



**ASSESSMENT OF KNOWLEDGE AND SKILLS ABOUT BASIC LIFE SUPPORT
AMONG NURSES IN ONE REFERRAL HOSPITAL IN RWANDA: A THEORETICAL
APPROACH**

USABUWERA Marie Claire

College of Medicine and Health Sciences

School of Nursing and Midwifery

MASTERS OF SCIENCE IN NURSING (CRITICAL CARE&TRAUMA)

2017



**ASSESSMENT OF KNOWLEDGE AND SKILLS ABOUT BASIC LIFE SUPPORT
AMONG NURSES IN ONE REFERRAL HOSPITAL IN RWANDA: THEORETICAL
APPROACH**

By

USABUWERA Marie Claire

Registration Number: 216340004

A dissertation submitted in partial fulfillment of the requirements for the degree of

MASTERS OF SCIENCE IN NURSING (CRITICAL CARE&TRAUMA)

In the College of Medicine and Health Sciences

Supervisor: Dr Lakshmi Rajeswaran

July 2017

DEDICATION

I would like to dedicate to:

- God Almighty
- My lovely husband NSENGIYUMVA Jean De Dieu
- My lovely son ISHIMWE Blaise,
- My lovely son MUGISHA Fred and
- Colleagues and lecturers of the University of Rwanda, College of Medicine and Health Sciences.

ACKNOWLEDGEMENT

This piece of work was achieved with intervention of many persons to whom I address the deep gratitude.

First of all I am grateful to the Government of Rwanda to provide the space for higher education and specialization through the University of Rwanda College of Medicine and Health Sciences.

My special thanks are addressed to the staff of the College of Medicine specifically the Master of Critical Care and Trauma Nursing.

I would like to extend my gratitude to Dr Lakshmi Rajeswaran for the supervisory role played during the journey of my research work.

My special thanks are also addressed to the staff of the research centre for the technical support provided during the research development process.

ABSTRACT

Background: Cardiac arrest is among the leading cause of death globally. Health care providers including nurses are the ones who are always with patients and the ones to discover the victims experiencing cardiac arrest. Based on this, nurses should have basic life support knowledge and skills in order to be able to provide quality care to those victims.

Aim: This study aimed to assess nurses' knowledge and skills with basic life support at the University Teaching Hospital of Butare.

Research design and approach: A quantitative cross sectional method was used to achieve the objectives of the present study. The data were collected by means of adapted questionnaire from AHA; the knowledge was examined by 15 multiple choice questions and skills was examined by 10 questions. The data were analyzed with IBM SPSS version 21 and presented using tables and charts, and where possible, the relationship between the knowledge scores and demographic characteristics were reported.

Results: 116 nurses completed the questionnaire out of the total of 141 nurses from different health units at the Butare Teaching Hospital namely Internal medicine, Surgery, Pediatrics, Intensive Care and Emergency unites. The 25 out of 141 nurses did not complete the questionnaires. The mean overall knowledge scores were very low (5.72 ± 2.466). Report on skills show that the overall mean skills score is also very low (3.4224 ± 1.31976) of all study participants who responded to all questions.

Conclusion: The present study reported low levels of knowledge and low level of skills on BLS among nurses at University teaching Hospital of Butare. More in service training on BLS would improve the situation. Assessing BLS knowledge & skills as a quasi-experimental design: pre-test, intervention and re-test after 6 months would allow the researcher to know the retention level of knowledge and skills on BLS.

Key words: Basic life support, knowledge, skills, nurse.

Definition of Key terms

Basic life support (BSL): is operationally defined as maintaining a patient's airway, supporting breathing and circulation without the use of equipment other than a simple airway device or protective shield (Bruce, 2011).

Knowledge: Facts, information, and skills acquired through experience or education; the theoretical or practical understanding of a subject. (Oxford living dictionaries, 2015)

Knowledge: In this study, knowledge refers to the awareness of basic principles of basic life support by the nurses at CHUB.

Skills: The ability to do something well, expertise (Oxford living dictionaries, 2015)

Skills: In this study, skill is applied as having ability to perform basic life support when a patient experiences cardiac arrest.

Nurse: is a person who having pursued and successfully completed all educational courses and recognized by the National Council after having successfully passed licensing exams prepared and/or organized by the National Council in collaboration with the relevant organ(International Council of Nurses, 2017).

List of symbols and acronyms

AED: Automated external defibrillator

AHA: American Heart Association

BLS: Basic Life Support

CA: Cardiac arrest

CHUB: University Teaching Hospital of Butare

CPD: Continuous Professional Development

CPR: Cardiopulmonary resuscitation

ECC: European cardiac care

ICU: Intensive Care Unit

ILCOR: International liaison committee on resuscitation guidelines

SAMU: Service d'Assistance Médicale d'Urgence

TABLE OF CONTENT

DEDICATION	i
ACKNOWLEDGEMENT	ii
ABSTRACT	iii
Definition of Key terms	iv
List of symbols and acronyms	v
LIST OF TABLES	viii
LIST OF FIGURES	ix
CHAPTER 1. INTRODUCTION	1
1.1. Background	1
1.2. Problem statement	3
1.3. MAIN OBJECTIVE OF THE STUDY	4
1.4. SPECIFIC OBJECTIVES	4
1.5. RESEARCH QUESTIONS	4
1.6. SIGNIFICANCE OF STUDY	5
CHAPTER 2. LITERATURE REVIEW	6
2.1.1 Chain of survival	Error! Bookmark not defined.
2.1.3. Adult Basic Life Support guidelines	7
2.2. Empirical studies conducted in assessing nurses knowledge and skill on BLS	9
CHAPTER 3. RESEARCH DESIGN AND METHODOLOGY	15
3.1. Introduction	15
3.2. Research approach	15
3.3. Research design	15
3.4. Research setting	15

3.5. Population.....	16
3.6. Sampling.....	16
3.6.1. Sample size.....	16
3.6.2. Sampling strategy.....	17
3.7. Data collection.....	17
3.7.1. Data collection instruments.....	17
3.9. DATA COLLECTION PROCEDURE.....	18
3.10. Data management.....	19
3.11. Dissemination of data.....	19
3.12. Data analysis	19
3.13. Ethical consideration	19
3.14. LIMITATIONS AND CHALLENGES	20
CHAPTER 4. RESULTS AND INTERPRETATION	22
CHAPTER 5. DISCUSSION.....	35
CHAPTER 6. CONCLUSION AND RECOMMENDATIONS	39
REFERENCES.....	41
APPENDICES.....	a

LIST OF TABLES

Table 1 Socio demographic data of the study participants	23
Table 2 Response to knowledge about BLS	24
Table 3 Response to skills on BLS	27
Table 4 Knowledge scores	29
Table 5 Knowledge levels	30
Table 6 Skills scores	31
Table 7 Levels of skills	31
Table 8 The relationship between levels of knowledge on basic life support and socio demographic variables	32
Table 9 The relationship between levels of knowledge on basic life support and socio demographic variables	34

LIST OF FIGURES

Figure 1 Chain of survival	6
Figure 2 The algorithm for adults basic life support: adopted from American Heart Association, 2015.....	9
Figure 3 AACN Synergy Model.....	12

CHAPTER 1. INTRODUCTION

1.1. Background

Emergency cases are the leading cause of death globally (Xanthos *et al.*, 2009). In Europe alone, cardiac arrest (CA) is associated with 7,000,000 death each year (Xanthos *et al.*, 2009).

In the United States of America (US) cardiac Arrest is associated with more than 500 000 deaths of children and adults per year (Bhanji *et al.*, 2015). Cayley, 2011 argues that the emergency care of sick or injured patients is the solution to managing the emergency cases reported to be high globally.

When a patient experiences a respiratory arrest, cardiac arrest or obstructed airway, you need to act swiftly and promptly starting with basic life support skills (AHA, 2015) as Basic Life Support (BLS) is the foundation for saving lives after cardiac arrest (Kleinman *et al.*, 2015).

The management of emergency cases face many challenges, in the primary healthcare settings, and in the hospital in sub-Saharan Africa (Cayley, 2011).

Fundamental aspects of adult Basic life support (BLS) which refers to maintaining an airway and supporting breathing and the circulation to rescue a patient who is experiencing respiratory, cardiac arrests or airway obstruction (Bruce, 2011) is reported to be one of the technique introduced to be used in managing emergency cases. Bruce observed that, it comprises the initial assessment, airway maintenance, expired air ventilation (rescue breathing; mouth-to-mouth ventilation) and chest compression. The purpose of BLS is to maintain adequate ventilation and circulation until a means can be obtained to reverse the underlying cause of the arrest.

Evidence shows that approximately 70% of all cases of cardiac arrest occur out of hospital, often in the victim's home (AHA, 2015), therefore early intervention would avert effects of sudden death that occur worldwide. It is believed that provision of ambulance crews and education of the general public about the cardiopulmonary resuscitation is among the options to save lives of people.

Health workers including nurses are at the forefront to ensure safe and timely response to emergency calls when a deadly incidence occurs. The study by Xanthos et al., 2009 has proved that nurses are more efficient than doctors in performing and teaching basic life support and automated external defibrillation and recommended that more studies regarding knowledge transference regarding BLS/AED can elucidate hidden aspects or even faults of the learning experience and advance the teaching process. Guidelines had been put in place by different resuscitation bodies to be adopted and used for basic life support in emergency situations. The guidelines are used to equip the general public and health care providers in particular with knowledge and skills to handle emergency cases with little difficulties. In this regards, in 2010, American Heart Association has put in place guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care (Berg *et al.*, 2010). The guidelines state that basic life support (BLS) is the foundation for saving lives following cardiac arrest. The recent publication of Basic Life support for health care providers (2015) by the American Heart Association recommends that the compression should be between 100 to 120 compression par minute and respiration is 30.

The 2015 guidelines stipulate that resuscitation education is primarily focused on ensuring widespread and uniform implementation of the science of resuscitation (Bhanji *et al.*, 2015). In the guidelines the training package was developed to close the gap between actual and desired performance by providing lay providers with CPR skills and the self-efficacy to use them. The guidelines are being adapted by different countries including Rwanda, but mostly targeting the physicians (Cayley Jr, 2011), while evidence showed that nurses are more efficient in both teaching and learning basic life support (Xanthos *et al.*, 2009). A study conducted in a Greek Hospital in 2012 to assess the theoretical knowledge of nurses in performing BLS revealed the low levels of BLS theoretical knowledge, taking into consideration that the failure rate in the written test was 84.2% (Xanthos *et al.*, 2012). Although some success and failures to perform BLS by nurses are documented in different settings (Sutton *et al.*, 2011; Onyeaso, 2016), their role in management of emergency cases are still of importance. There are challenges associated with emergency medicine and nursing care in the developing world and in Rwandan context. Therefore, the present study will shed light on knowledge and skills of nurses towards basic life support in University teaching Hospital of Butare.

