved results as was demonstrated by good results when the programme was evaluated by external evaluators and the confidence that the students who had gone through the training showed in their ability to conduct CPR during assessments and when asked to rate their CPR ability.

2.6. Current American Heart Association (AHA) CPR Guidelines

The field of CPR is dynamic with new evidence based guidelines being introduced and the older guidelines being improved periodically. These guidelines come into the fore due to continuing research that is aimed at optimizing the chances of survival for those who need CPR for one reason or another. The improvements in CPR are also aimed at simplifying of

the CPR technique for easy application and to optimize retention of both the skills and knowledge.

The current AHA adult basic life support algorithm is based on the assumption that 40% of all non-traumatic cardiac arrests in the community setting present with ventricular fibrillation rhythm. The treatment for this is immediate CPR by a bystander followed by defibrillation. These two measures serve to restore the normal sinus rhythm and thus prevent the deterioration of the rhythm progressing into a systole which is non-responsive to the two treatments. In cases such as trauma, drowning, drug overdose and asphyxia in small children the treatment is expired air ventilation in combination with chest compressions (American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular care, 2005a).

The current AHA chain of survival has been retained as it was previously even though defibrillation is now considered part of basic CPR. The importance of the administration of shock early has gained precedence. Current statistics indicate that administration of shock within the first 3-5 minutes of collapse can produce survival rates of 49-75%. In countries with well developed emergency medical service (EMS) the responds time from time of call to arrival of EMS personnel at the scene is 7-8 minutes or longer. This indicates the importance of bystander CPR with easy access to a defibrillator. The success of bystander CPR and early defibrillation optimizes the effect of the remaining elements of the chain of survival. The lone bystander can perform the first 3 elements of the chain of survival alone (American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular care, 2005a).

The current guidelines for basic adult CPR recommended by AHA in 2005 are as stated below;

1. Check the casualty response once safety is ascertained, if there is no response proceed to step two
2. Activate the EMS by calling the relevant local phone number e.g. 911 for USA. If a second rescuer is available then sent him/her to perform this task.
3. Open the airway by using head tilt /chin lift maneuver and check for breathing.
4. If not breathing give two rescue breaths that will make the chest rise.
5. If no response check pulse for at least 5 seconds and not more than 10 seconds. If there is a pulse give one rescue breath every 5-6 seconds and recheck pulse every 2 minutes. If no pulse proceed to step 6.
6. Give cycles of 30 compressions to 2 rescue breaths (30:2) until a defibrillator arrives, brief interruption of CPR is only allowed in case of: pulse check for health care providers, when the EMS team arrives or when the casualty begins to move (for compressions push hard and fast to attain at least 100 comp/min and release the chest completely between compressions, minimize interruptions in compressions).
7. Automated external defibrillator/conventional defibrillator arrives apply it on patient.
8. Check if it is a shockable rhythm. If shockable proceed to step 9 if not proceed to step 10.
9. Give one shock resume CPR for 5 cycles.
10. Resume CPR immediately for 5 cycles check rhythm every 5 cycles; continue CPR until ALS team takes over or the casualty starts to move.

In summary the following changes have been introduced in CPR:

- To improve airway and breathing (ventilation), lay rescuers are advised to use head tilt/chin lift maneuver to open the airway even in cases where injury to the spine is suspect. Health care professionals are advised to utilize head tilt/chin lift maneuver in all cases except in instances where cervical spine injury is suspected then they can utilize the jaw trust maneuver. If the jaw thrust is not effective in opening the airway head tilt/chin lift maneuver should be used whatever the circumstances since oxygenation need is a priority. The current guidelines recommend that a rescuer should give 8-10 slow breaths per minute. However, compressions are a priority and rescue breaths can be with held for the first four minutes of resuscitation if, the event is witnessed, CPR is commenced immediately and the victim was healthy and breathing normally before the arrest.
- Optimizing circulation: To optimize circulation AHA recommends that chest compressions should be performed at 100 per minute (push hard and fast) with few and very brief interruptions for ventilation and pulse checks. The new compression breathing ratio of 30:2 for adult single rescuer and 15:2 for adult 2 rescuer resuscitation, and compressions should be immediately resumed after administration of shock instead of reassessing for rhythm and pulse. Lay rescuers are now exempted from performing pulse check and should assume that cardiac arrest is present if the unresponsive victim is not breathing. This is because pulse check requires some skill and practice. Pulse check for health care providers is de-emphasized. Health care providers should take no more than 10 seconds in checking for pulse. They should then proceed to performing chest compressions.

- Expediting defibrillation: current recommendation favors early defibrillation i.e. within three minutes of collapse especially in the hospital set up where defibrillators are readily available. In cases where defibrillation was done within four minutes of collapse, survival to discharge was greater than 74% (Cooper, Cooper and Cooper, 2006). It is noted however that chest compressions should be continued for a few minutes after administration of a successful shock. This is important because bradycardia and low volumes persist for a few minutes after successful defibrillation (American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular care, 2005a).

2.7. Future Trends in CPR

There are devices that have been introduced to ease the conduct of CPR and some are still in the experimental stages. These include devices that are used to perform chest compressions such as the automated load distributing band chest compression device. The band is connected to a device that briskly tightens and loosens the band at fixed intervals, thus compressing the chest. The introduction of the devices arose out of the need to improve efficiency in CPR and reduce fatigue on those performing resuscitation. Responder fatigue has been shown to reduce the efficacy of CPR. Both ventilation volume and compression pressure reduces as fatigue takes toll on the rescuer. The use of artificial airways (airway, naso and oropharangeal airways and masks), ambu bags and barrier devices are some of the improvements on the ventilation technique in order to improve ventilation (Heidenreich, Berg, Higdon et al. 2006).

The introduction of active compression-decompression devices allows application of negative intrathoracic pressure with positive chest compressions during CPR. There are many devices of this type at the moment and some have demonstrated that they are good replacement to human chest compressions. Research on these devices is on going and their use could be validated soon. The results from studies on the efficacy of some of these devices are as of now inconclusive. The study by Hallstrom, Rea, Sayre et al (2006:2627) "demonstrated negative effects on the use of Load Distributing Band-CPR during resuscitation." The study was comparing the use of an LDB-CPR in giving chest compressions and the conventional chest compressions by hand. Those who were resuscitated with the device had lower survival rates than those who underwent standard CPR. On the other hand the results of a comparative study by Ong, Ornato, Edwards et al (2006:2637) showed that resuscitation strategy using the "LDB-CPR improved survival rates as compared to those who received conventional CPR." The study results favored the addition of the device in the management of cardiac arrest both in the community and hospital setting. The results of the two studies were reconciled in a study by Lewis and Nieman (2006). The study recommends that further comparative research of the two approaches will need to be conducted in order to validate the usefulness of the device in improving survival.

The use of chest compression alone as an alternative of standard CPR in resuscitation is gaining acceptance. This mode of resuscitation referred to as Chest-Compression cardiopulmonary Resuscitation (CCC-CPR) is preferred because it has been demonstrated to be less tiring than standard CPR in the short run, achieves higher perfusion pressures per compression, increases the total number of compressions per minute, is less prone to

interruptions, is more acceptable because it does not involve use of mouth to mouth ventilation which many are unwilling to perform, and it is also easier to learn and retain. This mode of resuscitation is best used in the first four minutes after arrest because at that point in time blood oxygen level is still high so circulation is more critical than ventilation. Standard CPR should be instituted after the first four minutes lapse for at that point saturation of oxygen in blood has dropped significantly (Heidenreich, Berg, Higdon et al. 2006; Groh and Zipes, 2000; American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, 2005b).

Other modes of CPR that are being explored include prone position CPR for ventilated patients being nursed in prone position, the re-introduction of the pericordial thump in case of witnessed cardiac arrest in the hospital setting and the use of therapeutic hypothermia during CPR. To enhance cardiac output during resuscitation use of interposed abdominal compression pressure of about 100mm Hg is applied rhythmically to the abdomen half way between the xiphisternum and the umbilicus by a second rescuer during the relaxation phase of cardiac compression. This is a new addition to CPR that is still under review. For effective utilization of CPR as a life saving measure both in the hospital and the community set up is dependant on strong ownership, audit and supervision of the resuscitation service, and its clear integration into local operational and governance policies. If these are implemented then sufficient resources will be availed with the necessary support both into training of personnel, establishing of resuscitation teams and placement of equipment and manpower in strategic sites for eventual use. The most important components of CPR that have demonstrated substantial increase in survival rate are training and deployment of both the lay and professional rescuers and deployment of automated defibrillators in the

community (Vincent, 2003; American Heart association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular care 2005a; Cooper, et al., 2006).

2.8. Conclusion

The importance of resuscitation skills as enumerated in the literature is enormous and demonstrates its centrality in saving lives. The art and science of resuscitation has generated much debate in research, received a lot of financial support both for training and research and yet more remains to be done. The dynamic nature of resuscitation demonstrates the need for continuous updates for those already trained and integration of the course in the curriculum in health care training institutions so that all students receive the training. Though the public have a high regard on health care professionals' ability to perform CPR, research studies cited have demonstrated that they are at best ineffective. The nurse's primary duty to the patient is to protect and preserve life; this can be achieved if life saving CPR skills are mastered and applied correctly when the need arises. For nurses to be able to deliver the essential service that they provide and in order to retain the respect that the public bestows on them then it is imperative that they are seen to be competent in what they do. The studies earlier have shown the disparity between the expected and the actual performance. The time required to teach CPR is relatively short, and review time for both skills and knowledge is minimal and can therefore be accommodated despite the tight schedule of work that the nurses have. The chapter that follows expounds in detail on the methodology of the study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This chapter gives an overview of the research methods, the research setting, the study design, sampling technique, data collection approach and the instrument used for data collection, preview of data analysis and the ethical considerations that guided the study.

3.2. Study Design

This study utilized a cross sectional, comparative, descriptive design. According to Burns and Grove (2001:248) a descriptive study "is designed to gain more information about the characteristics within a particular field of study." A descriptive design is used to describe the characteristics, prevalence, intensity or full nature of a phenomenon. The phenomenon that was being investigated in this study was CPR skills competence of advanced student nurses. A comparative descriptive design goes further than just a description of events by analyzing differences or similarities between the groups (Polit and Beck, 2004).

The study design was chosen by the researcher based on the natural composition and CPR training of the study sample. This design allowed for comparison of the two groups of advanced student nurses which were in agreement with the study purpose. The two groups of advanced nursing students were: group I comprised students who had undergone Advanced Life Support (ALS) and group II comprised students who had undergone Basic Life Support training (BLS). The purpose of the study was to examine, describe and

compare the differences in CPR competence of the two groups of advanced nursing students.

3.3. Research Setting

The study was conducted at the Kenyan Medical Training College. Actual data collection was done in the college skills laboratory. The skills laboratory is a one-storey building which has several rooms including skills demonstration rooms, offices, stores and instrument preparation area. The CPR skills laboratory is housed on the upper floor of the building. It consists of a skill demonstration area that is sandwiched by two stores on either side. On the eastern wall there is an open unroofed section that can be utilized for skill demonstration and practice. It was on this upper floor area that data collection was done. During data collection the tables were moved to the sides and the manikin was placed on floor at the centre of the room in a supine position. The study participant, the researcher or the research assistant were the only persons allowed in the room when CPR skill was assessed. The actual data collection technique is explained in detail under the heading data collection procedure.

3.4. Study Population and Sample

Polit and Beck (2004:289) describe the study population as “the entire aggregation of cases in which a researcher is interested in.” In this study the researcher was interested in the student nurses undertaking post basic studies in various nursing specialties. The study target population comprised all the nursing students undertaking advanced nursing studies at the College who are hereafter referred to as advanced student nurses. The total target population was N=97. Placement of the study sample into the two groups was based on the

CPR training that they had undergone and was not influenced by the researcher; group I consisted of students specializing in ICU (n=23) this group had done Advanced CPR training (ALS). Group II comprised of students specializing in Midwifery, Community health nursing, psychiatric nursing, Neonatal nursing and ophthalmology nursing (n=74) this group had basic CPR training (BLS). The other groups of students who were targeted for inclusion in the study e.g. Renal, and Neonatal nursing had no students in session at the time of the data collection because these specialties are offered in alternate years in order to get a sufficient number of students. All the students had undergone First Aid (BLS) training during their basic nursing course. The differences in CPR training during the current course allowed for comparisons to be made. Participation in the study was voluntary and subject to individual consent to participate.