1.2. Problem statement

Nurses are usually the first responders in cases not only in hospital cardiac arrest but also in community's emergency calls; therefore, their competence in Basic Life Support (BLS) is important in improving patient outcome. However, evidence shows that nurses have knowledge gaps in the basic life support guidelines (Xanthos *et al.*, 2012). The same study recommends that attendance at a BLS course once is not enough as there is considerable decline in knowledge and skills in a short period of time following the course. In the same line the international resuscitation guidelines(ILCOR) recommends that all healthcare professionals should be able to perform basic life support including defibrillation with an automated external defibrillator (AED) because of the potential of a cardiac arrest in every healthcare facility (M\"akinen *et al.*, 2006). In Rwandan hospitals, nurses play a very big role in rescue of emergency victims through a SAMU (Service d'Assistance Médicale d'Urgence) initiative to give a timely response to emergency calls. Furthermore, the reported emergency care poor outcomes in developing world are reported to be associated with the knowledge and skills acquired by the health providers including nurses (Calvello *et al.*, 2013). In Rwanda, the training on basic life support has been established in some hospitals (King Faisal hospital and Rwanda Military Hospital) but in the referral hospital the training is yet to be introduced (Norgang *et al.*, 2015) and levels of BLS knowledge and skills amongst registered nurses at CHUB remain unexplored. This motivated the researcher to find out the existing knowledge and theoretical skills about BLS among nurses working at the University Teaching Hospital of Butare.

1.3. MAIN OBJECTIVE OF THE STUDY

This study aims to assess nurses' knowledge and theoretical skills about basic life support at the university teaching hospital of Butare with reference to the recommendations by American Heart Association.

1.4. SPECIFIC OBJECTIVES

1. To determine the existing level of knowledge among nurses about Basic Life Support at Butare University Teaching Hospital
2. To identify the existing level of skills theoretically among nurses about BLS at Butare University Teaching Hospital.
3. To determine the possible relationships between the levels of knowledge, theoretical skills and socio-demographic variables.

1.5. RESEARCH QUESTIONS

1. What is the level of knowledge of nurses about Basic Life Support at Butare University Teaching Hospital?
2. What is the existing level of skills on BLS at Butare University Teaching Hospital?
3. What are the possible relationships between the levels of knowledge, theoretical skills and socio-demographic variables?

1.6. SIGNIFICANCE OF STUDY

Critical care nurses are always at the bedsides of critically ill patients. The present study will be therefore used as a tool to increase awareness that basic life support is a precondition in management of critical conditions in hospital setting. It will in addition be of use in multidisciplinary team work during ward rounds at the study site and a learning material for future scholars in the area of critical care medicine. The results may also contribute to CPD review targeting nurses working in different units not only in referral hospitals but also at the district levels. The community at large can use the present piece of work as a material to understand the basic knowledge and theoretical skills that a lay person can use to rescue the victim. Future research will be also informed by the results from the present study and the study can be replicated to different hospitals in Rwanda.

1.7. Conclusion

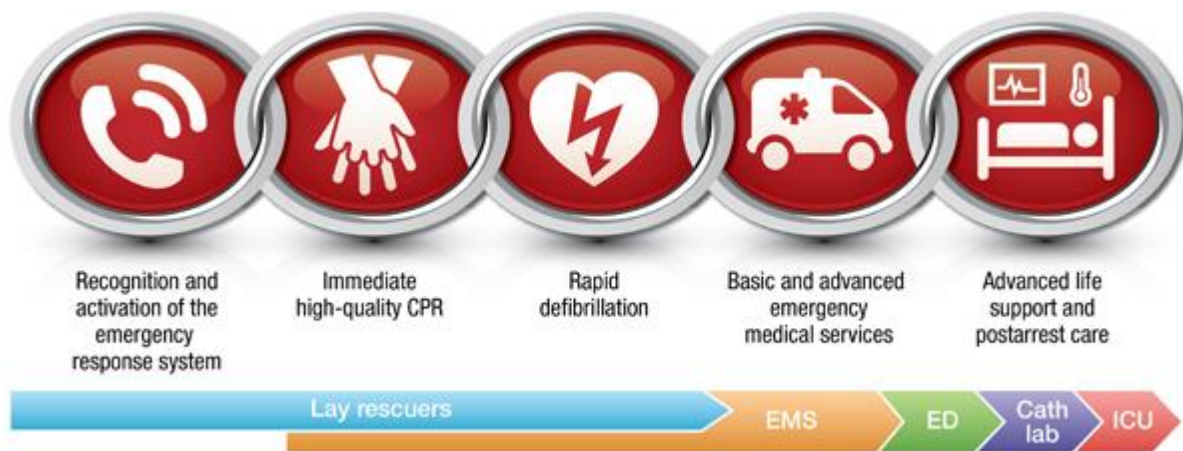
Chapter one describes background, country profile, health care system of Rwanda, problem statement, aim of the study, study objectives, research questions, significance of the study.

CHAPTER 2. LITERATURE REVIEW

This chapter describes the literature review from documented evidence in different sources. In this chapter the chain of survival, Sequences of Cardio Pulmonary Resuscitation (CPR), empirical studies conducted in assessing nurse's knowledge and skills on BLS, and ends with a conclusion. The searching engine included HINARI, and Publication of Medicine (PubMed) of NIH (National Institute of Library). The key words used were basic life support, knowledge and skills. In some instance Boolean operators were used to include or exclude some terminology.

2.1. Basic life support general theories

Figure 1 Chain of survival



(Adopted from American Heart Association, 2015)

The term Chain of Survival provides a useful metaphor for the elements of the European Cardiac Care (ECC) systems concept, and comprises 5 links: immediate recognition of cardiac arrest and activation of the emergency response system, early cardiopulmonary resuscitation (CPR) with an emphasis on chest compression, rapid defibrillation, effective advanced life support, integrated

post-cardiac arrest care. A strong Chain of Survival can improve chances of survival and recovery for victims of heart attack, stroke and other emergencies (AHA, 2015).

2.1.2. Sequences of Cardio Pulmonary Resuscitation (CPR)

Initially CPR sequences were A-B-C (Check Airways, Breathing and Chest Compression to be performed last), in the updated one chest compression comes first and becomes C-A-B, this was suggested by expert group and conformed through systematic analysis to allow early chest compression which allows blood flow for the victim (ILCOR). The study by Atkins et al., 2015 literature argues that the cause of cardiac arrest in children is mostly caused by the asphyxia which could be reversed by allowing blood flow carrying oxygen to reach the heart and other parts of the body. In addition the updated guidelines suggest the best practices as far as CPR is concerned. This includes five components: ensuring chest compressions of adequate rate, ensuring chest compressions of adequate depth, allowing full chest recoil between compressions, minimizing interruptions in chest compressions, avoiding excessive ventilation.

The depth and length of the compression was maintained to be the same for both pediatric and adult patients as it was reported to be associated with good patient's outcomes in adults. The new guidelines maintained the use the adult BLS- recommended chest compression rate of 100/min to 120/min for infants and children.

2.1.3. Adult Basic Life Support guidelines

The International Liaison Committee on Resuscitation (ILCOR) 2015 international evidence review process as it is for the infant basic life support provided expert review guidelines for adults to be adapted and used to save life of the emergency cases especially cardiac arrest (Kleinman *et al.*, 2015).

According to Kleinman et al. 2015, the updates in the 2015 BLS guidelines include: the crucial links in the adult out-of-hospital Chain of Survival is unchanged from 2010; however, there is increased emphasis on the rapid identification of potential cardiac arrest by dispatchers, with immediate provision of CPR instructions to the caller. This Guidelines Update takes into consideration the ubiquitous presence of mobile phones that can allow the rescuer to activate the

emergency response system without leaving the victim's side. For healthcare providers, these recommendations allow flexibility for activation of the emergency response to better match the provider's clinical setting. More data are available showing that high-quality CPR improves survival from cardiac arrest, these include: Ensuring chest compressions of adequate rate – Ensuring chest compressions of adequate depth – Allowing full chest recoil between compressions – Minimizing interruptions in chest compressions – Avoiding excessive ventilation. This Guidelines Update includes an updated recommendation for a simultaneous, choreographed approach to performance of chest compressions, airway management, rescue breathing, rhythm detection, and shocks (if indicated) by an integrated team of highly trained rescuers in applicable settings.

The updated basic life support guidelines are designed in a simplified way to be understood by a lay rescuer in a logical sequence manner. This makes it easy to learn and understand.

The sequences are detailed in the following figure:

According to Kleinman et al., 2015, the main compones of adults basic life support are as follow: Immediate recognition of respiratory distress and cardiac arrest, activation of the emergency response system, getting help and equipment, early cardiopulmonary resuscitation (CPR), rapid defibrillation with an automated external defibrillator (AED).

**BLS Healthcare Provider
Adult Cardiac Arrest Algorithm—2015 Update**

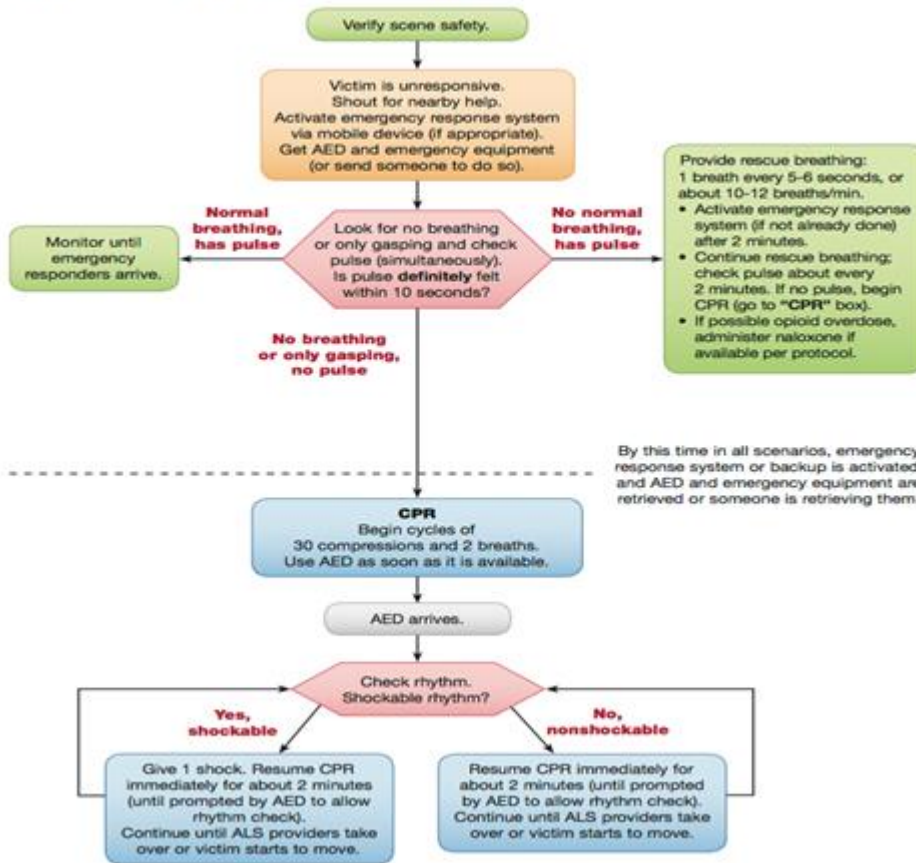


Figure 2 The algorithm for adults basic life support: adopted from American Heart Association, 2015.

2.2. Empirical studies conducted in assessing nurses knowledge and skill on BLS.

The empirical evidence has attempted to document nurses skills on basic life support. In this light the study conducted in Greece to evaluate nurses' theoretical knowledge in Basic Life Support revealed low levels of BLS theoretical knowledge, taking into consideration that the nurses failure to comply with sequence in performing basic life support was 84.2% (Xanthos *et al.*, 2012). The same study indicated that 96.1% of the study group showed enthusiasm and desire to undertake a refresher training although 64% of the participants had not had a refresher BLS training since their graduation. In addition, the same study has indicated that in studied population more than 25% of nurses had BLS training and 61% of them had a refresher BLS course during the preceding 12 months and 4 years from the survey respectively. The study

recommended that nurses have knowledge gaps in the 2005 CPR guidelines and confirmed that attendance at a BLS course once is not enough as there is considerable decline in knowledge and skill in a short period of time following the course. Nurses should be more aware of the usefulness of mastering emergency procedures as they are generally the first responders to a cardiac arrest victim.

Another study conducted in the United States of America to evaluate staff's retention of advanced Cardiac life Support (ACLS) and Basic Life Support (BLS) skills showed that among 133 studied nurses, it was revealed that nurses retain theoretical knowledge but performance skills degrade quickly. ACLS skills degrade faster than BLS skills with 63% passing BLS at 3 months and 58% at 12 months. Only 30% of participants passed ACLS skills at 3 months and 14% at 12 months (Smith, Gilcreast and Pierce, 2008).

The study conducted to investigate the effectiveness of brief bedside "booster" cardiopulmonary resuscitation (CPR) training to improve CPR guideline compliance of hospital-based pediatric nurses in Philadelphia, the United States highlighted that 57% of participants had average compression rates within guideline recommendations; 71% met minimum depth targets ; and 36% had overall CPR compliance (both rate and depth within targets). There were no statistically significant differences in baseline AHA compliance among the training groups for compression rate, depth, or overall CPR compliance (Sutton *et al.*, 2011).

The literature on CPR in African context indicates that Nigeria and South Africa researchers extensively researched on basic life support but more specifically on CPR. In addition, the study conducted in Ethiopia to evaluate knowledge, attitude, and practice and associated factors among clinical year medical students revealed that around 95 % of studied population had excellent knowledge about CPR with which, 36.1% of all students in fifth year had good knowledge 34 .2% in fourth year and 23% interns, and only 6.7% of them had poor knowledge.

This implies the higher the advancement in studies, the better the knowledge and skills in CPR. The same study argued that the CPR training has a crucial role in maintaining practioners' knowledge and attitude whereby improvements in CPR knowledge retentions improved from 57% to 94% after 2 months training. The study concluded that generally students' knowledge on

CPR was not quite enough as there were no formal training after studies, therefore, regular training are recommended to sharpen the knowledge (Tsegaye and Tesfaye, 2015).

In the same vein, the study conducted in Nigeria to assess theoretical knowledge of University medical students at the University of Port Harcourt on cardiopulmonary resuscitation has demonstrated that students with prior CPR training scored higher knowledge and performance as far as CPR is concerned where 50% of the participants who got that training scored above average compared to those who did not(Okonta and Okoh, 2015). Another study conducted in Nigeria to assess impact of basic life support (BLS) training on the knowledge of a group of dental students where a pre and post test were used showed that all the participant had some information on CPR prior to the training, all participants knew the term CPR and documented diverse source of knowledge. The study recommended regular training not only for the medical students but also for other health professionals (Owojuyigbe et al., 2015; Olajumoke et al., 2012). Other Nigerian study attempted to study skills on CPR among school secondary students and compared two groups to study on possible change after exposure to the training. The study revealed that CPR skills of the Nigerian students improved statistically with many ready to offer bystander CPR (Onyeaso and Onyeaso, 2016).

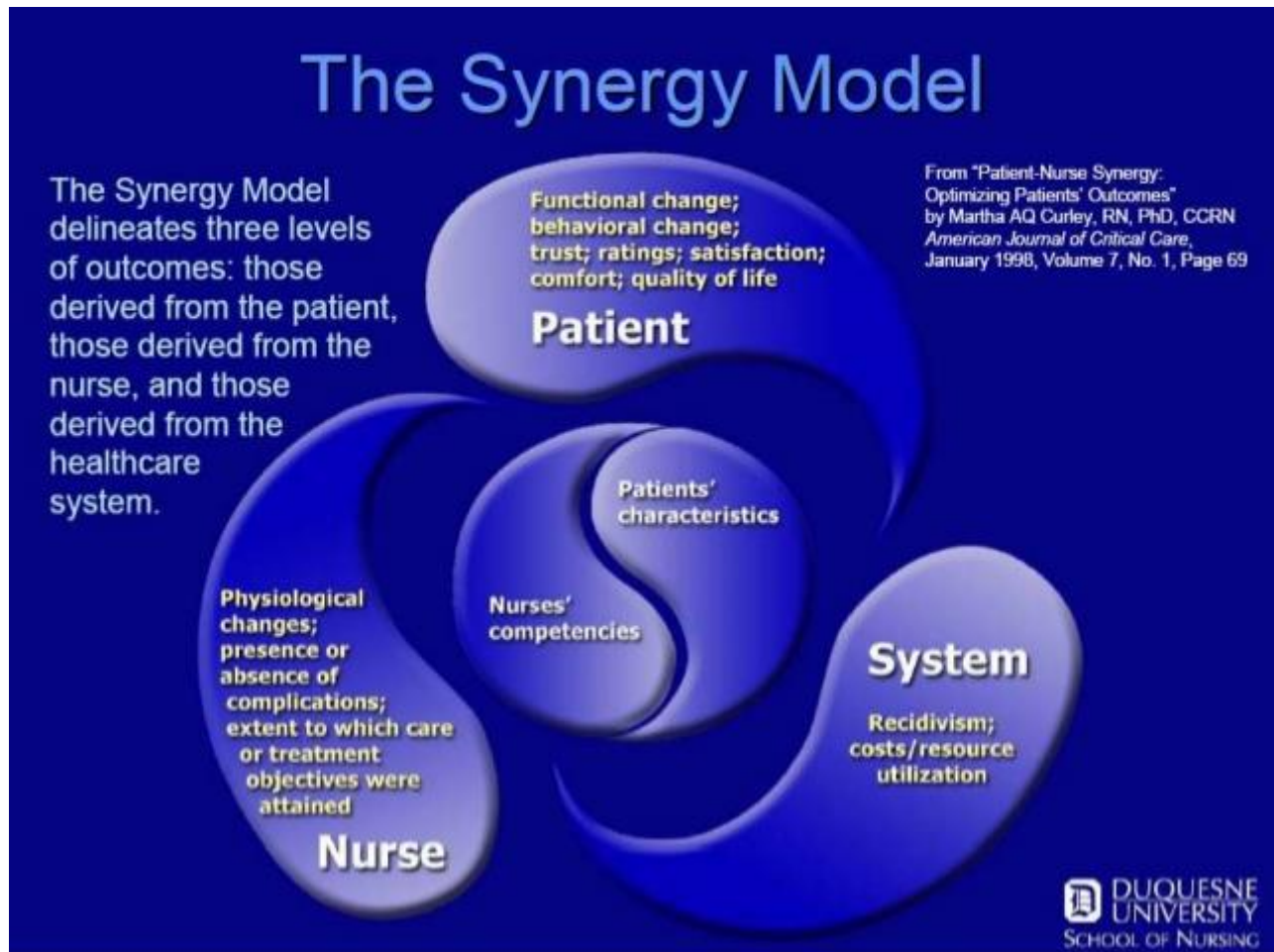
A study conducted in Kwazulu Natal, South Africa, to study on retention of knowledge and skills on CPR among health care practioners who attended BLS course added that knowledge and practice increases as one get a formal training on CPR (Govender *et al.*, 2010). Another study conducted in South Africa on clinicians in tertiary hospital have not gone far from other studies, in studying knowledge on CPR, where the exposure to prior training and difference in experience documented a significant CPR knowledge retention (Botha, Geysler and Engelbrecht, 2012) .

A pre-test, intervention and re-tests time series study conducted in Botswana (Rajeswaran & Ehlers, 2014) showed that nurses' knowledge and skills were poor during pre-test and increased considerably immediately following intervention. But knowledge and skills deteriorated significantly during the 12 weeks after the CPR training. Similar findings were reported in Ireland (Madden, 2006; and Regge et al., 2008). This indicates that all nurses should attend mandatory in-service CPR training.