3.5. Data Collection

3.5.1. Instrument

CPR competence was assessed using a standard checklist derived from American Heart Association (AHA) guidelines (American heart Association, 2000). The first part of the checklist comprised structured questions that captured the demographic data. This information was important for defining the sample characteristics and getting information on previous CPR training and experience. Minor restructuring of the instrument was done before data collection to align the instrument with the study objectives. The biographic data sheet, checklist, information sheet, the consent form and the AHA guidelines are found in annexures I, II, III, IV and V.

3.5.2. Technique

Data were collected through direct observation by the researcher and a research assistant. The research assistant had undergone both BLS and ALS courses and works in a private Hospital in Kenya. The checklist was used to check participant's demonstration of one rescuer adult CPR, by direct observation.

3.5.3. Data Collection Procedure

The potential study participants were approached once permission was obtained from the college administration to conduct the study. Data collection had been planned for June and July 2006, but this was not to be, because getting the necessary approval from the college took long to secure. Data collection was then done between January and February, 2007. The study was approved by the Ethics Committee from the Hospital that the college is attached to (annexure VI). A written approval for the conduct of the study was granted by the College administration (annexure VII).

Once the written permission to conduct the study was obtained the researcher then contacted the Chairperson of the Department of Nursing. At the time of data collection the potential study participants were in revision classes preparing for the final exams. The first contact with the study participants was facilitated by the class tutors. This involved the tutor introducing the researcher to the potential study participants. The researcher was then left with the students to explain his project and thereafter make the request to the advanced nursing students to participate in the study. The researcher and/or the research assistant explained to the potential study participants what the study entailed. The advanced student nurses were also told what was expected of them during the study. The potential study

participants were then given the information sheet (annexure III) to read through. An opportunity was also given to each participant to seek clarification and ask questions.

Those who accepted to take part in the study were then given the consent form to sign for informed consent (annexure IV). The participants were then individually given the first part of the questionnaire to fill in the biographic information (annexure I). Each participant was then asked to demonstrate a one rescuer adult CPR on a manikin for about four minutes on the scenario given. As the participant performed one rescuer CPR on the manikin the researcher or the research assistant gave prompts. The prompts are standard and form part of the checklist; they are written in bold italics on the checklist (annexure II). The researcher or the research assistant then scored the participant using the checklist as the participant demonstrated one rescuer adult CPR.

3.5.4 Scoring guideline

The scoring guideline that was used in awarding credit to the participants as they demonstrated one rescuer adult CPR is a standard guideline from AHA. It provides a standardized way of awarding a mark or penalizing a participant for each item as they demonstrate CPR on a manikin. The scoring guideline is outlined in annexure X.

3.6. Pilot Study

The research assistant was trained on the administration of the study instrument two weeks before data collection was to take place. The training of the research assistant was based on the checklist and the scoring guideline. The pilot study was done before the main data collection. The pilot study tested the inter-rater reliability of the researcher and the research

assistants i.e. the two research assistants scored the same participant independently at the same time and then the scores were assessed for agreement, the level of agreement was set at 0.75 or greater (Polit and Beck, 2004).

Ten final year nursing students were recruited for this purpose. They were approached to participate in the study given information concerning the study both verbally and by letting them read through the information sheet individually. Those who accepted signed the consent form prior to their participating in the study. Each participant was then asked to perform one rescuer adult CPR on a manikin. The researcher and the research assistant each scored the same participant independently as he/she performed CPR on the manikin. The purpose of the pilot study was to test the inter-rater reliability of the researcher and the research assistant in order to achieve equivalence in scoring.

The results of the pilot study were as follows. The test scores of the two raters were first divided into two, those for rater A (researcher) and those for rater B (research assistant) then analyzed. The level of agreement after analysis was 0.766 which was slightly above the set agreement level. The results of the pilot study were not included in the final study results because they were meant for rating the level of agreement and the students utilized for the pilot study were different from those targeted for the main study (students undergoing basic nursing training). No changes were done to the study instrument after the pilot study.

3.7. Issues of Reliability and Validity

3.7.1. Reliability

One research assistant was recruited to assist in data collection. The Cronbach alpha for the checklist with fourteen items was 0.89 developed by Brennan et al (Brennan, Braslow, Batcheller and Kaye, 1996). The research assistant had undergone both basic and advanced CPR training and is a nurse working in one of the leading private Hospital in Nairobi Kenya. A pilot study was conducted before the main data collection to serve the following purpose: to test the inter-rater reliability of the research assistant and the researcher and to refine the study instrument. The level of agreement attained for the researcher and the research assistant from the pilot study was r= 0.766. The research instrument has been used in many studies to test skill and has yielded reliable results. The researcher was guided by the research objectives during the course of the study. This was in order to avoid bias and to enhance study rigor.

3.7.2. Validity

Validity: “validity of an instrument is a determination of how well the instrument reflects the abstract concept of being examined” (Burns and Grove, 2007:365). Content validity of the instrument was ensured by using the standard instrument used for training and assessment of CPR derived from the American Heart Association (AHA). “Validity of the checklist was assessed by estimating its correlation with a subjective overall rating of CPR performance which was 0.87 and by estimating its correlation with a reliable 40 item cognitive CPR exam (Brennan, Braslow, Batcheller et al., 1996:87).” AHA is a recognized and credible association that sets CPR standards. A research assistant was utilized during

the data collection phase of the study in order to shorten the data collection period. Reducing the data collection period was aimed at preventing participants who had already taken part in the study from interacting and sharing information with those who were yet to participate and thus influencing the outcome of the study. The significance level of the study result was set at 0.05. This was done in order to avoid the occurrence of type II error. A statistician was consulted for statistical power and sample size (Polit and Beck, 2004).

3.8. Approach to Data Analysis

The data collected were first captured on EPI-INFO data base spread sheet then cleaned, followed by statistical analysis in the light of the study objectives. A statistician from the Epidemiology Data Center (EDC) was consulted both before data collection and after data collection for analysis. Biographical data were used to describe the study sample characteristics in order to allow for comparisons to be made.

The data set was then analyzed using descriptive statistics utilizing mean, mode, median and standard deviation. The measure of central tendency for each group was first done independently before a comparison of the two groups was made.

Inferential statistics using STATA 9 computer statistical package was used following consultation with the statistician. The t-test and analysis of variance (ANOVA) were used mainly to test the effect of level of training on CPR competence using the means of the two groups. The result from the tests was to determine whether the result was statistically significant or not. This was for the testing of the null hypothesis in order to demonstrate whether the difference in the means was related to the level of CPR training, the course and

the experience and not merely as result of chance. Other statistical tests used for data analysis included Shapiro-Wilk test, Bartlett's test, and the Bonferroni's correction and Regression analysis test. All of these are presented in the results section of the research report.

3.9. Ethical Considerations

In order to protect and respect the rights of the participants and institutions involved the following steps were taken.

- The research proposal for the study was presented to the Postgraduate Committee and the Human Research Ethics Committee of the University of the Witwatersrand for clearance. A written approval from the Postgraduate Committee was received. Ethical clearance was also obtained (clearance number M 060445). Check annexure VIII and IX for the clearance certificate and approval letter.
- Ethical clearance from the Hospital Ethics Committee and a written letter of permission to conduct the study were also sought from the College where the research was conducted and permission was granted. See annexure VI and VII for the ethics clearance and the letter of approval.
- Names of the participants were not used in the data collection instruments but rather codes were used to ensure anonymity of the study participants.
- The study participants were assured that the researcher and the assistant were not tutors in the institution and were not in anyway connected to the teaching or evaluation of the students in that college. Assurance was also given to the

participants that the study did not form part of the evaluation for the course they were undertaking.

During data collection each potential participant were approached individually and in groups where it was applicable to participate in the study. Each participant was given detailed information about the study both in writing and verbally. An opportunity was also provided for the participants to ask questions or seek clarification concerning the study. Assurance that participation in the study was voluntary and that no one was under any obligation to participate was provided. Further more, those who opted to participate were assured that they could withdraw from the study at any point without penalty or loss of benefit. Every participant who accepted to be part of the study had to sign an informed consent form before being allowed to participate in the study.

3.10. Conclusion

The research design was chosen based on the study purpose and set objectives. This then influenced sampling, data collection method and statistical data analysis. The instrument used in the study is a reliable and valid, developed and used by the American heart Association. Selection of the research assistant was based on CPR training in order to enhance study credibility. The pilot study was done to test the inter-rater reliability of the researcher and the research assistant who assisted in data collection. To protect the rights of the study participants the study proposal was subjected to ethical review and their input informed the conduct of the study and was also approved by the post graduate committee. To enhance study rigor the researcher maintained objectivity during the duration of the study. The next chapter presents study results as derived from the statistical tests applied.

CHAPTER FOUR

STUDY RESULTS

4.1 Introduction

This chapter presents the study results after data analysis was done. The data collected included both biographic information and CPR skill performance scores on one rescuer adult CPR as captured in the biographic data sheet and the checklist. The various statistical tests that were used are defined and described. The chapter begins with an overview of how the data were captured and analyzed; this is followed by a presentation of the study results. The results are described and presented in textual and graphic formats.

4.2 Approach to Data Analysis

The data collected from the checklists were first captured in EPI-INFO data base that was constructed based on the study checklist to allow for coding and data entry. Coding of data is essential for it presents data in a standard format for analysis using a computer a statistical package. Data were entered into the prepared data base and then re-checked to correct any errors made during data entry. The first part of data analysis, once data entry and cleaning was complete, was by use of descriptive statistics. Descriptive statistics gives the study sample characteristics thus fulfilling the first study objective. A statistician from the university's Epidemiology Data Centre was consulted to provide technical support during data analysis. STATA 9 computer statistical package was used. Graphs, pie charts and tables were used to present the study results for easier interpretation of the sample characteristics. Tables were used mostly to present results of the inferential statistics

applied. The following inferential statistical tests were used during data analysis Shapiro-Wilk test, t-test and Bartlett's test, analysis of variance (ANOVA), and the Bonferroni's correction test. Inter-rater and split-half reliability tests were done on the pilot study data. The level of significance had been set at 0.05.

4.3 The Study Results

The target population was 97 (N=97); 71 out of the possible 97 advanced student nurses consented and took part in the study. This represented a 73.19% response rate. Data were analyzed with the study objectives in mind. The study results are presented below starting with the sample characteristics, followed by the participants score results for CPR skill demonstration and lastly, the results of the comparison between the two groups are presented as derived from statistical tests applied.

4.3.1 Study Sample Characteristics

The study participants were predominantly female: n=51 (71.8%) of the study participants were females and n=20 (28.2%) of the study participants were males. When the sample was divided into the two groups (Group I comprising advanced life support (ALS) advanced nursing students, while Group II comprising basic life support (BLS) advanced student nurses; group I had 17.4% (n=4) being males while 82.6% (n=19) were females. Group II, had 33.3% (n=16) being males and 66.7% (n=32) being females. Figure 4.1 below illustrates distribution by gender for the study sample (n=71).