2.3. CONCEPTUAL FRAMEWORK

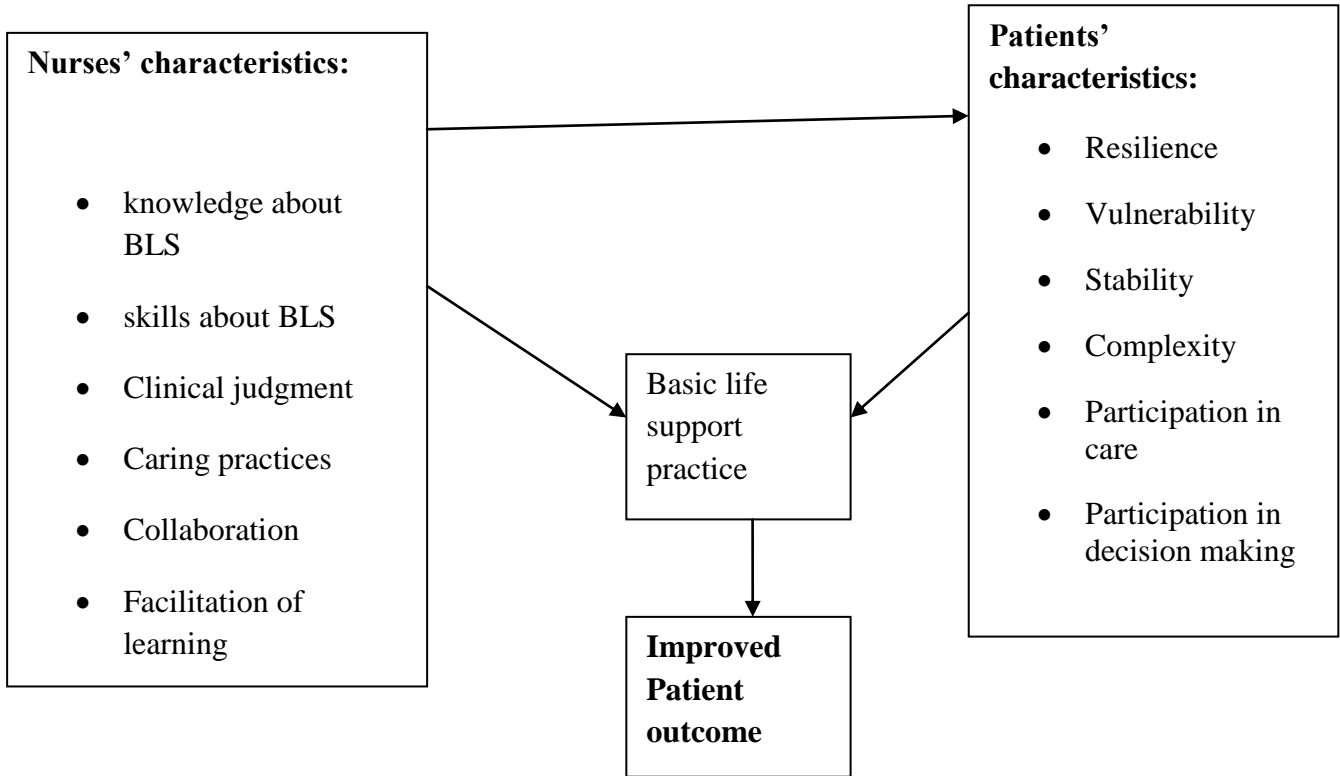
CONCEPTUAL FRAMEWOK GUIDING THE STUDY

Figure 3 AACN Synergy Model



The core assertion made by this model is that “when patient characteristics and nurse competencies match, patient outcomes are optimized” (Hardin, 2009).

Figure2.3. Application of the adapted AACN Synergy model to assess the knowledge and theoretical skills of nurses about basic life support



The AACN Synergy Model for the patient care supports that nurses should have adequate knowledge and skills to make sound clinical judgment and decisions to revive a cardiac arrest victim. During cardiac arrest, a patient is in a highly complex and vulnerable state because of his/her compromised cardiopulmonary system. The stability of the patient is affected. Such patients might have no resiliency and unable to participate in their own care or make decision for themselves. Nurses should possess knowledge and skills about Basic Life support, clinical judgment, and good collaboration in order to be able to respond to the needs of the patient.

Synergy occurs when a patient's needs and characteristics are symmetrically matched by the competencies, knowledge and skills of the nurse.

The AACN Synergy Model for Patient Care, is a patient-centered model that is focused on the needs of the patient and the competencies of the nurse, when those needs and competencies match, good patients outcome are granted (Swickard et al., 2014).

In this study, the researcher focus was nursing characteristics including knowledge and skills about basic life support. Although the patients characteristics are affected during cardiopulmonary arrest, but the patients characteristics were not focused on in this study.

Conclusion

Briefly the empirical data showed the training gap on basic life support. The literature review also revealed that knowledge and skills on basic life support decline gradually if not updated on regular basis.

The studies recommended that assessment of relationship between the theoretical knowledge and practice as well as studies comparing the rural and urban health facilities should be done. In addition, continuous professional development and incorporation of basic life support training in health practioners curriculum was recommended. More empirical research was also recommended to be done in resource poor countries.

CHAPTER 3. RESEARCH DESIGN AND METHODOLOGY

3.1. Introduction

This chapter is about, research approach, research design, research setting, population, sampling strategy and sample size, data collection instruments and data collection procedures, data analysis, ethical considerations, data management, data dissemination, limitations and challenges.

3.2. Research approach

A quantitative method was used because it enabled the researcher to collect numerical data and perform quantitative analysis using statistical procedures, in order to determine the level of knowledge and skills about basic life support among nurses at CHUB. Quantitative methods emphasize objective measurements and the statistical, mathematical, or numerical analysis of data collected through polls, questionnaires, and surveys, or by manipulating pre-existing statistical data using computational techniques. Quantitative research focuses on gathering numerical data and generalizing it across groups of people or to explain a particular phenomenon (Babbie and Mouton, 2001).

3.3. Research design

A cross-sectional design was used to capture nurses' knowledge and skills about basic life support at the study site.

3.4. Research setting

The study was conducted at University Teaching Hospital of Butare (CHUB) which is located in Huye district, Southern Province of Rwanda. CHUB is one of the referral hospitals of the country with the capacity of 500 beds. It has in total 511 employees and 218 of them are nurses and midwives. CHUB serves patients from district hospitals of southern province and one part of western province. It has four big departments which are Internal medicine, Obstetrics and Gynecology , Surgery, and Pediatrics and other small departments as ENT, Stomatology /dentistry, Dermatology ; Physiotherapy ; Medical Imaging; Preventive Medicine; Medical Biology and Functional Testing; Pharmacy; Medical Research ; Ophthalmology; ICU (Intensive Care Unit) and Emergency Services. The study setting was chosen purposively to meet the

objectives of the present study as a specialized and referral Hospital which manage all tertiary referral cases from the Southern and one part of the Western province of Rwanda. The cases to be received by the hospital include also the emergency cases.

3.5. Population

The registered nurses working at the study site constituted the sampling frame for the present study. According to the data from the hospital human resources office, registered nurses are 218 in all departments. Selected staff members from the departments who in their attribution fall the management of critical conditions from which the required information was gathered from internal medicine, surgery, pediatrics, intensive care Unit, and emergency.

3.5.1. Inclusion criteria

- All nurses registered in Nursing Council of Nurses and Midwives (NCNM) working at CHUB.
- Nurses with 6 months working experience as stipulated in Rwandan civil servant stature and registered nurses are considered to be accepted to practice the profession.
- In addition; nurses willing to participate in the study were part of the study.

3.5.2. Exclusion criteria

Nurses without responsibilities to manage critical ill patients.

3.6. Sampling

3.6.1. Sample size

According to Israel (2013), determination of a sample size for a given research depends on different factors including the degree of variability. The more the population is homogeneous, the smaller the sample size. Therefore, for the purpose of the present study, the Israel formula was used to get the sample out of 141 nursing staff at the study site.

When a confidence level is 95% and the P value at 0.05

$$n = \frac{N}{1 + N(e)^2}$$

Where

Where n= sample size

N=Total population

E=P value

Therefore:

$$n=218/1+218(0.05)^2 = 141$$

The total sample used in the present study was 141 nurses.

3.6.2. Sampling strategy

Convenient sampling strategy was used. It means that reaching nurses depended on their availability in the service.

According to the literatures all nurses working in hospital setting are required to have basic life support skills to intervene if there is urgent need (Rajeswaran & Ehlers, 2014). Basing on that, nurses in the mentioned departments was contacted to get the sample.

3.7. Data collection

3.7.1. Data collection instruments

The questionnaire was developed based on American Heart Association guidelines (AHA, 2015) and also from the literature reviews (Rajeswaran & Ehlers, 2012). The tool for the present study comprises two sections. The first section comprises 15 questions measuring knowledge on basic life support while the second section comprises 10 questions measuring the theoretical skills regarding basic life support as reported by the study participants themselves.

3.7.2. Establishment of rigor

- **VALIDITY:** the content validity of the questionnaire was assured by following the guidelines of basic life support of American Heart association updated in 2015.
- **FACE VALIDITY:** The instrument was evaluated by the research supervisor, critical care nurses and a statistician.
- **RELIABILITY:** Questions were developed from AHA guideline and have been used in many other studies but also the instrument was pre-tested on 10 nurses who did not participate in the study to evaluate the tool. The reliability of the questionnaire was assured by calculating its Cronbach's alpha equals to 0.756 which is between 0.8 > 0.756 > 0.7 and is considered to be acceptable.

The questionnaire in English version was not translated in any other language as English is used in referral hospital in routine work as a medium of instructions and documentation and nurses are educated in English.

3.9. DATA COLLECTION PROCEDURE

Before conducting any data collection activity, the hospital administration was approached to get the permission of entering in the services. After that, departments as well as unit managers were approached to get their permission to enter their services.

The data were collected at the normal working hours. Before actual data collection, participants were explained the purpose of the study and were provided the information sheet for reference by the researcher; for those who agreed to participate, the informed consent was given and signed for ethical compliance. Participants were given right to withdraw and discontinue from the study.

Each participant was given 20 to 30 minutes to fill the questionnaire. At the end, all the questionnaires were kept in secure box to ensure the optimal security by the researcher.

3.10. Data management

All data was kept on researcher's personal laptop and security and protection of data was ensured through use of individual password. The data are kept by the researcher until the publication of the study in a reputable journal and the copyrights were discussed between the researcher and the publisher.

3.11. Dissemination of data

Research findings are planned to be presented to UR-CMHS and to CHUB administration so that recommendations can be implemented. The results can be published in medical and nursing journal. The University of Rwanda intellectual property policy stipulates that the results from the research owned by the students are solely the property of the authors. The anonymity of the participants shall be assured in dissemination by mentioning neither their identity nor any form of name.

3.12. Data analysis

The collected data was entered in an SPSS data set version 23, then, cleaned up for easy analysis which later used for interpretation. The data were presented in the form of tables, graphs and Pie charts, and descriptive statistics using frequencies was employed to analyze quantitative data. Where applicable, relationships between variables were generated by means of the Chi-square test, and odds ratios. The confidence interval was set at $P \leq 0.05$

3.13. Ethical consideration

Prior to the data collection the investigator requested permission from CMHS Institutional Review Board (IRB). After getting ethical approval letter, the investigator contacted the selected health care facility for permission. At the end, the participants were also explained that the study results were available in the research unit.

Anonymity

The researcher assigned code numbers to the questionnaire so that no participant's name won't appear on the questionnaire.

Confidentiality

Participant's information was kept in secure box to ensure the optimal security. Completed questionnaire was only accessed by the researcher.

Risk protection

There were no potential risks of participating in the present study as the participants had the right to withdraw from the study at any time.

Consent form

Consent was sought before participants are part of the study. Participants in turn made informed decision on his/her participation before being part of the study. The informed consent was signed by the study participants who were ready to be part of the study

3.14. LIMITATIONS AND CHALLENGES

No single study is free of limitations; the study was conducted in one referral hospital hence the findings cannot be generalized to all nurses in other hospitals in Rwanda.

Due to time constraint and the course work, the researcher could not institute experimental or quasi-experimental methods that could have brought out the real existing knowledge and skills about cardio pulmonary resuscitation.

Ideally, the practical skills of the nurses on CPR should have been assessed through direct observation of the nurses while demonstrating their skills utilizing the manikin. But due to the time factor, it was not possible for the researcher to adopt this method. Instead, the researcher opted for the use of a questionnaire to assess the theoretical knowledge of the study group by focusing on their cognitive and psychomotor ability regarding CPR.

Conclusion

This chapter discussed introduction, research approach, research design, research setting, population, sampling technique, sample size, data collection, data management, data analysis, ethical considerations, limitation and challenges.

CHAPTER 4. RESULTS AND INTERPRETATION

4.1. INTRODUCTION

This chapter presents the results emanated from the study. The results presented relate to the objectives of the study. It starts by the social demographic characteristics followed by responses of participants to knowledge and skills, levels of knowledge and skills on basic life support are also reported and finally the possible relationship between socio-demographic data and the levels of knowledge and skills on basic life support.

The questions to assess knowledge were 15 while questions to assess skills were 10.

4.1. The response rate (n=116)

The study sample was made up of 141 nurses who work in different units at the Butare University Teaching Hospital namely internal medicine, surgery, pediatrics, intensive care Unit, and emergency. Those who completed the questionnaire were 116, where 25 either did not complete the questionnaires or were not present in the services at the time of data collection (Response rate 82%).

4.2. Socio demographic data

In table 1, the results show that the majority of the respondents are females (72%). In addition, the majority of the participants were reported to be in their middle age where the majority was in 31-34 range (49%). Very few respondents had experience with basic life support as only 18% were certified in BLS. Few participants reported that they had BLS in service training (36%) and very few had been certified with BLS (18%).

Table 1 Socio demographic data of the study participants (n=116)

Variables		Frequency	%
Gender	Female	84	72.40%
	Male	32	27.60%
Age	25-30	20	17.20%
	40-44	13	11.20%
	31-34	57	49.10%
	44-49	2	1.70%
	35-39	23	19.80%
	Above 50 Years	1	0.90%
Qualification completed	High school	2	1.70%
	Undergraduate degree	112	96.60%
	Postgraduate degree	2	1.70%
	Other certificates	0	0.00%
Professional designation	Registered Nurse	112	96.60%
	Enrolled nurse	4	3.40%
In service training on BLS	Yes	42	36.20%
	No	74	63.80%
BLS past experience	1-4 Years	35	79.50%
	Above 5 years	9	20.50%
Certification in BLS	Yes	21	18.10%
	No	94	81.90%

4.3. Responses to knowledge about BLS.

In table 2, respondents were requested to tick the correct answer which corresponds to the items describing the basic life support knowledge. It is obvious that only 21% of all study participants know the first step when performing CPR for adult, child and infants. It is in addition clear that throughout the 15 items indicating the knowledge, most of the participants ‘incorrect dominated the correct answers. Ninety two per cent (92%) of the nurses don’t know the correct sequence of steps for CPR, while only on one item, the study participants ticked above the average that they know the goal of CPR (67%).

Table 2 Response to knowledge about BLS

Variables	Answers	Options	N	%
First step in the CPR sequence for adult, child and infants	Incorrect answers	Determine responsiveness	91	78.40%
		Open the airway		
		Check for breathing		
Correct answer	Checking the scene for safety	25	21.60%	
Method of opening the airway in cervical spine injury	Incorrect answers	Head - tilt – chin lift	47	40.50%
		Heimlich method		
		Abdominal thrust		
Correct answer	Jaw thrust	69	59.50%	
Length of assessment for a pulse to decide on compression	Incorrect answers	One to three seconds	94	81.00%
		Three to five seconds		
		Thirty seconds		
Correct answer	At least 5 seconds but no longer than 10 seconds	22	19.00%	
Artery usually used to feel for a pulse in infant victim	Incorrect answers	Carotid artery	76	65.50%
		Radial artery		
		Popliteal artery		
Correct answer	Brachial artery	40	34.50%	
Artery usually used to feel for a pulse in adult victim	Incorrect answers	Brachial artery	96	82.80%
		Radial artery		
		Popliteal artery		
Correct answer	Carotid artery	20	17.20%	

Tables 2. Response to knowledge about BLS (cont'd)

Variables	Answers	Options	N	%
The three steps to check for a victim breathing	Incorrect answers	Feel, push and ventilate	50	43.10%
		Listen, breathe and exhale		
		Look, listen and ventilate		
	Correct answer	Look, listen and feel	66	56.90%
How do you know when to start compressions	Incorrect answers	The victim has is breathing but has no pulse	81	69.80%
		The victim has a pulse but is not breathing		
		The victim is breathing and has a pulse		
	Correct answer	The victim is not breathing and has no pulse	35	30.20%
The correct sequence of steps for CPR	Incorrect answers	Breathing, airway, chest compressions.	107	92.20%
		Breathing, airway, chest compression		
		Airway, breathing, chest compressions		
	Correct answer	Chest compressions, airway, breathing	9	7.80%
Rescue breathing	Incorrect answers	One breath every five to six seconds on adult victims	91	74.40%
		One breath every three to five seconds on child and infant victim		
		All of the above		
	Correct answer	When the victim has a pulse but no spontaneous breathing	25	21.60%
Rate of compressions per minute as specified in the 2015 American Heart Association guidelines	Incorrect answers	80 to 100	79	61.80%
		At least 100		
		At least 120		
	Correct answer	100 to 120	37	31.90%

Tables 2. Response to knowledge about BLS (cont'd)

Variables	Answers	Options	N	%
How often should rescuers switch roles when performing 2 rescuers CPR?	Incorrect answers	After every cycle of CPR	92	79.30%
		After every 2 cycles of CPR		
After every 10 cycles of CPR				
	Correct answer	After every 5 cycles of CPR	24	20.70%
The goal of CPR is to maintain the	Incorrect answers	Heart beat until respirations are restored	38	32.80%
		Respirations until the heart beat is restored		
		Consciousness until the heart beat is restored		
	Correct answer	Oxygenation and circulation until heart beat and respiration are restored.	78	67.20%
The patient who collapsed doesn't respond to your call, which is your best next action	Incorrect answers	Check response	62	53.40%
		Start high quality CPR		
		Start providing rescue breaths		
	Correct answer	Shout for nearby help	54	46.60%
What action should you take when more rescuers arrive	Incorrect answers	continue CPR while AED is attached even if you are fatigued	82	70.70%
		Wait for the most experienced rescuer to provide direction to team		
		Direct the team to assign a team leader and roles while you continue CPR		
		Correct answer	Assign tasks to other rescuers and rotate compressors every 2 minutes or more frequently if needed to avoid fatigue	34
Which action can rescuers perform to potentially reduce the risk of gastric inflation	Incorrect answers	Giving rapid, shallow breaths	96	82.80%
		Using a bag-mask device for delivering ventilation		
		Using the mouth- to-mask breathing technique		
		Correct answer	Delivering each breath over 1 second	20

4.4. Responses to skills on BLS

In table 3, the study respondents were required to tick on correct answers which depict the skills items which correspond to basic life support. Among the 10 items, only two of them, above the average of participants were able to answer correctly. Those items correspond to how you can tell if ventilations are going into a victim and the critical characteristics of high quality CPR.

Table 3 Response to skills on BLS

Variables	Answers	Options	N	%
The initial Basic Life Support steps for adults	Incorrect answers	Assess the victim, give 2 rescue breaths, defibrillate, start CPR	98	84.50%
		Check pulse, give rescue breaths, assess the victim, defibrillate		
		Assess the victim, start CPR, give 2 rescue breaths, defibrillate		
Correct answer	the victim, activate EMS, get AED, check pulse, start CPR	18	15.50%	
The proper steps for operating an AED are	Incorrect answers	Power on the AED, attach the electrode pads, shock the analyze the rhythm	82	70.70%
		Attach electrode pads, check pulse, shock patient, analyze rhythm		
		Check pulse, attach electrodes, analyze rhythm, shock patient.		
Correct answer	Power on the AED, attach electrode pads, analyze the rhythm, clear the patient, deliver shock	34	29.30%	
Clearing the victim during defibrillation	Incorrect answers	Taking the pads off the victims chest	101	87.10%
		Moving the victim to a clear room		
		Beginning the CPR immediately after defibrillation		
Correct answer	Making sure no one is touching the victim	15	12.90%	
Compression-to-ventilation ratio for one rescuer CPR for victims of all age	Incorrect answers	5 compressions to 1 breath	104	89.70%
		10 compressions to 2 breaths		
		15 compressions to 2 breaths		
Correct answer	30 compressions to 2 breaths	12	10.30%	

Tables 3. Response to skills on BLS (Cont'd)

Variables	Answers	Options	N	%
The method used to hold the mask in place while delivering ventilations via a bag valve mask	Incorrect answers	The W-C clamp	111	95.70%
		The C-C grip.		
		1The E-W grip.		
Correct answer	The E-C clamp.	5	4.30%	
How can you tell if ventilations are going into a victim?	Incorrect answers	Watch for abdominal rise	35	30.20%
		Listen for air going through the airway		
		Listen for the victim exhaling air		
Correct answer	Watch for chest rise	81	69.80%	
The correct depth of compression for an adult patient	Incorrect answers	2.5 to 3 inches	68	58.60%
		1.5 to 2 inches		
		2 to 2.4 inches		
Correct answer	2 inches	48	41.40%	
The critical characteristics of high quality CPR include which of the following	Incorrect answers	Starting chest compressions within 10 seconds of cardiac arrest	29	25.00%
		Push hard and fast		
		Minimize interruptions		
Correct answer	All of the above	87	75.00%	
Which step is one of the universal steps for operating an AED	Incorrect answers	Shaving the victim hairy chest	72	62.10%
		Removing the victim from water		
		Finding the victim's implanted pacemaker		
Correct answer	Placing the pads on the victim's bare chest	44	37.90%	
What action should you take when the AED is analyzing the rhythm	Incorrect answers	Check the pulse	63	54.30%
		Continue chest compression		
		Give rescue breaths only		
Correct answer	Stand clear of the victim	53	45.70%	

4.5. Levels of knowledge on basic life support

In the present study, in order to scale the knowledge levels; the scores were developed to get the average score that would be considered to be low and high levels of knowledge. The overall mean knowledge scores is very low (5.72 ± 2.466) and 75% had poor knowledge on basic life support.

Table 4 Knowledge scores

Scores	Frequency	%	
Knowledge scores	1	2	2
	2	6	5
	3	12	10
	4	23	20
	5	20	17
	6	13	11
	7	12	10
	8	10	9
	9	6	5
	10	7	6
	11	5	4
	Total	116	100

In table 4 knowledge scores were calculated from 15 questions that describes the highest levels of knowledge on basic life support. The lowest level of score is 1 and represents the respondents who were able to answer correctly on 1 question among 15, while the highest one (11) represents the respondents who were able to answers correctly on 11 questions among the 15.

The scores were arranged in two categories from the low knowledge to high knowledge. The scores between 1 to 5 were categorized as low level while from 6 to 11 were categorized as high level of knowledge on basic life support.