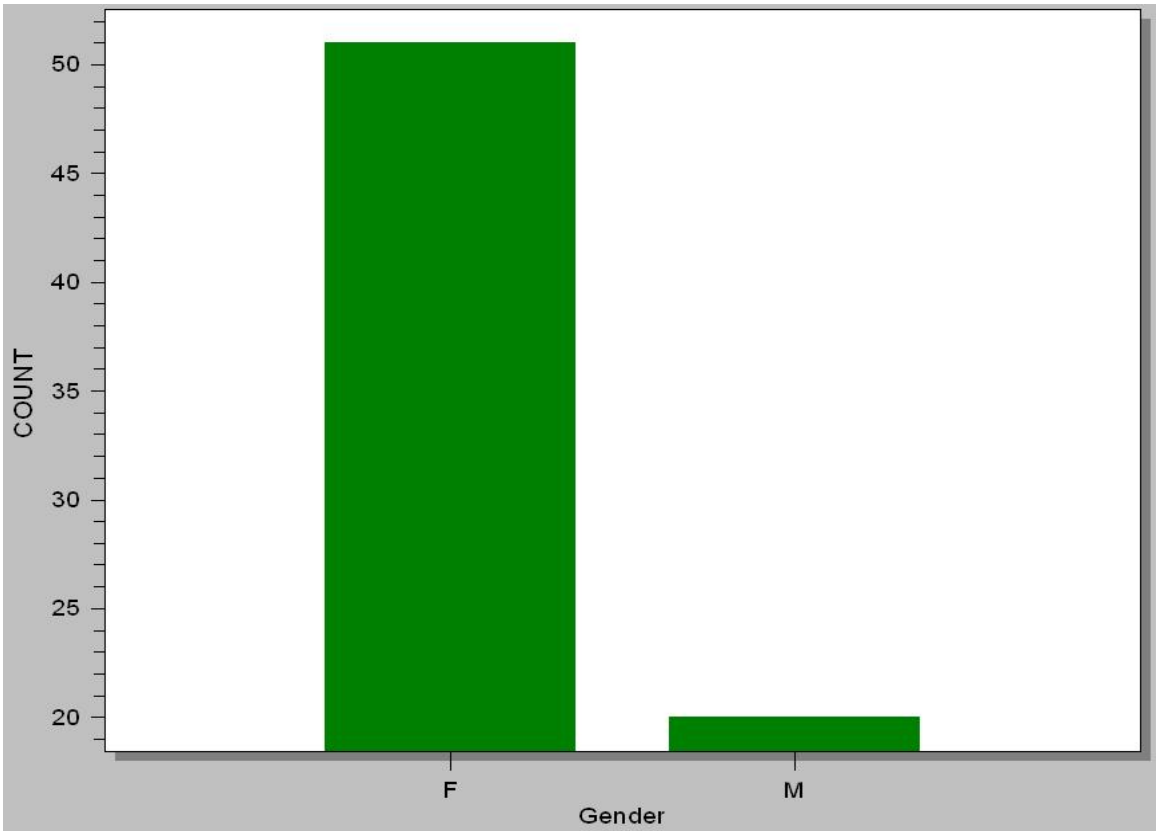

Figure 4.1 Sample distribution by gender (n=71).

Distribution by age category for the two groups were as follows: in group I, two (8.8%) participants were in the age category 20-24, 7 (30.4%) participants were in the age category 25-29, 7 (30.4%) participants were in the age category 30-34, 6 (26.1%) participants were in the age category 35-39 and one (4.4%) participant was over the age of 40 years. In group II, 8 (16.7%) participants were in the age category 20-24, 16 (33.3%) participants were in the age category 25-29, 14 (29.2%) participants were in the age category 30-34, 5 (10.4%) participants were in the age category 35-39 and 5 (10.4%) participants were above 40 years of age. The age distributions for the sample are illustrated in figure 4.2.

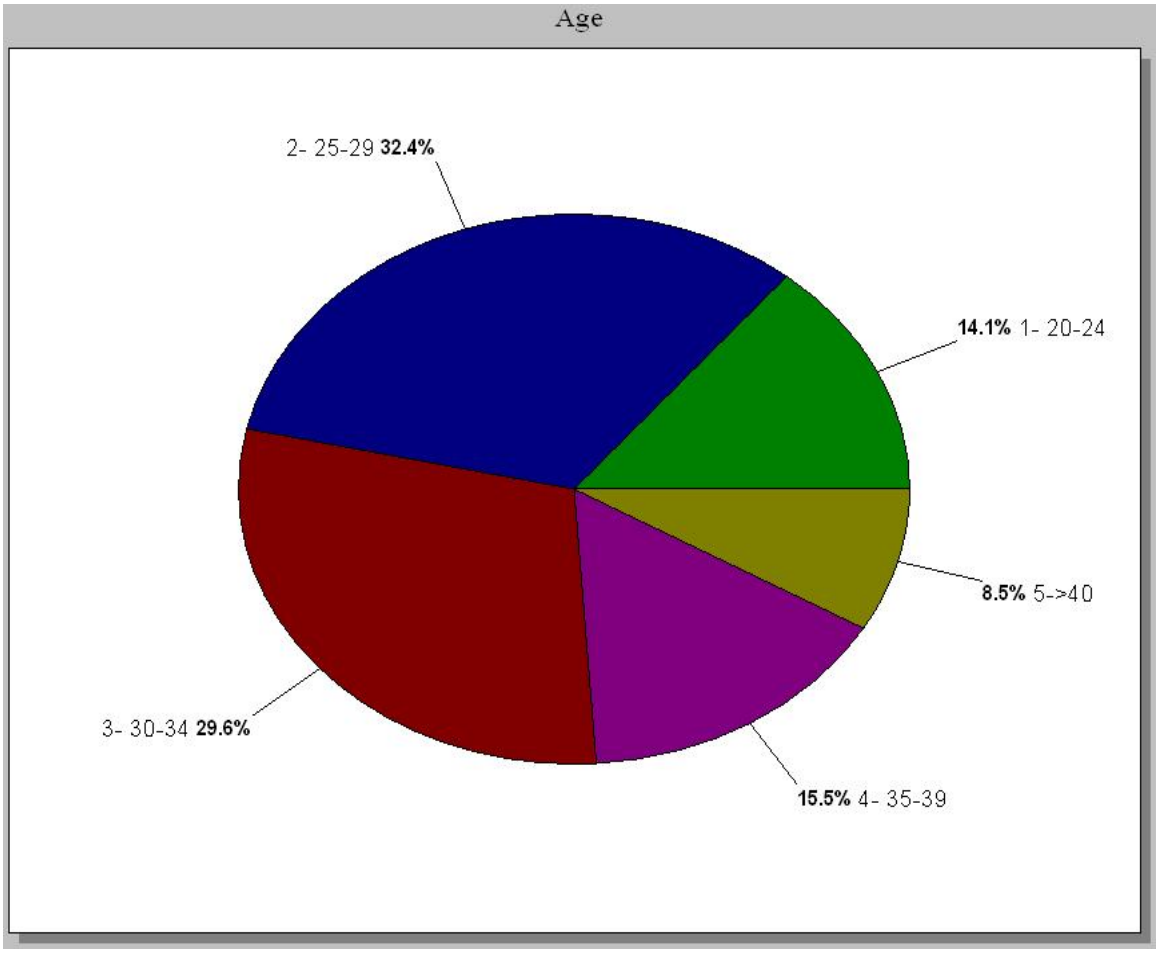

Figure 4.2 Age distribution of study the sample (n=71)

Distribution by rank for the two groups were as follows: In group I, there was one (4.4%) participant in the rank of senior nursing officer (SNO) as compared to none in group II, there were 6 (26.1%) participants in the rank of nursing officer one (NO I) in group I as compared to 23 (47.9%) participants in group II, there were 11(47.8%) Participants in the rank of nursing officer two (NO II) in group I as compared to 11 (22.9%) participants in group II, and there were 5 (21.7%) participants in the rank of nursing officer three (NO III) in group I as compared to 14 (29.2%) participants in group II. The percentages in rank for the whole sample were as illustrated in figure 4.3 below.

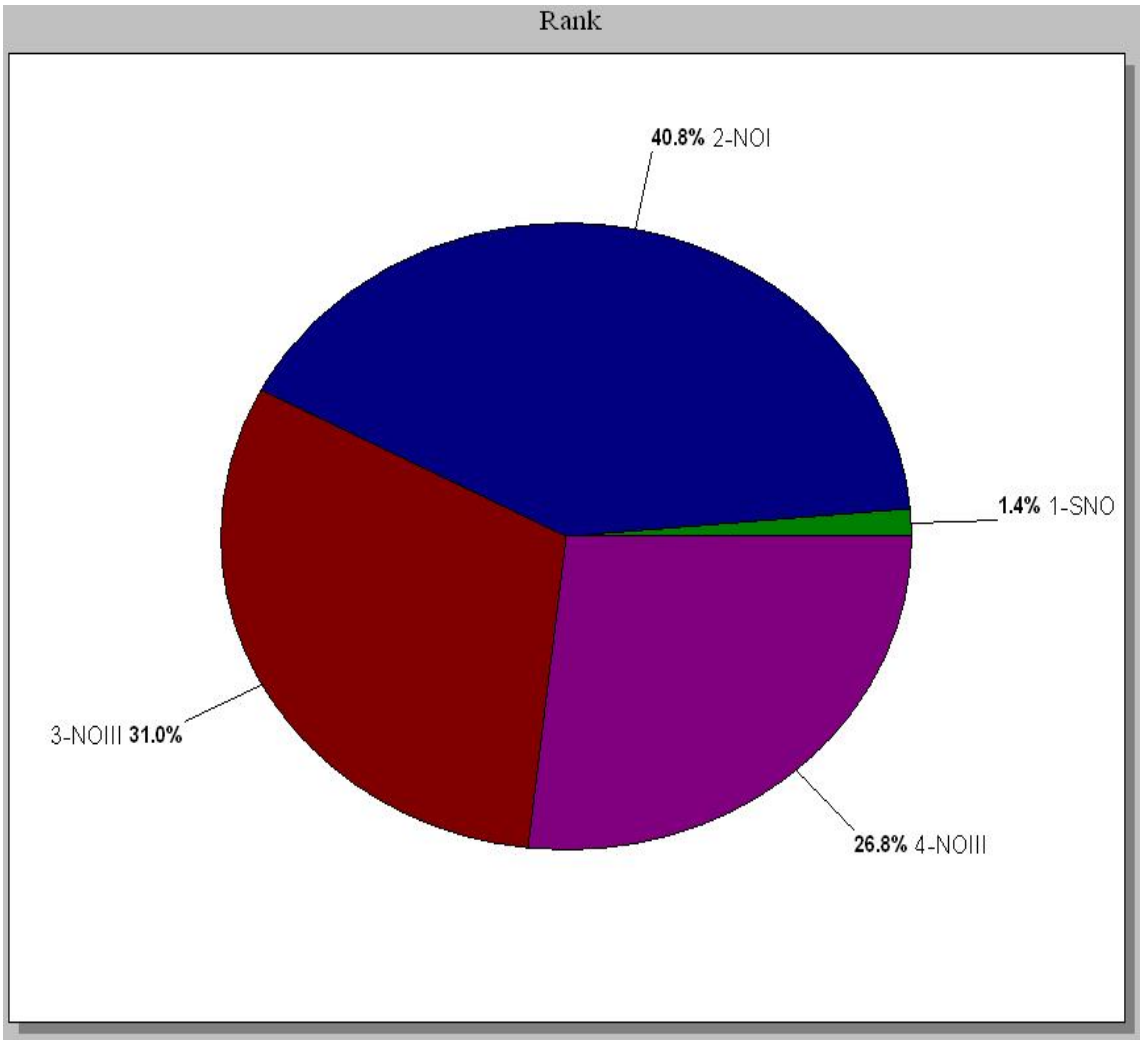

Figure 4.3 Distribution by rank of the study sample (n=71)

Of the 71 advanced student nurses that participated in the study, 23 were registered in the ICU nursing course, 8 were registered in the midwifery nursing course, 12 were registered in the ophthalmic nursing course, 12 were registered in the psychiatric nursing course and (n=16) from the community nursing course. Figure 4.4 below illustrates the distribution of the study participants by specialty. In terms of group placement 23 participants were in

group I and the remaining 48 were in the group II. Group I composed of advanced nursing students taking the ICU course and had ALS training and group II comprised of midwifery, ophthalmic, community and psychiatric advanced nursing students who had BLS training.