Table 5 Knowledge levels (n=116)

Variables		Frequency	%
Levels of knowledge	Low levels of knowledge	63	54
	High levels of knowledge	53	46
	Total	116	100

In table 5, the knowledge levels were calculated and shows that only 53 (46%) of those who scored on knowledge items documented high levels of knowledge while 63(54%) documented low levels of knowledge. It is evident that the majority of the study participants have low levels of knowledge with regards to basic life support at the study site.

4.6. Levels of skills on basic life support

Skills levels were calculated by means of 10 questions that best describe the skills among the study participants. It is evident in table 6 that the score range from 0 to 7; to mean that the higher the score, the higher the level of skills. The highest percentage is 29% of participants who at least score 4 questions among 10. The scores were categorized into two: from 0 to 3 depict the low levels of skills while from 4 to 7 represent the high level of skills.

The overall mean skills score is also very low (3.4224 ± 1.31976) of all study participants who responded to all questions.

Table 6 Skills scores

Scores		Frequency	Percentage
Skills scores	0	1	1
	1	6	5
	2	24	21
	3	27	23
	4	34	29
	5	20	17
	6	2	2
	7	2	2
	Total	116	100

Table 7 Levels of skills

		Frequency	Percentage
Levels of skills	Low level of skills	92	79
	High levels of skills	24	21
	Total	116	100

In table 7, most of the participants scored low levels of skills 92 (79%) while only 24 (21%) documented the high level of skills. The skills levels were calculated based on mean score.

4.7. Cross tabulation of knowledge and selected socio-demographic characteristics

Table 8 The relationship between levels of knowledge on basic life support and socio demographic variables

Variables		Levels of knowledge		Total	P_Value
		Low levels of knowledge	High levels of knowledge		
Gender	Female	44	40	84	0.499
		52.4%	47.6%	100.0%	
	Male	19	13	32	
		59.4%	40.6%	100.0%	
Total	63	53	116		
	54.3%	45.7%	100.0%		
BLS past experience	1-4 Years	17	18	35	0.332
		48.6%	51.4%	100.0%	
	Above 5 years	6	3	9	
		66.7%	33.3%	100.0%	
Total	23	21	44		
	52.3%	47.7%	100.0%		
Highest educational qualification completed	High school	2	0	2	0.131
		100.0%	0.0%	100.0%	
	Undergraduate degree	61	51	112	
		54.5%	45.5%	100.0%	
	Postgraduate degree	0	2	2	
		0.0%	100.0%	100.0%	
Total	63	53	116		
	54.3%	45.7%	100.0%		
In service training on BLS	Yes	23	19	42	0.941
		54.8%	45.2%	100.0%	
	No	40	34	74	
		54.1%	45.9%	100.0%	
Total	63	53	116		
	54.3%	45.7%	100.0%		

In table 8, the possible relation between knowledge level with gender were documented, the results showed that gender does not have any relationship with basic life support knowledge and skills ($P>0.05$).

In addition, table 8, the participant experience to basic life support is not associated with either low or high levels of knowledge and skills with regards basic life support ($P>0.05$) and the qualifications of the participants were attempted but the p value ($P> 0.05$) confirms that there is no direct relation between the reported knowledge and qualifications of the study participants.

4.8. Cross tabulation of skills on basic life support and selected socio-demographic characteristics

Table 9, indicates that there is no observed relationship between gender and skills levels on basic life support among the study participants ($P=0.0479$). However there is a positive relationship between BLS past experience and skills of participants on basic life support ($P=0.05$)

It is clearly documented that participants' qualification is positively associated with the levels of skills on basic life support. The undergraduate (diploma holders) participants reported high levels of skills compared to other ($P<0.05$)

Contrary to qualification, in table 4.14, basic life support skills is not associated with participants' in service training ($P>0.05$)

Most of the socio-demographic characteristics were not associated with the levels of knowledge on basic life support; however, skills on basic life support was reported to be associated with some of the socio demographic variables namely BLS past experience and the participants qualification completed. The calculated Pearson chi square tests did not show any relationship with age, gender and in service training on basic life support.

Table 9 The relationship between levels of knowledge on basic life support and socio demographic variables

Variables		Levels of skills		Total	P_Value	
		Low level of skills	High levels of skills			
Gender	Female	68	16	84	0.479	
		81.0%	19.0%	100.0%		
	Male	24	8	32		
		75.0%	25.0%	100.0%		
Total	92	24	116	79.3%	20.7%	100.0%
BLS past experience	1-4 Years	24	11	35	0.052	
		68.6%	31.4%	100.0%		
	Above 5 years	9	0	9		
		100.0%	0.0%	100.0%		
Total	33	11	44	75.0%	25.0%	100.0%
Highest educational qualification completed	High school	2	0	2	0.016	
		100.0%	0.0%	100.0%		
	Undergraduate degree	90	22	112		
		80.4%	19.6%	100.0%		
Postgraduate degree	0	2	2			
	0.0%	100.0%	100.0%			
Total	92	24	116	79.3%	20.7%	100.0%
In service training on BLS	Yes	31	11	42	0.271	
		73.8%	26.2%	100.0%		
	No	61	13	74		
		82.4%	17.6%	100.0%		
Total	92	24	116	79.3%	20.7%	100.0%

CHAPTER 5. DISCUSSION

5.1. INTRODUCTION

This study assessed knowledge and skills about basic life support among nurses at University teaching Hospital of Butare. This chapter discusses the major findings of the study with a focus on the objectives of the study which were to assess the existing level of knowledge and skills among nurses about Basic Life Support at Butare University Teaching Hospital.

5.2. Socio-demographic information

The socio demographic information showed that the majority of the respondents were females (72%) and is probably due to the dominance of women in the profession of nursing from long ago as cited in Kaplow, 2003 that through the efforts of Florence Nightingale in the mid-nineteenth century, nursing was established as a women's profession.

In addition, the majority of the participants were reported to be in their middle age where the majority was in 31-34 range (49%). Very few respondents had experience with basic life support as only 18% were certified in BLS. Few participants reported that they had BLS in service training (36%) and very few had been certified with BLS (18%). The results are consistent with other studies conducted in other African settings which show that in-service training for BLS is low among clinicians (Tsegaye & Tesfaye, 2015; Okonta & Okoh, 2015; Owojuyigbe et al., 2015; Olajumoke et al., 2012).

5.3. The existing knowledge about basic life support

To the researcher knowledge, this study is the first of its kind conducted in Rwanda to document the knowledge and skills levels on basic life support among nurses at a tertiary hospital. The results shows that the nurses who reported the correct answers on questions related to basic life support knowledge were below the half of all study participants (25%) while the majority did not answer correctly the knowledge (75%). This finding agrees with the study conducted by Xanthos et al., 2012 in Greece to evaluate nurses' theoretical knowledge in Basic Life Support which revealed low levels of Basic Life Support theoretical knowledge.

According to the table 4.2, it is obvious that only 21% of all study participants know the first step when performing CPR for adult, child and infants. It is in addition clear that throughout the 15 items indicating the knowledge, most of the participants 'incorrect dominated the correct answers. Ninety two per cent (92,2%) of the nurses don't know the correct sequence of steps for CPR, while only on one item, the study participants ticked above the average that they know the goal of CPR (67,2%), these findings are consistent with a study about Knowledge, attitude and practice of basic life support among junior doctors and students in a tertiary care medical institute by Yunus et al., 2015 which revealed that knowledge and practice skills of BLS/CPR are poor in medical and nursing students. and a study conducted by Chaudhari et al., 2017 which showed that the knowledge about BLS is very poor among health care providers in a tertiary care hospital.

These results are consistent with the documented literature on basic life support among different populations including nurses, students and medical doctors which showed that awareness about basic life support is very poor and need to be improved (Al-Mohaissen, 2017; Xanthos et al., 2012; Botha et al., 2012; Chaudhari et al., 2017; Smith et al., 2008).

The reported low levels may be linked to the lack of basic life support training in the undergraduate curricula in most of higher learning institutions in Rwanda as well as the inconsistency of Continuous Professional Development (CPD) trainings regarding basic life support when the nurses are in services, though the AHA recommend that the regular training on basic life support should be provided to all health practioners in every 2 years Sánchez García et al., 2015 and the international resuscitation guidelines(ILCOR) recommends that all healthcare professionals should be able to perform basic life support including defibrillation with an automated external defibrillator (AED) because of the potential of a cardiac arrest in every healthcare facility (M\"{a}kinen et al., 2006).

According to figure 4.3, knowledge scores were calculated from 15 questions that describes the highest levels of knowledge on basic life support. The lowest level of score is 1 and represents the respondents who were able to answer correctly on 1 question among 15, while the highest

one (11) represents the respondents who were able to answer correctly on 11 questions among the 15.

The scores were arranged in two categories from the low knowledge to high knowledge. The scores between 1 to 5 were categorized as low level while from 6 to 11 were categorized as high level of knowledge on basic life support.

In the above mentioned figure 63(54%) of all participants did not answer correctly to any of the knowledge questions while only 53(46%) were able to score to at least 1 question to 11.

These results are supported by a study which revealed that Poor basic life support knowledge scores among different health professionals have been reported in many countries (Chandrasekaran et al., 2010; Zaheer & Haque, 2009; Mac Giolla Phadraig et al., 2016). Some barriers to BLS competency including a lack of adequate knowledge acquisition and educational reinforcement need to be addressed in order to improve BLS knowledge among healthcare trainees at the study site

These results are also in agreement with a study done by (German Aranzábal-Alegría *et al.*, 2017) which revealed that the level of knowledge was low and this is something that needs to be considered when developing continuing education policies in order to ensure that the healthcare staff has updated knowledge, and is prepared, in theory and in practice, to avoid complications and fatal outcomes.

5.4. The levels of skills levels about basic life support

The previous section addressed the discussion about theoretical knowledge about CPR. This section discusses the findings about the knowledge of the skills about CPR among nurses at University Teaching Hospital of Butare.

The findings of the study show that overall scores for response to variables on skills were low.

The overall mean skills score is also very low (3.4224 ± 1.31976) of all study participants who responded to all questions. Having 10 questions which describe the skills on basic life support, the study participants wouldn't score more 4 in average.

The findings shown in table 4.5, reveal that most of the participants scored low levels of skills 92 (79%) while only 24 (21%) documented the high level of skills. This is in agreement with the study conducted by Yunus *et al.*, 2015 which showed that Knowledge and practice skills of BLS/CPR are poor in medical and nursing students.

This indicates the low level to perform basic life support techniques among the study participants. This is contrary to the study conducted in school, where teenagers have demonstrated acquisition of BLS/CPR knowledge adequately and stable skill retention over four months of training. The same study showed that high school students have the cognitive and physical ability to act as first bystanders in an emergency by providing CPR to children and even adults (Meissner, Kloppe and Hanefeld, 2012).