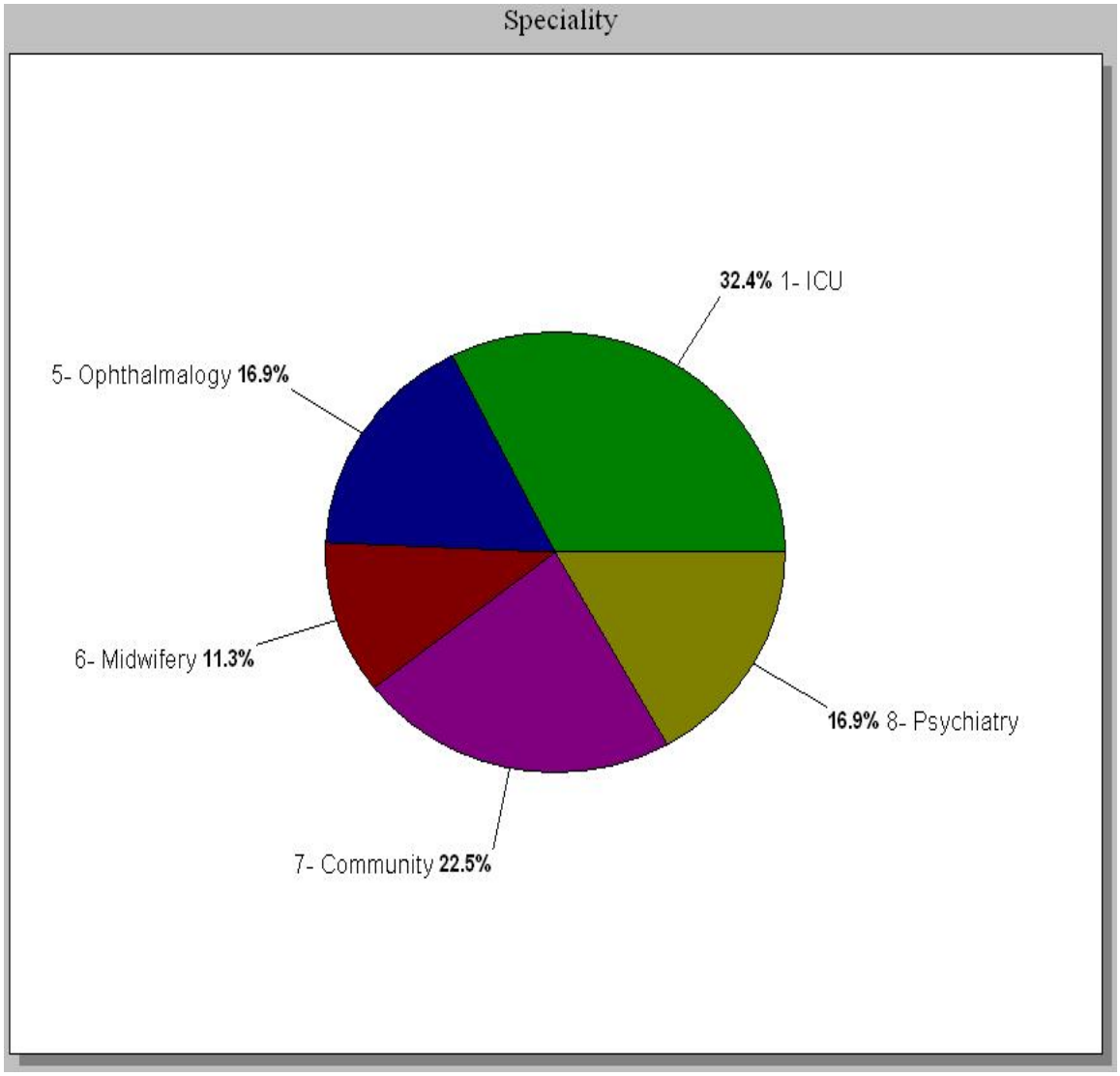

Figure 4.4 Distribution by specialty of the study sample (n=71)

The study participants had work experience for periods ranging from 1 year to 20 years. The majority 77.46% (n=55) had worked for a period between 4-15 years, 12.68% (n=9) had worked for a period of less than 3 years and 9.86% (n=7) had worked between 16-20 years. When participants are divided into the two groups; group I, 17.39% (n=4) of the participants had worked for less than three years, 73.91% (n=17) had worked for a period of between 4-15 years and 8.70% (n=2) had worked for more than 16 years. For group II participants their years of work experience were as follows; 14.58% (n=7) had less than 3 years working experience, 75% (n=36) had 4-15 years of work experience and 10.42% (n=5) had more than 16 years of work experience.

4.3.2 Skill Performance Scores

The checklist used to assess CPR skill performance for the study participants contained 15 items. The study participants were awarded one mark if they performed the item and zero if they did not perform the item. The scoring for each participant was done based on the scoring guideline in annexure VII. The CPR skill performance, item by item, for the study participants are presented in table 4.1. The table presents the number of participants who performed each item correctly per group, the calculated percentage of those who performed against those who did not for that particular group and the percentage for the whole sample.

Table 4.1 Participants' performance for each item of the 15 item checklist

Items	No. of group I participants who performed the item	% for group I participants who performed the item	No. of group II participants who performed the item	% for group II participants who performed the item	% for the group I and II combined.
Item 1	20	86.95	27	56.25	66.2
Item 2	13	56.52	16	33.33	40.8
Item 3	21	91.30	38	79.16	83.1
Item 4	17	73.9	27	56.25	62
Item 5	20	86.95	33	48.35	74.65
Item 6	23	100	38	79.16	85.91
Item 7	19	82.6	19	39.58	53.5
Item 8	13	56.52	21	43.75	47.9
Item 9	19	72.6	33	48.35	60.5
Item 10	21	91.30	18	37.5	54.9
Item 11	19	82.6	27	56.25	64.8
Item 12	21	91.30	22	45.83	60.6
Item 13	18	78.26	10	20.83	39.4
Item 14	20	86.95	19	39.58	54.9
Item 15	19	82.6	12	25	43.7

The skill scores attained by the participants ranged from 3-15. The lowest possible score was 0 and the highest possible score was 15. The performance scores for the whole sample are as shown in table 4.2.

Table 4.2 Distribution of scores of the sample (n=71)

Score Range	Number of Participants who attained the mark within the range	Percentage representation for the sample
0-5	8	11.27
6-10	35	49.29
11-15	28	39.44
Total	71	100.00

From the score distribution 64.79% (n=46) of the participants obtained a score greater than 8, while 35.21% (n=25) obtained a score less than 7.

The mean score for group I was 12.3 out of 15 with a standard deviation of 1.42, the mode and the median of the scores for the group being the same 12. Group II had the mean score of 7.77 out 15 with a standard deviation of 2.38 and a median of 7.5. The score distribution for this group was bimodal with scores 6 and 9 having the highest equal frequency of 9 each. Performance scores for the two groups are as shown in the table 4.3.

Table 4.3 Distribution of participants' scores for the two groups

Scores	Frequencies for group I	% for group I	Frequencies for group II	% for group II
3	0	0	1	2.08
4	0	0	3	6.25
5	0	0	4	8.33
6	0	0	9	18.75
7	0	0	7	14.58
8	0	0	3	6.25
9	1	4.35	9	18.75
10	0	0	6	12.50
11	5	21.74	3	6.25
12	9	39.13	2	4.17
13	3	13.04	1	2.08
14	3	13.04	0	0.00
15	2	8.70	0	0.00
Total	23	100.00	48	100.00

Score distributions as illustrated graphically in the three histograms below were subjected to the Shapiro-Wilk test of normality. The Shapiro-Wilk test is defined as a test that determines whether or not a sample comes from a normal distribution; it is calculated by regressing the quartiles of the observed data against that of the best-fitting normal distribution. The Shapiro-Wilk test is used to test the null hypothesis in order to determine whether a sample or samples come from a normally distributed population. The null hypothesis can either be accepted or rejected based on the p-value derived from the test (http://www.statsdirect.com/help/parametric_methods/swt.htm). The score distributions illustrated graphically are as shown figure 4.5. Three graphs are used to allow for comparisons.

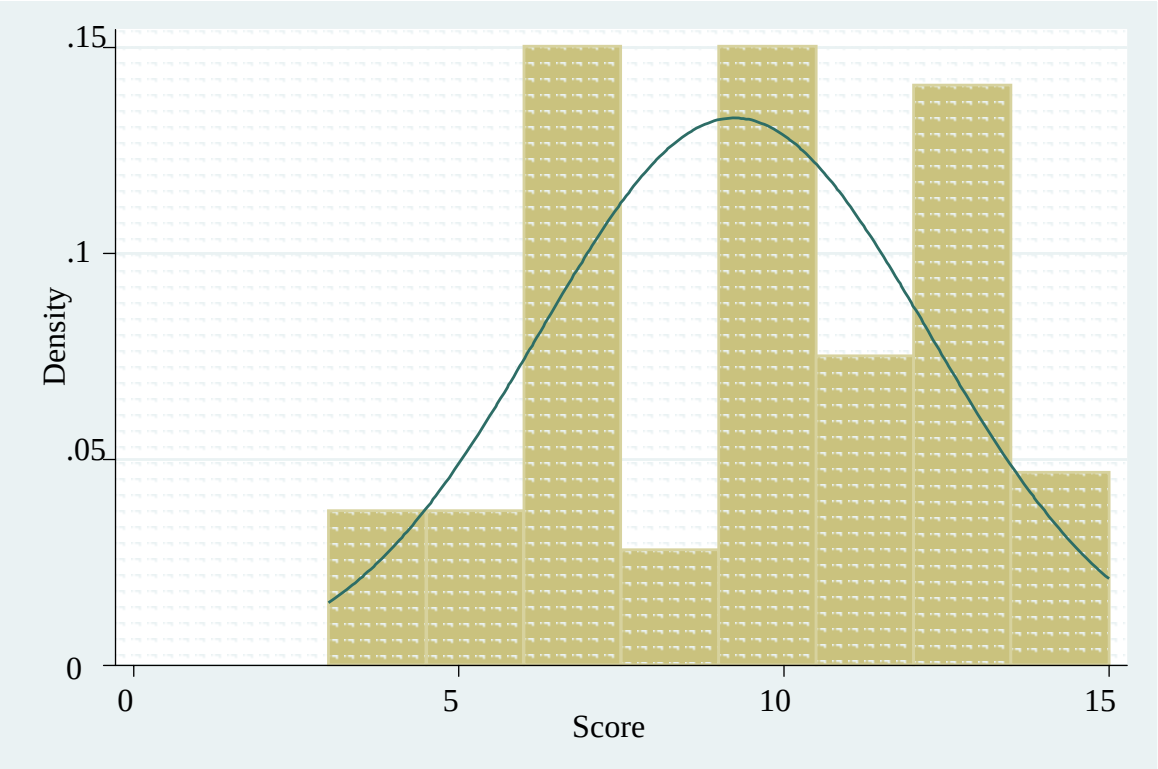

Figure 4.5 Normal curve showing score distribution for the sample (n=71)

This histogram shows the overall performance for the two groups combined. The score distribution takes the shape of a normal curve. The Shapiro-Wilk test p-value attests to the normality of this curve with a P value 0.298, which is not statistically significant.

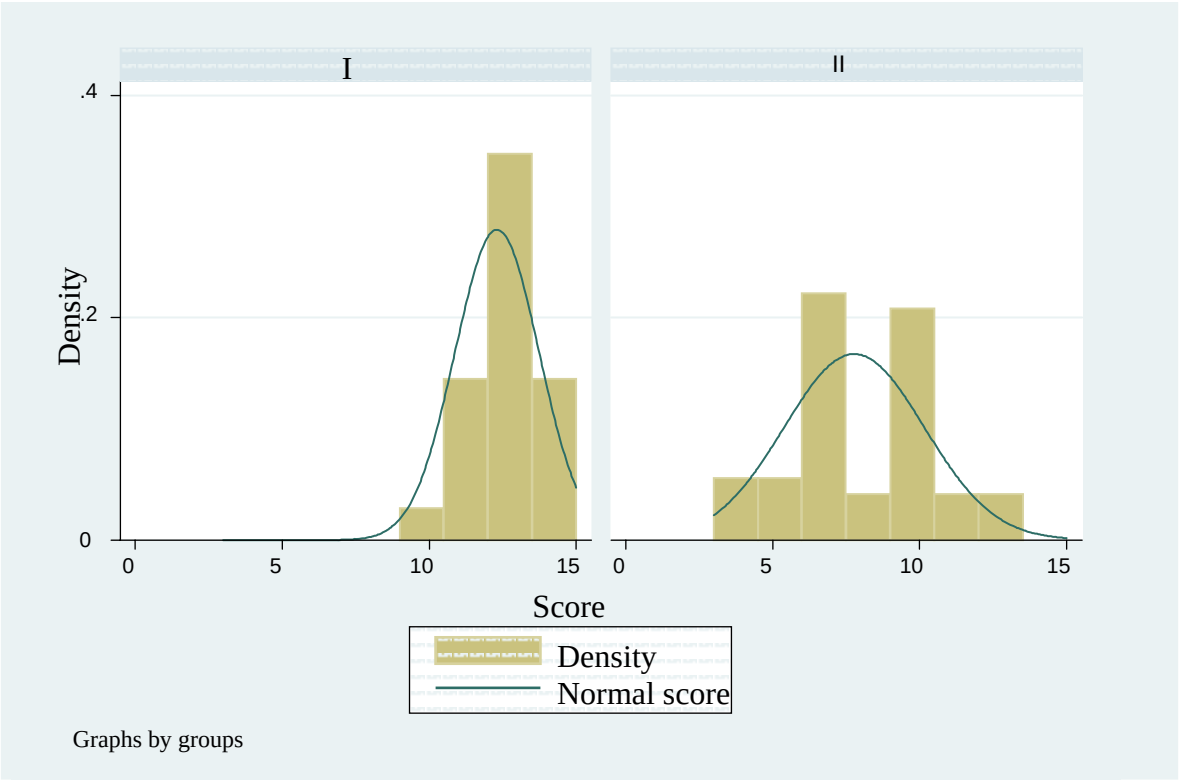

Figure 4.6 Normal curve showing score distribution for the two groups

These two histograms depict the scores for the two groups independently with the normal curve lines showing how the scores were distributed. The first histogram (group I) is a negative skew of a peaked normal curve with the majority of the scores between 9 and 15. The second histogram (group II) takes a normal curve distribution with the majority of the scores clustered at the centre of the curve. The scores distributions on the curves were subjected to Shapiro-Wilk test of normality. The results of the test were as follows histogram 1 (group I) p= 0.298 and histogram 2 (group II) p= 0.81. The differences were not statistically significant.

The results for the overall performance for the whole sample when divided according to gender were more or less the same. The t-statistic derived when the two were compared did

not yield a statistically significant difference. The results from the two sample (male female) t-test are as shown in the table below, P= 0.2282.

Table 4.4 Two-sample t-test with equal variances (n=71)

Group	Sample	Mean	Std. error	Std. deviation	95% confidence interval	95% confidence interval
Female	51	9.509804	.4013434	2.866165	8.073682	10.31593
Male	20	8.55	.7379738	3.300319	7.005403	10.0946
Combined	71	9.239437	.3562971	3.002212	8.528825	9.950049
Difference		0.9598039	.78939		- .614986	2.534594

T = 1.22 Ho: diff = 0 Degrees of freedom = 69

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 0.8859 **Pr(|T| > |t|) = 0.2282** Pr(T > t) = 0.1141

When performance scores were compared with rank there was no significant difference between the ranks. The rank of nursing officer I had the lowest mean of 8.34, while that of nursing officer II had the highest mean of 10.23 as shown in the table below;

Table 4.5 shows the mean scores, standard deviation and the frequencies when comparing skill score versus rank. It shows that differences in performance are not significant in relation to rank/seniority. The most senior rank had the highest mean score of 15 but it should be noted that there was only one student falling in this category. Advanced nursing students in the rank of nursing officer I had the lowest mean score of 8.34 (it had the highest percentage of participants) Advanced nursing students in the rank of nursing officer

II had a high mean score of 10.23 despite comprising the second largest group and in terms of ranking they occupy the second lowest rank. Advanced nursing students in the rank of nursing officer III (most junior rank) had the third best mean score of 9.16. The test result is as summarized in the two tables below.

Table 4.5 Mean scores attained by participants in each rank (n=71)

Ranks	Mean	Standard Deviation	Frequency
SNO	15	0	1
NO I	8.3448276	3.1766544	29
NO II	10.227273	2.4481639	22
NO III	9.1578947	2.8335913	19
Total	9.2394366	3.0022125	71

The mean score for all the ranks combined was 9.16.the score results for the four ranks combined when subjected to analysis of variance and Bartlett's test were as follows; ANOVA results F = 2.69 and p = 0.075 and the Bartlett's result were p = 0.46

Table 4.6 ANOVA test comparing ranks versus score (n=71)

Comparisons	SS	Df	Ms	F	Prob > F
Between groups	44.3297523	2	22.1648761	2.69	0.0755
Within groups	552.941676	67	8.25286084		
Total	597.271429	69	8.65610766		

Bartlett's test for equal variances: $X^2 = 1.5493$ P = 0.461

The Bonferroni's correction is a statistical adjustment for the multiple comparisons, it allows for many comparison statements to be made, while still assuring an overall confidence coefficient is maintained. Bonferroni's correction performs multiple pair wise comparisons between groups of samples. It is valid for both equal and unequal sample sizes. The use of this test helps to avoid making type I error (rejecting the null hypothesis inappropriately) by keeping the total chance of erroneously reporting a difference below some ALPHA value. This is achieved by dividing the test set significance level by the number of tests to be run (Simon, 2005a). The following one way Bonferroni's correction of skill score versus rank gave the following result. The p-value is in bold.

Table 4.7 Bonferroni's correction test comparing rank versus score

Rank	**SNO I**	**NO I**	**NO II**
NO I	-6.65517 **0.156**		
NO II	-4.77273 **0.653**	1.88245 **0.I41**	
NO III	-5.84211 **0.309**	0.813067 **1.000**	-1.06938 **1.000**

4.3.3 Comparisons Between group I and group II

Performance scores for the study participants were subjected to the following statistical tests; regression analysis, paired t-test, Fisher's exact test, analysis of variance (ANOVA) and Bartlett's test for equal variances. The results of the above mentioned statistical tests were as follows:

Regression analysis test comparing age category versus the scores for the sample and then for the two groups yielded the following results: when the mean scores for each age category for the sample were subjected to regression analysis it yielded a statistically significant p-value = 0.00001. When the same test was applied to the participants in the two groups results were also statistically significant, for group I, P=0.00001 and group II, P=0.00001.

A t-test is a test which measures how many standard errors the set statistical estimate is from a hypothesized value. This statistical test is often appropriate when comparing the means of two groups and the result will demonstrate whether the means of two groups are statistically different from each other. The t-test therefore compares the actual difference between two means in relation to the variation in the data. It is calculated by taking a statistic and dividing it by its estimated variation (standard error), the result being the t-test. The value is expressed as the standard deviation of the difference between the means. A large positive t-test implies that the set standard error is larger than the hypothesized value, while a large negative t-test implies that the set standard error is smaller than the hypothesized value (Simon, 2005c). The results of the two sample t-test for the two groups of participants that is group I advanced life support group and group II basic life support group.

Table 4.8 Results from the two-sample t-test with equal variances.

Groups	Sample	Mean	Std. error	Std. deviation	95% confidence interval	95% confidence interval
1	23	12.30435	.2977835	1.42812	11.68678	12.92191
2	48	7.770883	.3436862	2.381128	7.079426	8.462241
Combined	71	9.239437	.3562971	3.002212	8.528825	9.950049
Difference		4.533514	.5386959		3.458846	5.608183

t = 8.4157 Ho: diff = 0 degrees of freedom = 69

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0

Pr(T < t) = 1.0000 **Pr(|T| > |t|) = 0.0001** Pr(T > t) = 0.0000

The test was meant to test the null hypothesis and to determine if there were differences between the two groups of students. The test showed that there was a significant difference between the two groups. The P value P=0.0001 indicates that the difference in performance is statistically significant. Group I which had undergone ALS training in the current course performed better than group II which like group one had undergone BLS training in the basic training. Thus the null hypothesis was rejected.

Fisher's exact test is used to calculate the level of significance (p-value) for data in a two by two contingency table. That is there must be two variables that are being compared for this test to be carried out. To perform a Fisher's exact test there must be at least one data value in each row and one data value in each column. This test is an alternative to the Chi-square test in situations where a large sample approximation is inappropriate and also in case of highly imbalanced scores (some values in one or two of the cells are in thousands while

values in the other cells are less than 5). The Chi square test relies more on a large sample approximation (Simon, 2005b).

The results of one-sided Fisher's exact test for the two groups of advanced student nurses comparing the two groups performance in relation to attaining a competence score are as shown in table 4.9; the test was used because the number of those who met the competence score were less as compared to those who did not (p value is in bold).

Table 4.9 Fisher's exact test result showing difference in competence scores

Groups	Participants did not Achieve the Competence Score	Participants who Achieved the Competence Score	Total
Group I	18	5	23
Group II	48	0	48
Total	66	5	71

Fisher's exact p= 0.003

This test was used because of the small number 5 out the total (n=71) participants attained the competence score. This result shows that out of the 71 students who participated in the study only 5 scored 14 marks out of 15. The rest (n=66) had a score less than 14. The five participants who achieved the competence score were from group I the ALS group. Therefore only five students passed the competence score which was set at 90%. Overall the p-value P=0.003 from the test demonstrated a statistically significant difference between the two groups.

The skill scores for the two groups were also subjected to analysis of variance (ANOVA). ANOVA is defined as an analysis of the difference (variation) in the outcomes of an experiment to assess the contribution of each variable to the difference. The ANOVA decomposes the variability in the response variable amongst the different factors. It is therefore important to determine which factors have a significant effect on the response or how much of the variability in the response variable is attributable to each factor before the analysis is done (http://www.statgraphics.com/analysis_of_variance.htm).

The purpose of analysis of variance (ANOVA) is to test for significant differences between means of groups in a sample. The result of the variation that is derived by comparing the means of the groups is expressed as a ratio (F-ratio). If the null hypothesis is to be accepted then the F value must be close or equal to 1 and the p-value should be greater than 0.05. If the F-value is large and the p-value is less than 0.05 the null hypothesis is rejected (http://www2.chass.ncsu.edu/garson/PA765/anova.htm).

The test determines whether the means of the groups formed by values of the independent variable and that of the dependent variable are different enough not to have occurred by chance. The results were as follows: F= 3.15 and P = 0.03. Since F is large and p-value is less than 0.05 the result is significant and therefore the null hypothesis is rejected. The ANOVA test result was as shown in table 4.10.

Table 4.10 ANOVA result for difference between two groups means

Source	SS	Df	MS	F	Probability
Between groups	77.9879012	3	25.9959671	3.15	0.0306
Within groups	552.941676	67	8.25286084		
Total	630.929577	70	9.01327968		

Bartlett's test is used to test if samples have equal variances. This test indicates whether there is homogeneity of variances (Equal variances across samples). This test is normally done after performing analysis of variance as was the case here to verify the assumption that variances are equal across groups or samples. Bartlett's test is sensitive to departures from normality (http://www.itl.nist.gov/div898/handbook/eda/section3/eda357.htm). Bartlett's test was done because the two group's samples were not equivalent. The results derived from Bartlett's test was P= 0.46; the p-value is not statistically significant for group I and group II. It demonstrates that even though the sample sizes for the two groups were not equal in size, this difference did not contribute to the difference in scores as derived from ANOVA. The two groups' samples emanated from a normally distributed sample (variances were equal across the two groups).

4.4 Conclusion

This chapter presented the results of the study participants CPR skill performance. The results were derived from descriptive and inferential statistical tests that were applied. Descriptive statistics served to organize data for analysis. The results have been presented

both in tables and graphs to enhance the interpretation of the results. The next chapter presents the discussion of the results, the limitations of the study, the main findings of the study, the recommendations derived from the main findings and finally, the conclusion.

CHAPTER FIVE

DISCUSSION, MAIN FINDINGS, RECOMMENDATIONS AND CONCLUSION

5.1. Introduction

This is the final chapter of the research report and it presents the discussion of the study results, the limitations of the study, a summary of the main findings from the study; recommendations are drawn from study findings for CPR training, nursing education and nursing research. The chapter closes with the conclusion of the study.

5.2. Discussion of Results

5.2.1. Sample Characteristics

The overall response rate was 73.2%. The response rate was good and it can be said that the sample is representative of the target population. The representativity of a sample is determined by the size of the population targeted when compared to the percentage of those who actually participated in the study. The study by Asch, Jedriewski and Christakis (1997) shows a response rate of 54-68% for mailed survey studies. The study by Baruch (1999) on the other hand found in their study that the average response rate for the majority of the studies they reviewed was 55.6% with a standard deviation of 19.7. All advanced student nurses were approached at the two campuses at different times and those who were available at the time of data collection consented and participated in the study.