The level of skills in present study was reported to be associated with prior experience with basic life support and participants qualifications. This confirms that the more nurses are exposed to training at undergraduate level, the higher the likelihood of best practices in hospital settings. Therefore, studies suggested that early introduction as well as the refresher courses of basic life support at the undergraduate levels is associated with an increase in the levels of skills to care for critically ill patients as well as those in need of basic life support.

This is in agreement by a study done by Tsegaye & Tesfaye 2015, which revealed that the higher the advancement in studies, the better the knowledge and skills in CPR. The same study argued that the CPR training has a crucial role in maintaining practioners' knowledge and attitude. The study concluded that generally students' knowledge on CPR was not quite enough as there were no formal training after studies, therefore, regular training are recommended to sharpen the knowledge and the study conducted by Okonta & Okoh 2015 has demonstrated that students with prior CPR training scored higher knowledge and performance as far as CPR is concerned.

These findings are also supported by a study conducted in Kwazulu Natal, South Africa, to study on retention of knowledge and skills on CPR among health care practioners who attended BLS course added that knowledge and practice increases as one get a formal training on CPR (Govender *et al.*, 2010).

CHAPTER 6. CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

The aim of this study was to assess nurses' knowledge and skills about basic life support at the university teaching hospital of Butare. The findings of the study suggest that nurses have low level of knowledge about basic life support. The knowledge about skills is poor and there is no established regular training on basic life support to nurses working in this hospital.

The findings from the present study reported low level of knowledge and skills among nurses at a tertiary hospital in Rwanda. More in service training on BLS would improve the situation. The past experience with BSL among the participants was likely to be one factor of good knowledge, therefore, more exposure even at the undergraduate courses would likely expose nurse to knowledge and skills required to be on duties very equipped with basic life support. In addition, assessing BLS knowledge & skills as a quasi-experimental design: pre-test, intervention and re-test after 6 months would allow the researcher to know the retention level of knowledge and skills on BLS.

6.2. Recommendations

The results of this study have some implications for nursing practice, nursing education, and research

Nursing practice

The main implications of the findings from this study are that nurses' knowledge and skills about Basic life support are generally poor regardless of qualification, experience of the nurse and education level. Every patient admitted to the hospital should be confident that once experience cardiac arrest, their chances of survival are not in any way compromised because of lack of knowledge and skills about basic life support on the part of nursing staff.

Without a specific training or in service education, lack of facilities and resources to maintain knowledge and skills; patient's survival will be affected.

- Sensitization on AHA guidelines on BLS in hospital setting
- From these findings, registered nurses, who are working at University Teaching Hospital of Butare, need to be provided with the in service training in order to update their knowledge and skills about basic life support, advanced cardiac life support for the benefit of their clients.
- All nurses regardless of the area of work, experience and education, should update their knowledge and skills about Basic life support every two years.

Nursing education

- Curriculum for nursing program must incorporate the theory and practice related to BLS, ACLS from the beginning of the programme.

Nursing research

- A similar study can be undertaken in other referral hospitals.
- A similar study can be replicated on a large sample.
- There is also a need for further research based on experimental design.
- Further research to look at resuscitation outcomes in hospital setting

REFERENCES

- Al-Mohaissen, M. A. (2017) 'Knowledge and Attitudes Towards Basic Life Support Among Health Students at a Saudi Women's University', *Sultan Qaboos University Medical Journal*, 17(1), pp. e59-65. doi: 10.18295/squmj.2016.17.01.011.
- Atkins, D. L., Berger, S., Duff, J. P., Gonzales, J. C., Hunt, E. A., Joyner, B. L., Meaney, P. A., Niles, D. E., Samson, R. A. and Schexnayder, S. M. (2015) 'Part 11: Pediatric basic life support and cardiopulmonary resuscitation quality: 2015 American Heart Association guidelines update for cardiopulmonary resuscitation and emergency cardiovascular care', *Circulation*, 132(18), pp. S519–S525. doi: 10.1161/CIR.0000000000000265.
- Babbie, E. R. and Mouton, J. (2001) *The practice of social research*. Cape Town: Oxford University Press Southern Africa.
- Berg, R. A., Hemphill, R., Abella, B. S., Aufderheide, T. P., Cave, D. M., Hazinski, M. F., Lerner, E. B., Rea, T. D., Sayre, M. R. and Swor, R. A. (2010) 'Part 5: Adult basic life support: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care', *Circulation*, 122(SUPPL. 3). doi: 10.1161/CIRCULATIONAHA.110.970939.
- Bhanji, F., Donoghue, A. J., Wolff, M. S., Flores, G. E., Halamek, L. P., Berman, J. M., Sinz, E. H. and Cheng, A. (2015) 'Part 14: Education 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care', 132(suppl 2), pp. 561–574. doi: 10.1161/CIR.0000000000000268.
- Botha, L., Geyser, M. M. and Engelbrecht, A. (2012) 'Knowledge of cardiopulmonary resuscitation of clinicians at a South African tertiary hospital', *South African Family Practice*, 54(5), pp. 447–454. doi: 10.1080/20786204.2012.10874269.
- Bruce, J. C. (2011) 'No Title', pp. 103–118.
- Calvello, E., Reynolds, T., Hirshon, J. M., Buckle, C., Moresky, R., O'Neill, J. and Wallis, L. A. (2013) 'Emergency care in sub-Saharan Africa: Results of a consensus conference', *African*

Journal of Emergency Medicine, 3(1), pp. 42–48. doi: 10.1016/j.afjem.2013.01.001.

Cayley Jr, W. E. (2011) ‘Adapting the Advanced Cardiac Life Support for the Experienced Provider (ACLS-EP) course for emergency care education in Rwanda’, *African Journal of Primary Health Care & Family Medicine*, 3(1), pp. 2–4. doi: 10.4102/phcfm.v3i1.178.

Chandrasekaran, S., Kumar, S., Bhat, S. A., Saravanakumar, Shabbir, P. M. and Chandrasekaran, V. (2010) ‘Awareness of basic life support among medical, dental, nursing students and doctors.’, *Indian journal of anaesthesia*, 54(2), pp. 121–6. doi: 10.4103/0019-5049.63650.

Chaudhari, M. S., Panchal, N. N., Kamat, H. V. and Ganjiwale, J. (2017) ‘Knowledge of 2015 basic life support (BLS) guidelines among doctors and nursing staff of a rural based tertiary care hospital , in western India : Current status and requirement’, 4(2), pp. 193–197. doi: 10.18231/2394-4994.2017.0041.

Fitzpatrick, B., Watt, G. C. and Tunstall-Pedoe, H. (1992) ‘Potential impact of emergency intervention on sudden deaths from coronary heart disease in Glasgow.’, *British heart journal*, 67(3), pp. 250–254.

German Aranzábal-Alegría, B., , Araseli Verastegui-Díaz, B., ~ D. M. Q.-L., B., , Lizet Y. Quintana-Mendoz, B., Vilchez-Cornejo, J., D, C. B. E., D, L. K. A., Melissa L. Vargas, B., Fernández-Lamase, N. and , Christian R. Mejía, G. (2017) ‘Revista Colombiana de Anestesiología Factors influencing the level of knowledge of cardiopulmonary resuscitation in hospitals in’, 5(2), pp. 114–121.

Mac Giolla Phadraig, C., Ho, J. D., Guerin, S., Yeoh, Y. L., Mohamed Medhat, M., Doody, K., Hwang, S., Hania, M., Boggs, S., Nolan, A. and Nunn, J. (2016) ‘Neither Basic Life Support knowledge nor self-efficacy are predictive of skills among dental students’, *European Journal of Dental Education*, (6), pp. 1–6. doi: 10.1111/eje.12199.

Govender, K., Rangiah, C., Ross, A. and Campbell, L. (2010) ‘Retention of knowledge of and skills in cardiopulmonary resuscitation among healthcare providers after training’, *South African Family Practice*, 52(5), pp. 459–462. doi: 10.1080/20786204.2010.10874025.

Herrington, C. E. (no date) ‘: THEORY CRITIQUE: AACN SYNERGY MODEL’.

International Council of Nurses (2017) *Definition of Nursing, ICN*.

Israel, G. D. (2013) ‘Determining Sample Size 1’, (April 2009), pp. 1–5.

Kaplow, R. (2003) ‘AACN Synergy Model for Patient Care: A Framework to Optimize Outcomes.’, *Critical Care Careers*, Feb. Supp(1), pp. 27–30.

Kleinman, M. E., Brennan, E. E., Goldberger, Z. D., Swor, R. A., Terry, M., Bobrow, B. J., Gazmuri, R. J., Travers, A. H. and Rea, T. (2015) ‘Part 5: Adult basic life support and cardiopulmonary resuscitation quality: 2015 American Heart Association guidelines update for cardiopulmonary resuscitation and emergency cardiovascular care’, *Circulation*, 132(18), pp. S414–S435. doi: 10.1161/CIR.0000000000000259.

Mäkinen, M., Castrèn, M., Tolska, T., Nurmi, J. and Niemi-Murola, L. (2006) ‘Teaching basic life support to nurses’, *European journal of anaesthesiology*, 23(4), pp. 327–331. doi: 10.1017/S0265021506000032.

Meissner, T. M., Kloppe, C. and Hanefeld, C. (2012) ‘Basic life support skills of high school students before and after cardiopulmonary resuscitation training: a longitudinal investigation’, *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*. BioMed Central Ltd, 20(1), p. 31. doi: 10.1186/1757-7241-20-31.

Norgang, K., Muhire, A. I. and Howrath, S. (2015) ‘Learning the C-A-Bs: Resuscitation Training at Rwanda Military Hospital’, *Rwanda Journal Series F: Medicine and Health Sciences*, 2(2), p. 104. Available at: <http://dx.doi.org/10.4314/rj.v2i242F>.

Okonta, K. E. and Okoh, B. A. N. (2015) ‘Theoretical knowledge of cardiopulmonary resuscitation among clinical medical students in the University of Port Harcourt, Nigeria’, 14(1), pp. 42–46. doi: 10.4103/2384-5589.153391.

Olajumoke, T. O., Afolayan, J. M., Raji, S. A. and Adekunle, M. A. (2012) ‘Cardiopulmonary Resuscitation - Knowledge, Attitude & Practices in Osun State, Nigeria.’, *Journal of the West*

African College of Surgeons, 2(2), pp. 23–32.

Onyeaso, A. and Onyeaso, C. (2016) ‘Cardiopulmonary resuscitation skills in some Nigerian secondary school students’, *Port Harcourt Medical Journal*, 10(2), p. 60. doi: 10.4103/0795-3038.189455.

Owojuyigbe, A., Adenekan, A., Faponle, A. and Olateju, S. (2015) ‘Impact of basic life support training on the knowledge of basic life support in a group of Nigerian Dental Students’, *Nigerian Postgraduate Medical Journal*, 22(3), p. 164. doi: 10.4103/1117-1936.170740.