Out of the 71 students who participated in the study 51 (71.8%) were females and 20 (28.2%) were males; the percentages were comparable when the sample was divided into the two groups. The male/female ratio is skewed in favor of female nurses because the nursing profession is predominantly female in Kenya, South Africa and elsewhere in the world. Statistics from the South African Nursing Council (SANC) and the Nursing Council of Kenya (NCK) show that the majority of the nurses are females. SANC statistics shows that male nurses comprise only 6.8% of the nursing workforce in South Africa (South African Nursing Council, 2005). The NCK statistics puts the percentage of male nurses enrolled or registered at 23%, as compared with 77% for the female nurses (Nursing Council of Kenya, 2006). The ratio of male and female participants who turned up for this study are comparable to the NCK statistics on male/female ratio. The study participants had received basic nursing training from various nursing colleges both government and private. There are only three colleges in Kenya that offer post basic training for nurses, two of them are government run and the other is private.

In terms of age category distribution for the two groups combined the age category 25-29 had a bigger representation of 32.39% and the next category 30-34 had the second largest representation of 29.58%. The two age categories combined accounted for 62% of the sample. The statistics from the NCK, for nurses who have ever been indexed up to 2004 indicate that 31.2% fall under 25-29 and 30-34 age categories. The percentages are not tallying and this could be attributed to the fact that more young nurses are still pursuing education as compared to the older ones; 15.49% of the study participants came from the age category of 35-39 this is almost a mirror image of the NCK statistics that gives 15.6% for the same age category. More than 76% of the study participants were under the age of

34 years this is in agreement with the NCK statistics which show that more than 80% of the nurses in school were under the age of 34 years (Nursing Council of Kenya, 2006). Group II had a higher percentage of young nurses as compared to group I, 50% of the participants in group II were under 29 years as compared to 39% under 29 in group I.

In terms of rank 40.85% of the study participants came from the rank of NO I, 30.99% coming from the rank of NO II and 26.76% coming from the lowest rank NO III. There was only one participant in the senior most rank (SNO). The majority of the advanced student who participated in the study had worked for some time as indicated by years of experience. Work experience is one of the admission requirements for post basic courses and by the time one attains the rank of senior nursing officer quite often they have specialized and are therefore not likely to be in school. Group I had a higher percentage of participants in the rank of NO I, 47.9% as compared to 22.9% in group II. Group II had a higher percentage of participants in the rank NO II, 47.2% as compared to 26.1% in group I. There was only one participant in the rank of SNO in group I; group II had none in that rank.

5.2.2. Skill Performance

Skill performance was evaluated using the checklist which had 15 items. The scoring guidelines were as outlined in annexure VI. The discussion regarding participants CPR performance follows in the paragraphs below;

- Response check, 87% of the participants in group I checked for responsiveness as compared to 56.3% for group II. Of the n=71, 66.2% performed this item.

- Calling for help, 56.2% of participants in group I called for help as compared to 33.3% in group II. Of the71 students, 40.8% performed this item. This was the second worst performed item. This could be true because the emergency call service in Kenya is still developing and is concentrated majorly in the big towns. The majority could not even remember to shout for help which is a standard practice for mobilizing support when an emergency occurs in the hospital.
- Opening the airway, 91.3% of participants in group I remembered to open the airway as compared to 79.2% in group II. Of the 71 students, 83.1% performed this item. This was the best performed item by participants in group I and the second best performed by group II. It was the best performed item by the two groups based on the average. Participants who did not get a mark for this item either did not perform the step all together or performed a maneuver that was not acceptable.
- Assessing breathing, 74% of participants in group I assessed for breathing as compared to 56.3% for group II. Of the 71 students, 62% performed this item. Participants who did not manage this item either omitted the step completely or attempted rescue breaths with no chest rise or less than 2 successful breaths were done.
- Attempting expired air ventilation; 86.9% of participants in group I performed this item as compared to 48.4% for group II. Of the 71 students 74.7% performed this item. This item was among the best performed by group I participants.
- Head repositioning and attempting expired air ventilation for the second time, the majority of the participants who had failed in the first attempt managed to give two successful rescue breaths after repositioning the head using head tilt chin lift

maneuver. However, there were participants who despite repeated attempts, could not manage to perform this item correctly.

- Unilateral carotid pulse check, 82.6% participants in group I performed this item correctly as compared to 39.6% for group II. Of the 71 students 53.5% performed this item. The majority of the participants who did not perform this item correctly either checked other peripheral pulses (brachial or radial) while others went ahead to perform the other steps or just could not continue anymore because they were lost for what to do next. Those who checked pulse in any other position other than the carotid pulse were penalized.
- Compression location, 56.5% of the participants in group II performed this item correctly as compared to 43.6% for group II. Of the 71 students, 47.9% performed this item. This item was among the worst performed by the two groups. Some participants located the compression position correctly but could not explain how they came to choose that particular position and some said they were not aware there was a standard way of locating the compression position. Some picked the compression position too far up the sternum or too low, while others chose the position on the left rib cage just above the anatomical position of the heart.
- Performs 15 compressions, 72.6% of the participants in group I performed this item correctly as compared to 48.4% for group one. Of the 71 students, 60.5% performed this item. The number of compressions that were accepted per cycle for this item was 13-17 compressions as stipulated in the score guidelines. Participants who performed the correct compressions in the wrong position were penalized for this item. Those who picked the right position but had no explanation as to why they

choose that position but went ahead to perform the correct number of compressions were awarded the mark.

- Performs head tilt chin-lift maneuver after compressions before giving 2 rescue breaths; 91.30% of the participants in group I performed this item correctly as compared to 37.5% for group II. Of the 71 students, 54.9% performed this item. The performance for group I from this point onwards was good but there was a general decline for participants in group II either because they had forgotten or were not sure of what to do next.
- Slow but firm breaths after the first cycle of chest compressions, 82.6% of the participants in group I performed this item correctly as compared to 56.3% for group II. Of the 71 students, 64.8% performed this item. The majority of participants in group II could not achieve successful compressions at the first attempt but had to reposition the head before giving successful breaths.
- Repeats steps 8, 9, 10 and 11 three more times; 91.30% of the participants in group I performed this item correctly as compared to 45.8% for group II. Of the 71 students, 60.6% performed this item. The participants who did not perform this step correctly either were not sure the number of cycles to perform before performing the first evaluation or performed fewer compressions while others could not continue anymore.
- Performing head tilt chin-lift maneuver after every set of compressions, 78.3% of the participants in group I performed this item correctly as compared to 20.85 in group II. Of the 71 students, 39.4% performed this item this was the lowest for the two groups combined and the worst performed by participants in group II.

- Performing expired air ventilation with chest rise after every set of chest compressions, 86.9% of participants performed this item correctly as compared with 39.6% in group II. Of the 71 students, 54.9% performed this item.
- Locating compression position after giving two rescue breaths in each cycle, 82.6% of participants in group I performed this item correctly as compared with 25% in group II. Of the 71 students, 43.7% performed this item. This was the second worst performed item by group II.

5.2.3. Comparisons for the two groups

Overall group I (mean score of 12.3) performed better than group II (mean score 7.77) and this is may be attributed to the advanced CPR training they had received. Nyman and Sihvonen (1998) concluded in their study that the quality of CPR training and the recency of the training optimize performance. Close scrutiny of the scores item by item showed that there were some items that were poorly performed by both groups. The second item on the checklist (calling for help) was the least performed item. This may be attributed to the lack of a developed emergency ambulance/emergency call service in Kenya. The participants had the alternative of shouting for help which is the standard practice for summoning help in the hospital setting. The other items that were not well performed or omitted included; compression location, pulse check and opening up the airway before giving rescue breaths in between the cycles of compressions. Most of the participants in both groups and more so in group II were slow in performing CPR, time was lost in both doing the assessment, trying to remember what step to do next and when alternating between compressions and giving of rescue breaths.

Group I performed poorly in the above mentioned items but also in performing the correct number of compressions was also their other weak point. In group II the areas of weakness included response check, calling for help assessing for breathing, performing the correct number of compressions and the majority could not remember what to do after step 11 (the number of cycles to perform before evaluating response to CPR).

The more worrying aspects in the performance of CPR by the participants included proceeding with CPR without first assessing for response. This means there was a possibility of resuscitating a casualty who had a pulse and breathing spontaneously. The other problem noted was lack of order in the conduct of CPR, with some participants omitting some steps or performing some steps earlier or later than expected thus not following the correct sequence. Some realized their mistakes or omissions and corrected them while some did not. Omissions and not following the correct sequence when performing CPR can have detrimental effect on the success of resuscitation. A previous study by Lewis et al. (1993) had identified the following as problematic in the conduct of CPR failure to follow the correct sequence during CPR, missing critical steps, performing faulty compressions, giving in inadequate ventilations, taking too much time during resuscitation, not attaining the recommended ventilation compression ratio and failure to integrate physiology into practice during CPR.

The better performance by group I when compared to group II is related to advanced CPR training that they had undergone. The participants in group I may also have had more opportunities to practice on the CPR skills in ICU leading to better proficiency. It can be noted from the results that even though participants in group I had a better mean score as

compared to their counterparts in group II only five participants in group I managed to attain the competence score. This indicates that deterioration of CPR skills was already evident and was impacting negatively on their performance. This is in agreement with previous studies conducted (David and Gould, 2000; Broomfield, 1996:1022), which confirmed deterioration of both CPR knowledge and skills from the second week post training and a marked decline by third month.

The test scores for the whole sample was subjected to the t-test to determine whether the various variables age, gender, work experience and rank had an effect on the scores did not yield any significant value. The p-value when gender was compared to the score was p= 0.23, the p-value when age was compared the score was p= 0.092 and that for rank when compared to the score was p= 0.075. Work experience in either the medical, surgical, casualty, dental, intensive care, midwifery wards and other areas of experience did not improve the participant's performance in CPR. This is in agreement with the findings by Broomfield (1996) that participants who had worked in intensive care units where CPR is done frequently, did not perform any better than those who worked in areas where resuscitation is less likely to be utilized. When the sample was split into the two groups and regression analysis done the variable age category was significant with p= 0.0001 for group I and that for group II was the same. This means that age category distribution for the two groups each standing alone affected the scores significantly.

The following tests were applied to test the null hypothesis, t-test and analysis of variance. Bartlett's test was done to test whether the difference in sample sizes for the two groups could have contributed the rejection of the null hypothesis. The first two test demonstrated

that there was a statistically significant difference in performance between the two groups of participants the p-value for the t-test was p= 0.00001 and the ANOVA result was p= 0.03. The study null hypothesis was therefore rejected. Bartlett's test result was p= 0.46, the result is not statistically significant. This indicates that there was homogeneity between the two samples (variances were equal) and were drawn from a normally distributed population. The inequality in sample size did not contribute to the differences in scores for the two groups.

5.3. Main Findings

5.3.1 Biographic Findings

The study participants were predominantly female comprising 71.8% female, even when the sample was divided into the two groups the percentages remained the same. This is in agreement with KNC statistics. More than 60% of participants were aged between 20-34 years. The rank of NO I had a higher percentage of study participants standing at 40%, NO II was second with 31%. The majority (77.5%) of the participants had work experience ranging from 4-15 years. The 23 participants in the ICU course comprised group I and had undergone advanced life support training. Advanced student nurses in the Midwifery, Psychiatry, ophthalmic and community courses comprised group II.

Age was the only biographic variable that had a statistically significant effect on the scores p=0.00001. There was a general increase in the mean scores across the age categories the only exception being the age group >40 years which had the lowest mean for the two groups and for the sample as a whole.

5.3.2 CPR Skill Competence

Out of the 71 advanced student nurses only five attained the competence score which had been set at 90%. Those who attained a competence score (n=5) were from group I (those who had done ALS). The remaining 66 (93%) advanced student nurses failed the competence test. Therefore 93% of advanced student nurses failed the competence test and could not be trusted to carry out safe and effective CPR.

The best performed item on the checklist by group I was opening the airway with 91% of the participants meeting the criterion. The other two best performed items were response check and locating compression position between every set of compressions 87% of the participants getting credit for the two items. The worst performed item for the group was calling for help and performing chest compressions correctly, 56.5% of the participants managed to be credited for the two items. The performance of this group, though better than that of group II, was very low with 78% of them failing to meet the competence score. There was no single item from the checklist that was performed 100% by the study participants

In group II the best performed item was opening the airway with 79.2% of the participants met this criterion. The other two best performed items were response check and giving the first two rescue breaths with 56.3% of the participants performing them. The general performance for this group was very poor and none could be trusted to perform safe and effective CPR successfully.