Sánchez García, A. B., Fernández Alemán, J. L., Alonso Pérez, N., Hernandez Hernández, I., Navarro Valverde, R. and Rosillo Castro, D. (2015) ‘Assessment of the knowledge level and its relevance in terms of CPR in medical personnel of the hospital emergency medical system of the Autonomous Community of the Region of Murcia’, *Enfermería Global*, 14(3), pp. 230–260. doi: <http://dx.doi.org/10.1108/17506200710779521>.

Smith, K. K., Gilcreast, D. and Pierce, K. (2008) ‘Evaluation of staff’s retention of ACLS and BLS skills’, *Resuscitation*, 78(1), pp. 59–65. doi: 10.1016/j.resuscitation.2008.02.007.

Sutton, R. M., Niles, D., Meaney, P. A., Aplenc, R., French, B., Abella, B. S., Lengetti, E. L., Berg, R. A., Helfaer, M. A. and Nadkarni, V. (2011) ““Booster” training: evaluation of instructor-led bedside cardiopulmonary resuscitation skill training and automated corrective feedback to improve cardiopulmonary resuscitation compliance of Pediatric Basic Life Support providers during simulated cardiac ’, *Pediatric critical care medicine : a journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies*, 12(3), pp. e116-21. doi: 10.1097/PCC.0b013e3181e91271.

Swickard, S., Swickard, W., Reimer, A., Lindell, D. and Winkelman, C. (2014) ‘Adaptation of the AACN synergy model for patient care to critical care transport’, *Critical Care Nurse*, 34(1), pp. 16–28. doi: 10.4037/ccn2014573.

Tsegaye, W. and Tesfaye, M. (2015) ‘Knowledge, Attitude and Practice of Cardiopulmonary Resuscitation and Associated Factors in Ethiopian University Medical Students’, *Journal of*

General Practice, 3(4), pp. 1–6. doi: 10.4172/2329-9126.1000206.

Xanthos, T., Akrivopoulou, A., Pantazopoulos, I., Aroni, F., Datsis, A. and Iacovidou, N. (2012) ‘Evaluation of nurses’ theoretical knowledge in Basic Life Support: A study in a district Greek hospital’, *International Emergency Nursing*. Elsevier Ltd, 20(1), pp. 28–32. doi: 10.1016/j.ienj.2010.11.001.

Xanthos, T., Ekmektzoglou, K. A., Bassiakou, E., Koudouna, E., Barouxis, D., Stroumpoulis, K., Demestiha, T., Marathias, K., Iacovidou, N. and Papadimitriou, L. (2009) ‘Nurses are more efficient than doctors in teaching basic life support and automated external defibrillator in nurses’, *Nurse Education Today*. Elsevier Ltd, 29(2), pp. 224–231. doi: 10.1016/j.nedt.2008.08.008.

Yunus, M., Mishra, A., Karim, H., Raphael, V., Ahmed, G. and Myrthong, C. (2015) ‘Knowledge, attitude and practice of basic life support among junior doctors and students in a tertiary care medical institute’, *International Journal of Research in Medical Sciences*, 3(12), pp. 3644–3650. doi: 10.18203/2320-6012.ijrms20151416.

Zaheer, H. and Haque, Z. (2009) ‘Awareness about BLS (CPR) among medical students: Status and requirements’, *Journal of the Pakistan Medical Association*, 59(1), pp. 57–59.

APPENDIX

CONSENT TO PARTICIPATE IN THE RESEARCH STUDY ON ASSESSMENT OF KNOWLEDGE AND SKILLS ABOUT BASIC LIFE SUPPORT AMONG NURSES AT THE UNIVERSITY TEACHING HOSPITAL OF BUTARE

PARTICIPATION IN THE STUDY

Participating in this study is a full and free consent. No one will be forced to take part in the study. Apart from the researcher no one will have access to the information

RESEARCHER TEAM

The current research on basic life support is being conducted by USABUWERA Marie Claire a student at the University of Rwanda, College of Medicine and Health Sciences, Critical care and trauma track.

WHO WILL PARTICIPATE IN THE STUDY

Having consented to take part in the study and fulfilling the following conditions:

Being a nurse

With more than 6 months of experience

WHO IS NOT ALLOWED TO TAKE PART IN THE STUDY

Nurses on probation period

Nurses not willing to participate in the study

RISKS OF PARTICIPATING IN THIS STUDY

There are no risks of participating in the present study.

CONFIDENTIALITY

As with any other type of research, the current research will not reveal any personnel detail or personal information of nurses or any other staff. The participants information during and after the research period of time will be kept confidential.

PERSON OF CONTACT

For any query about this research, please kindly contact us on the following e-mail address: musabuwera@yahoo.fr or the following phone number: +250 788990896

CONSENT

I hereby assert that I was explained thoroughly the purpose of this research, and I confirm that I was given sufficient amount of time to think about my participation in the study. I was assured about my privacy, and confidentiality was warranted by the researcher team. I confirm that I have chosen to participate in this study without financial motivation and my participation was not in any case forced by anybody.

Names

.....

Signature

Date

.....

.....

STUDY INSTRUMENT

Dear participant, rate the questions in relation to the knowledge and skills on BLS. You are required to tick where applicable.

SECTION A: QUESTIONS ON KNOWLEDGE ABOUT BASIC LIFE SUPPORT

1. When performing Basic Life Support on the adult, child or infant, the first step in the sequence of CPR is to:
 - a. Determine responsiveness
 - b. Open the airway
 - c. Check for breathing
 - d. Checking the scene for safety
2. If a cervical spine injury is suspected, which method of opening the airway should be used?
 - a. Head - tilt – chin lift
 - b. Jaw thrust
 - c. Heimlich method
 - d. Abdominal thrust
3. How long should you assess for a pulse before deciding the victim needs compression?
 - a. One to three seconds
 - b. Three to five seconds
 - c. At least 5 seconds but no longer than 10 seconds
 - d. Thirty seconds

4. Which artery is usually used to feel for a pulse in the infant victim?
 - a. Brachial artery
 - b. Carotid artery
 - c. Radial artery
 - d. Popliteal artery

5. Which artery is usually used to feel for a pulse in adult victim?
 - a. Brachial artery
 - b. Carotid artery
 - c. Radial artery
 - d. Popliteal artery

6. What are the three steps to check for a victim breathing?
 - a. Look, listen and feel
 - b. Feel, push and ventilate
 - c. Listen, breathe and exhale
 - d. Look, listen and ventilate

7. How do you know when to start compressions?
 - a. The victim has is breathing but has no pulse
 - b. The victim has a pulse but is not breathing
 - c. The victim is breathing and has a pulse
 - d. The victim is not breathing and has no pulse

8. The correct sequence of steps for CPR is:
 - a. Breathing, airway, chest compressions.
 - b. Chest compressions, airway, breathing.
 - c. Breathing, airway, chest compression.
 - d. Airway, breathing, chest compressions

9. Rescue breathing should be done:
 - a. When the victim has a pulse but no spontaneous breathing
 - b. One breath every five to six seconds on adult victims
 - c. One breath every three to five seconds on child and infant victim
 - d. All of the above

10. What is the rate of compressions per minute as specified in the 2015 American Heart Association guidelines?
 - a. 80 to 100
 - b. 100 to 120
 - c. At least 100
 - d. At least 120

11. How often should rescuers switch roles when performing 2 rescuers CPR?
 - a. After every cycle of CPR
 - b. After every 2 cycles of CPR
 - c. After every 5 cycles of CPR
 - d. After every 10 cycles of CPR

12. The goal of CPR is to maintain the
 - a. Heart beat until respirations are restored
 - b. Respirations until the heart beat is restored
 - c. Consciousness until the heart beat is restored
 - d. Oxygenation and circulation until heart beat and respiration are restored.
13. The patient who collapsed doesn't respond to your call, which is your best next action
 - a. Check response
 - b. Start high quality CPR
 - c. Start providing rescue breaths
 - d. Shout for nearby help
14. What action should you take when more rescuers arrive?
 - a. Assign tasks to other rescuers and rotate compressors every 2 minutes or more frequently if needed to avoid fatigue
 - b. continue CPR while AED is attached even if you are fatigued
 - c. Wait for the most experienced rescuer to provide direction to team
 - d. Direct the team to assign a team leader and roles while you continue CPR
15. Which action can rescuers perform to potentially reduce the risk of gastric inflation
 - a. Delivering each breath over 1 second
 - b. Giving rapid, shallow breaths
 - c. Using a bag-mask device for delivering ventilation
 - d. Using the mouth- to-mask breathing technique

SECTION B: QUESTIONS ON SKILLS ABOUT BASIC LIFE SUPPORT

16. The initial Basic Life Support steps for adults are:
- Assess the victim, give 2 rescue breaths, defibrillate, start CPR
 - Assess the victim, activate EMS, get AED, check pulse, start CPR
 - Check pulse, give rescue breaths, assess the victim, defibrillate
 - Assess the victim, start CPR, give 2 rescue breaths, defibrillate
17. The proper steps for operating an AED are:
- Power on the AED, attach the electrode pads, shock the analyze the rhythm
 - Power on the AED, attach electrode pads, analyze the rhythm, clear the patient, deliver shock
 - Attach electrode pads, check pulse, shock patient, analyze rhythm
 - Check pulse, attach electrodes, analyze rhythm, shock patient.
18. Which of the following best describes “clearing the victim” during defibrillation
- Taking the pads off the victims chest
 - Making sure no one is touching the victim
 - Moving the victim to a clear room
 - Beginning the CPR immediately after defibrillation

19. What is the compression-to-ventilation ratio for one rescuer CPR for victims of all age?

- a. 5 compressions to 1 breath
- b. 30 compressions to 2 breaths
- c. 10 compressions to 2 breaths
- d. 15 compressions to 2 breaths

20. Which of the following choices best describes the method used to hold the mask in place while delivering ventilations via a bag valve mask?

- a. The W-C clamp.
- b. The C-C grip.
- c. The E-C clamp.
- d. The E-W grip.

21. How can you tell if ventilations are going into a victim?

- a. Watch for chest rise
- b. Watch for abdominal rise
- c. Listen for air going through the airway
- d. Listen for the victim exhaling air

22. The correct depth of compression for an adult patient is:

- a. 2.5 to 3 inches
- b. 1.5 to 2 inches
- c. 2 to 2.4 inches
- d. 2 inches (5cm)

23. The critical characteristics of high quality CPR include which of the following?

- a. Starting chest compressions within 10 seconds of cardiac arrest
- b. Push hard and fast
- c. Minimize interruptions
- d. All of the above

24. Which step is one of the universal steps for operating an AED

- a. Placing the pads on the victim's bare chest
- b. Shaving the victim hairy chest
- c. Removing the victim from water
- d. Finding the victim's implanted pacemaker

25. What action should you take when the AED is analysing the rhythm

- a. Check the pulse
- b. Continue chest compression
- c. Give rescue breaths only
- d. Stand clear of the victim