There was a general decline in CPR performance for both groups from item one to the last item more so for group II. This decline could be associated to rescuer fatigue as explained by the study by Heidenrich, Berg, Travis et al. (2006:1022) and Hightower, Thomas, Stone et al. (1995:303) which indicate that the quality of chest compressions and rescue breaths decline from the first minute and by the fifth minute exhaustion is evident. The lack of order in the demonstration of CPR was disturbing. The International Liaison Committee on Resuscitation stresses the importance of the 'sequence in action' when conducting CPR (Handley, Becker, Allen et al., 1997).

5.3.3 Comparing the Two Groups

Overall group I had the highest mean score of 12.3 out of 15 as compared to 7.77 for group II. Though group I had a high mean score 78% of the participants in the group failed to meet the competence score and were therefore judged not competent to perform safe and effective CPR. All the participants in group II failed the competence test and were judged to be not competent to perform safe and effective CPR. The general CPR skill performance for the two groups was very disappointing producing only five participants who could be trusted to perform safe and effective CPR. These findings are in agreement with those of a previous study by Greig et al. (1996).

The poor performance by 66 students is an indication of deterioration of skills which arises if the skills are not practiced on or if retraining is not done periodically. This finding is consistent with that of previous studies which have demonstrated deterioration of skills beginning from the second week post training (Moule and Knight, 1997; Madden, 2006).

The study confirmed differences in CPR training for the advanced nursing students. Group I had advanced life support training while group II advanced student nurses had basic life support training only. This institutionalized disparity in CPR training for students undergoing the same level of training cannot be accepted and must be reviewed. Once these students graduate and return to service regardless of the specialty they undertake, they are expected to provide leadership when emergencies arise because of the advanced training they have received.

5.4. Study Limitations

The study was done in one training center thus the study findings from this study cannot be generalized to students in other nursing training colleges in Kenya. Though the sample for this study was small it was representative for the target population as it encompassed more than 70% of class. The study was cross sectional and not longitudinal and therefore could not trend the effect of time on skill deterioration.

It was not easy to quantify the adequacy of the tidal volumes attained by the study participants when giving rescue breaths because the manikin used could not measure this. Thus a participant was judged to have given adequate tidal volume if the volume of breath given caused a chest rise. The study concentrated in assessing the skill component of CPR, the cognitive component was not tested. Skill performance to a certain degree measures the knowledge component, because there must be integration of the two if one is to excel in either.

5.5. Recommendations

5.5.1 CPR and Nursing Practice

Nursing students both at the basic and post basic level undergo some form of CPR training. This indicates the importance attached to imparting CPR skills for the nurses. This however needs to be enhanced in order to ensure that student nurses and practicing nurses acquire and retain the knowledge for eventual use when the need arises. It is therefore recommended that policy makers charged with drawing the curriculum for nurses both in the colleges and the hospitals need to ensure that nurses who are the first responders in hospitals in case of emergencies are proficient in CPR skills.

The study by Badger and Rawstorne (1998) acknowledges that nurses play a central role during CPR and are often the first responders when an emergency arises in the hospital set up. The researchers go ahead to point out that imparting of technical skills associated with advanced life support should not take precedence to acquisition of basic life support skills by first responders that are geared towards preservation of basic life functions. CPR knowledge and skill acquisition is central to the nursing profession.

5.5.2 CPR and Nursing Education

The knowledge and skills that nurses acquire and finally put into practice in the field are acquired in training colleges and universities. These institutions play a central and critical role in ensuring that student nurses both in the basic training and post basic training acquire the necessary and vital knowledge and skills. It is therefore their duty to ensure that the graduates that come out of their institutions are competent to perform safe and effective CPR.

It is important to take into consideration that the knowledge and skills disseminated should be commensurate to the level of training that the student is being prepared for. Advanced student nurses are being prepared for greater responsibility and leadership and the CPR training they receive should reflect this expanded role. The difference in CPR training that was evident in this study is not acceptable and should be addressed. It is recommended that all advanced nursing students irrespective of specialty receive ALS training. The study has identified items which were problematic to perform such as calling for help, pulse check, taking too much time performing certain items, locating compression position and giving inadequate rescue breaths among others. This finding is in agreement with the findings of a previous study by Lewis et al. (1993). These are the areas that should be given more emphasis during training until the trainees have mastered them.

The American Heart Association recommends that health care professionals should receive CPR training up to advanced level and retraining is important to ensure retention (American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care, 2005b). It is currently an accepted practice in most countries all over the world that all students pursuing basic training in health care related courses receive compulsory BLS training before being allowed into the clinical areas and in some cases students are also required to undergo advanced life support (ALS) training before they graduate (Graham and Scollon 1996:108; Jordan and Bradley, 2000; Hamilton, 2004:295). The participants in this study underwent CPR training during basic as well as post basic training but at different levels in post basic training. The approach needs to change so as to ensure equality and quality of CPR training for all advanced nursing students.

5.5.3 CPR and Nursing Research

Since this study used only one training college it is the researcher's recommendation that further research needs to be conducted in all three colleges that offer post basic training in the various nursing specialties. Such a study will provide a base for generalization of the study findings. The design for such a study should if possible be experimental and longitudinal in order to assess the effect of time on retention and to control as much as possible the extraneous variables that may influence the study findings.

There is also need to conduct further research on CPR targeting students undergoing basic nursing training and also nurses practicing in the field, emphasis for such studies should incorporate the following; CPR training done, the timing of the training, the length of training, determining whether there is formal or informal assessment after training and qualification of those charged with the training.

5.6. Conclusion

The importance of nurses being competent in CPR is a critical health care issue and patient survival is dependent on this to a large degree. The findings from this study shows a negative picture of CPR preparedness of advanced student nurses and the difference in the level of training that is provided. It is hoped that this study acts as a base for change in CPR training for nurses and spur further research. If this done, and the changes implemented it will ultimately improve, the quality and CPR preparedness for the nurses coming out of the training colleges.

It is important for training colleges to realize and capitalize on their central role, which is dissemination of knowledge by ensuring that students graduate having acquired the knowledge and well equipped with CPR skills. The current CPR training that advanced nursing students receive is not adequate to meet the needs that will confront advanced practice nurse once he/she qualifies. The onus is for the training institution to take charge and provide CPR training at advanced level for all the students and ensure acquisition through formal assessments. Hospitals in Kenya did not train or retrain health care professionals on CPR until after the after the 1998 terrorist bombings in Nairobi. From that point on many hospitals on the major hospitals both in private or public sectors started training and retraining their staff in disaster preparedness which includes CPR training (Njuguna, 2005; Wollschlaeger, 2005). This is on a lower scale though, and training colleges are still better placed for they have the primary responsibility for conducting CPR training. Ultimately, the goal for training colleges is to prepare nurses that are competent and confident to handle cardiac or pulmonary related emergencies.

This study has shed light on the CPR skill competence for advanced student nurses in a Kenyan Medical training college and the level of CPR training that they undergo. The findings from this study have shown that the majority of the students are not competent to perform CPR to the desired level. The study has also identified the differences in training for the advanced student nurses and this was reflected in their skill performance. CPR knowledge and skills are central to the call of nursing; nursing colleges have an obligation to train and ensure that the nurses graduate having acquired the life saving CPR skills. Only in that way will the graduating nursing students be able to perform their central role which is to preserve and promote life.

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ANNEXURE I

BIOGRAPHIC INFORMATION **CODE ( )**

You are requested to fill in the following information by placing a tick in the appropriate Box or indicating the number of years worked in a particular unit or ward.

1. Age

20-24	
25-29	
30-34	
35-39	
>40	

2. Rank

SNO	
NO I	
NO II	
NO III	

3Gender

Male	
Female	

4. Previous experience

Ward or Unit worked in	Duration
Theatre	
Renal	
Trauma	
Ophthalmology	
Surgical	
Medical	
ICU	
Midwifery	
Dental	

Other (specify)…….…….

5. Specialty

ICU	
Theatre	
Renal	
Trauma	
Ophthalmology	
Midwifery	
Community	
Psychiatry	

Other (specify)……..

***I would be very grateful if you would answer the following questions about your Cardiopulmonary resuscitation experience and training by cycling the appropriate response*:**

6. Did you receive CPR training during your basic training? Yes/No

If yes which one? BLS/ALS

7. Have you received any CPR training during this course? Yes/No
If yes which one? BLS/ALS

8. What qualification did you get after your basic training? KRN / KRCHN / KRM

Thank you for your help.

ANNEXURE II

Performance Evaluation Checklist for Adult One Rescuer CPR

Instruction to Rescuer: You enter a room and find an adult lying still on the floor. There are no signs of trauma. Demonstrate how you would approach the casualty and the emergency actions you will take to resuscitate. There is no equipment on sight. I shall not offer any advice or opinion other than to report the condition of the casualty. Please start and continue until I ask you to stop. ***(Score the participant by placing 1 on the performed column if the step is performed or 0 in the not performed column if the step is not performed as the rescuer demonstrates).***

Participant code ( ) Date……

Performance guidelines (Research assistant cues to rescuer are in bold italics)	**Performed**	**Not Performed**
1. Checks responsiveness (taps shoulders and calling aloud) ***(Unresponsive)***		
2. Calls for help or indicates help should be called		
3. Opens airway (head tilt-chin lift maneuver)		
4. Assesses for breathing (look listen and feel) ***(no breathing)***		
5. Gives 2 slow breaths that cause the chest to rise (2 seconds per breath) repositions the head if does not rise and try again ***(chest rises).***		
6. Checks carotid pulse unilaterally for at least 5 seconds ***(no signs of circulation).***		
7. Locates compression position by land marking.		
8. Performs 15 compressions.		
9. Opens airway using head tilt-chin lift maneuver.		
10. Gives 2 slow breaths such that the chest rises twice		
11. Repeats steps 8, 9, 10 and 11 three more times.		
12. Opens airway using head tilt-chin lift maneuver between every set of compressions.		
13. Gives 2 slow breaths with 2 chest rises between every set of compressions.		
14. Locates compression position between every set of compressions.		
15. Re-assess for circulation at the end of the four cycles		
Total score		

Final score……

ANNEXURE III

STUDY TITLE: CARDIOPPULMONARY RESUSCITATION (CPR) COMPETENCE AMONG ADVANCED STUDENT NURSES IN A KENYAN MEDICAL TRAINING COLLEGE.

INFORMATION SHEET

RESEARCHER: KIPSANG JOHN Msc. NURSING STUDENT

Dear----------

(Potential participant)

I am a master's student currently registered at the University of the Witwatersrand, Department of Nursing Education. I am conducting a study to find out Cardio-pulmonary resuscitation (CPR) competence among advanced nursing students as part of my course requirement. You are invited to participate in the study. Your inclusion will be subject to your informed consent to participate in the study. Although the study may not benefit you directly, it will provide essential information that may be used to effect changes in CPR training, assessment and re-training of nurses on CPR. Your participation in the study does not pose any risk or discomfort to you. You are assured that I am not a staff member in the college in which you are studying and therefore I am not involved in the decision making in the college and neither am I involved in evaluation of the students. The two research assistants who will assist in data collection are not employees of the college and are not linked to the teaching or evaluation of students in the college you are enrolled in. You are assured that this study does not form part of the college evaluations or examinations and will not be used for that purpose. The quality of your performance during the study will be held in confidence and will not be discussed with the college administration. The use of research assistance is solely for the purpose of enhancing study credibility and to shorten the data collection period.

The study and its procedures have been approved by postgraduate and the ethics committees of the University of the Witwatersrand, Johannesburg, South Africa. Permission to conduct study has been sought from the Director of the Medical Training College and permission has been granted. Once you consent to participate in the study you will be requested to: (1) Fill in the checklist your age, gender, past experience your specialty, CPR training that you received in the past and the one you received in the current training. (2) You will also be requested to perform a one rescuer adult CPR on a manikin. Participation in the study will take approximately 20 minutes. Participation in the study is voluntary and you can withdraw consent at any point without penalty or loss. Steps will be taken to ensure that during data collection, you and the research assistant will be the only ones in the room and no other person will witness the demonstration, this is in order to ensure your privacy.

Your name as a participant will not be used in the checklist but a code will be used so that the information collected in the checklist will not be linked to your name. Raw data captured during data collection will be handled by me (researcher) and the research assistants only. Once data analysis is complete the raw data will be destroyed.

Feel free to ask any questions concerning the study and your participation in the study through the following contacts +27723493260, +254722433620 and arsenwo@yahoo.com.

Yours faithfully

John Kipsang

ANNEXURE IV

CARDIOPULMONARY RESUSCITATION (CPR) COMPETENCE AMONG ADVANCED STUDENT NURSES IN A KENYAN MEDICAL TRAINING COLLEGE

CONSENT FORM

I---------- read the information sheet and I have been accorded the opportunity to ask questions regarding the study. I have comprehended the information and do give my consent to take part in the study by appending my signature.

Subjects signature----------Date----------

I John Kipsang have explained the study to the above subject and have sought his /her understanding for informed consent.

Investigators signature----------Date----------

ANNEXURE V

AMERICAN HEART ASSOCIATION ONE RESCUER ADULT BLS GUIDELINES

The association recommends that before performing CPR the rescuer or rescuers should ensure scene safety. One-rescuer CPR should be performed as follows:

1. **Assessment**: Determine unresponsiveness (tap or gently shake the victim and shout). If unresponsive,
2. **Activate the EMS system**: This should be performed according to local practice. In many countries and regions, activation of the EMS system is delayed until it has been determined that the victim is not breathing.
3. **Airway**: Position the victim and open the airway by the head tilt–chin lift or jaw-thrust maneuver.
4. **Breathing**: Assess breathing to identify absent or inadequate breathing.
    - If the victim is unresponsive with normal breathing, and spinal injury is not suspected, place the victim in a recovery position, maintaining an open airway.
    - If the adult victim is unresponsive and not breathing, begin rescue breathing. In the United States and many other countries, 2 initial breaths are provided, but up to 5 breaths are recommended in areas such as Europe, Australia, and New Zealand. If you are unable to give the initial breaths, reposition the head and reattempt ventilation. If you are still unsuccessful in making the chest rise with each ventilation after an attempt and reattempt: Lay rescuers

should provide chest compressions and begin the cycle of 15 compressions and 2 ventilations. Each time you open the airway to attempt ventilation, look for an object in the throat. If you see an object (such as a foreign body), remove it. Healthcare providers follow the unresponsive FBAO sequence.

- Be sure the victim's chest rises with each rescue breath you provide.
- Once you deliver the effective breaths, assess for signs of circulation.

5. **Circulation.** Check for signs of circulation: after the initial breaths, look for normal breathing, coughing, or movement by the victim in response to the initial breaths. Healthcare providers should also feel for a carotid pulse, take no more than 10 seconds to do this. If there are no signs of circulation, begin chest compressions:
    - Locate proper hand position.
    - Perform 15 chest compressions at a rate of approximately 100 per minute. Depress the chest 11/2 to 2 inches (4 to 5 cm) with each compression. Make sure you allow the chest to rebound to its normal position after each compression by removing all pressure from the chest (while still maintaining contact with the sternum and proper hand position). Count "1 and, 2 and, 3 and, 4 and, 5 and, 6 and, 7 and, 8 and, 9 and, 10 and, 11, 12, 13, 14, 15." (Any mnemonic that accomplishes the same compression rate is acceptable. For ease of recollection, use the "and" only up to the number 10.)
    - Open the airway and deliver 2 slow rescue breaths (2 seconds each).
    - Find the proper hand position and begin 15 more compressions at a rate of 100 per minute.
    - Perform 4 complete cycles of 15 compressions and 2 ventilations.

6. **Reassessment:** Reevaluate the victim according to local protocol.
    - In the United States, this will be after 4 cycles of compressions and ventilations (15:2 ratio); elsewhere, reevaluation may be recommended only if the victim shows some sign of recovery. Check for signs of circulation (10 seconds). If there are no signs of circulation, resume CPR, beginning with chest compressions. If signs of circulation are present, check for breathing.
    - If breathing is present, place the victim in a recovery position and monitor breathing and circulation.
    - If breathing is absent but signs of circulation are present, provide rescue breathing at 10 to 12 times per minute (1 breath every 4 to 5 seconds) and monitor for signs of circulation every few minutes.
    - If there are no signs of circulation, continue compressions and ventilations in a 15:2 ratio.
    - Stop and check for signs of circulation and spontaneous breathing every few minutes (according to local protocol).
    - Do not interrupt CPR except in special circumstances.
    - If adequate spontaneous breathing is restored and signs of circulation are present, maintain an open airway and place the patient in a recovery position.

KENYATTA NATIONAL HOSPITAL
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Ref: KNH-ERC/ 01/3916

Date: 22nd November, 2006

Dr. Kipsang John,
University of Witwatersrand R14/49
South Africa

Dear Dr. Kipsang

RESEARCH PROPOSAL: "CARDIOPULMONARY RESUSCITATION (CPR) COMPETENCE AMONG ADVANCED STUDENT NURSES IN A KENYAN MEDICAL TRAINING COLLEGE" (P148/7/2006)

This is to inform you that the Kenyatta National Hospital Ethics and Research Committee has reviewed and **approved** the revised version of your above cited research proposal for the period 22nd November, 2006 – 21st November, 2007.

You will be required to request for a renewal of the approval if you intend to continue with the study beyond the deadline given.

On behalf of the Committee, I wish you fruitful research and look forward to receiving a summary of the research findings upon completion of the study.

This information will form part of database that will be consulted in future when processing related research study so as to minimize chances of study duplication.

Yours sincerely

PROF A N GUANTAI
SECRETARY, KNH-ERC

c.c. Prof. K.M.Bhatt, Chairperson, KNH-ERC
The Deputy Director CS, KNH
The Dean, Faculty of Medicine,
Chairman, Dept. of Obs & Gynae, UON
The HOD, Medical Records, KNH
Supervisors: Prof. J. Bruce, University of Witwatersrand, South Africa
Dr. Anna Karani, School of Nursing Sciences, UON

ANNEXURE VII

Telegrams: "MEDTRAIN" Nairobi
TELEPHONE: NAIROBI 2725191, 2725711/14
Fax: 2722907 Email: info@kmtc.ac.ke
Please address all correspondence to:
The Director
When replying please quote

KENYA MEDICAL TRAINING COLLEGE
P.O. BOX 30195-00100
NAIROBI

Ref: No. KMTC/ADM/23B/VOL.II /(74)

Date 18TH JANUARY 2007

Dr. Kipsang John
University of Witwatersrand r14/49
South Africa

RE: PERMISSION TO CONDUCT RESEARCH AT KENYA MEDICAL TRAINING COLLEGE

Please refer to our letter Ref. KMTC/ADM/23B/VOL. I/(6) of 3rd July 2006. Since Kenyatta National Hospital's letter dated 22nd November 2006 Ref. KNH-ERC/01/3916 approves that you do your research there. The College has decided to grant your request.

V.M. Kangero
FOR: DIRECTOR

Faculty of Health Sciences
UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

7 York Road PARKTOWN Johannesburg 2193 Telegrams WITSMED Telex 4-24655.SA
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MR J KIPSANG
ROOM 413, WEST CAMPUS VILL
PO WITS 2050
1 JAN SMUTS AVENUE
2050

APPLICATION NUMBER 0502499H
STATUS (DEG 67) (MM033) PZZ

2006-06-06

Dear Mr Kipsang

Approval of protocol entitled Cardiopulmonary resuscitation (CPR) competence among advanced student nurses in a Kenyan medical training college

I should like to advise you that the protocol and title that you have submitted for the degree of Master Of Science In Nursing (Full-Time) (Coursework) have been approved by the Postgraduate Committee at its recent meeting. Please remember that any amendment to this title has to be endorsed by your Head of Department and formally approved by the Postgraduate Committee.

Prof JC Bruce has/have been appointed as your supervisor/s. Please maintain regular contact with your supervisor who must be kept advised of your progress.

Please note that approval by the Postgraduate Committee is always given subject to permission from the relevant Ethics Committee, and a copy of your clearance certificate should be lodged with the Faculty Office as soon as possible, if this has not already been done.

Yours sincerely

S Benn (Mrs)
Faculty Registrar
Faculty of Health Sciences

Telephone 717-2075/2076

Copies - Head of Department____Supervisor/s

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Kipsang

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER M060445**
PROJECT	Cardiopulmonary Resuscitation Competence among Adavanced student Nurses in a Kenyan Medical Trainging Coll.
INVESTIGATORS	J Kipsang
DEPARTMENT	Dept of Nursing Education
DATE CONSIDERED	06.05.05
DECISION OF THE COMMITTEE*	

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

DATE 06.06.02 **CHAIRPERSON** .....
pp (Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable

cc: Supervisor : Prof J Bruce

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10005, 10th Floor, Senate House, University.
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to a completion of a yearly progress report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

ANNEXURE X

Competence Definitions

Item 1

Checks unresponsiveness by touching the manikin and speaking loudly: participant is close to the manikin, uses a loud voice, touches and shakes the manikin: the unresponsiveness check must precede any intervention including opening of the airway.

Item 2

Calls for help or indicates help should be called: participant either simulates a phone call or just shouts help! Or any other clear instruction calling for help. Sequence: this must occur after a check of unresponsiveness and before starting chest compressions. If the there is no unresponsiveness check, call for help must follow either a pulse or breathing check.

Item 3

Opens airway using head tilt/chin lift: participant kneels beside the manikin near the shoulders and uses one hand to push down on the forehead and the other to lift the chin. There should be obvious movement of the head from the neutral position. Nose may or may not be pinched. Sequence: this step must precede the breathing check. If the airway is opened for the first time to give breaths, do not count it as the open airway step.

Item 4

Checks breathing for at least 5 seconds: participant places his/her face near the manikin's (the participant's ear should be above the manikin's nose) and looks at the chest, listens for breath sound and feel for the breath. Participant counts silently to him/her self or loudly

one-one thousand, two one thousand up to five. Short breathing checks do not count. Sequence: this must occur before any breaths are given and the airway must have been opened.

Item 5

Attempts at least two breaths such that the chest rises at least once and not more than twice: participant places his/her mouth over the mouth of manikin and exhales into the manikin. At least once and not more than twice, chest rise should be visible. Sequence: this must precede any chest compressions. Note: do not consider the volume of ventilation, leaking of air, or stomach distention.

Item 6

Second attempt in giving rescue breaths if the first attempt in item 5 fails, by performing head-tilt chin-lift maneuver. Conditions set in item 5 apply.

Item 7

Checks carotid pulse for a minimum of 5 seconds: participant places fingers on ‘Adam’s apple’ and slips fingers towards him or herself into the ‘groove’ unilaterally or uses an alternative method to establish correct position and then maintains position of fingers for 5 seconds by counting loudly or silently one-one thousand, two-one thousand up to 5. Short pulse checks do not count. Sequence: this must occur before any chest compressions.

Item 8

Locates compression position by feeling or baring chest and looking: participant finds position by using one of the following methods: (1) tracing the outline of the ribs and finding the place two fingers above where the ribs come together, (2) finding the xiphoid process and placing two fingers above it, (3) baring the chest and visually finding a point on the sternum between the nipples. Note: this item does not assess where the hands are ultimately positioned, only whether one of the three methods was used.

Item 9

Performs 15 compressions. Compressions must result in visible depression of the sternum and complete release of the sternum. 13 to 17 compressions are accepted. Note: do not consider the dept of compressions and rate.

Item 10

Opens airway using head-tilt/chin-lift maneuver: as in item 3, but following the first sequence of compressions.

Item 11

Attempts at least two breaths such that the chest rises at least twice and not more: as in item 5, but following first sequence of compressions

Item 12

Repeats items 8, 9, 10 and 11 at least 3 more times: performs at least 3 more cycles of 15 compressions interspersed with breathing attempts.

Item 13

Opens airway between every set of compressions using head tilt/chin-lift maneuver. As in item 3, but check only if done for each additional set of compressions.

Item 14

Attempts at least two breaths such that the chest rises at least once and not more than twice between every set of compressions: as in item 5, but check only for if done for each additional set of compressions.

Item 15

Locates compression position between every set of compressions: as in item 8, but only check if done for each additional set of compressions.