

**Development, Implementation and Evaluation of an In-Service  
Training Programme for Critical Care Nurses in Malawi**

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## Abstract

**Background:** Critical care nursing is a specialty which deals with the care of critically ill patients with potential or actual life-threatening illness. The critical illness of the patients and the extensive use of technology to monitor and treat patients, create a complex environment in the critical care units that demands critical care nurses possess specialist knowledge and skills to make the complex decisions needed to care for critically ill patients and their families. Compared to developed countries, where significant resources are invested in critical care environments and specialised training of health professionals, the situation differs in developing countries like Malawi. In the developing countries there are critical shortages of resources and health professionals with critical care training. There are no critical care nurse training programmes in most developing countries as is the case in Malawi. This is against the background of high burden of communicable and noncommunicable diseases which increase the demand for critical care services in the developing countries. In the absence of proper training, the nurses rely on their intuition and basic nursing education to meet the needs of the critically ill patients and their families. This PhD study is premised on documented evidence that critical care nurses in Malawi lack the knowledge and skills required for their practice in the critical care units. The study aimed to explore learning needs of the critical care nurses as a way of informing the development and evaluation of in-service training for the nurses in Malawi.

**Methodology:** A programme planning and evaluation approach using multiphase mixed methods design was applied. The study was conducted at two public tertiary hospitals which were purposively selected. The implementation of the quantitative and qualitative strands in two of the three phases of the study followed the principles of explanatory sequential mixed methods. The phases of the study were informed by Caffarella's Interactive Model of Programme Planning as follows: *Phase 1:* needs assessment. Nurses (n=79) in intensive care units (ICUs) and high dependency units (HDUs) self-assessed their competence on the Intensive and Critical Care Nursing Competence Scale (ICCN-CS-1) and a list of 10 additional competencies. An interpretive descriptive design was used in the follow up qualitative strand. Data were gathered through two focus group discussions with the nurses, and key informant interviews with nurse leaders (n=8) and anaesthetists (n=2) on learning needs of the nurses. *Phase 2:* Development of the training programme. A training programme was developed in

consultation with Malawian experts in intensive and critical care nursing (n=4) and one anaesthetist. *Phase 3: Implementation and evaluation of the programme.* The training programme was delivered to ICU and HDU nurses (n=41) over three days at each hospital. The impact of the training was evaluated through self-assessment on ICCN-CS-1 and the additional competencies at Time 1 and 2, pretraining and post training respectively; and completion of a training evaluation form and interviews with participants (n=8) at Time 2. Quantitative data were analysed using SPSS version 23. Qualitative data were entered into NVivo programme. The data were then analysed manually utilising Thorne's (2008) steps of analysis.

**Results:** In *Phase 1*, nurses rated their competence on ICCN-CS-1 as good and excellent ( $M = 604.97$ ,  $SD = 55.08$ ). Majority of the nurses rated their competence as poor or moderate on two additional competencies; basic interpretation of electrocardiogram (83.5%; n=66) and analysis of arterial blood gases (83.5%; n=66). Most of the identified learning needs were related to knowledge domain of nursing competence. Analysis of the qualitative data identified three themes, '*being unprepared*', '*challenge of limited resources*' and '*knowing*'. *Phase 2:* A training programme was developed based on the identified learning needs. *Phase 3:* There was statistically significant increase in the competence score on ICCN-CS-1 from Time 1, pretraining ( $M = 608.2$ ,  $SD = 59.6$ ) to Time 2, posttraining ( $M = 684.7$ ,  $SD = 29.7$ ),  $t(40) = 8.8$ ,  $p < .001$  (two-tailed). The mean increase in the competence score was 76.9, 95% CI [59.3, 94.5]. Similarly, there was a statistically significant increase in the overall score on additional competencies from Time 1 to Time 2,  $p < .001$  (two-tailed). The mean increase in the competence score was 11.9, 95% CI [10.1, 13.8]. The overall programme was rated very relevant by 85.4% (n=35) of the participants. Post training interviews showed that the training was well received by the participants.

**Conclusion:** Nurses self-rated their competence on ICCN-CS-1 as good and excellent but the majority rated knowledge and skills on additional competencies as poor in Phase 1 of the study. The results of the subsequent qualitative strand in the same phase revealed that CCU nurses are not adequately prepared for practice in the units. The identified learning needs guided the development of a training programme which was implemented at the two hospitals. The competence scores of the nurses who received the training significantly increased at the end of the training. The study addressed the need for a training programme for CCU nurses, which was implemented using existing structures and resources in Malawi. Recommendations have been made in relation to

critical care nursing education, practice, health policy, regulatory body and nursing research.

# Table of Contents

Abstract .....	i
List of Figures .....	viii
List of Tables.....	ix
Attestation of Authorship.....	x
Co-Authored Works .....	xi
Acknowledgements .....	xii
Ethics Approval.....	xiv
Abbreviations .....	xv
Chapter 1 Introduction .....	1
1.1 Disease burden .....	2
1.2 Critical care nursing in Malawi .....	3
1.3 Aim of the study .....	5
1.4 Design of the study .....	5
1.5 Significance of the study .....	6
1.6 Structure of the thesis .....	6
1.7 Chapter summary .....	7
Chapter 2 Literature Review .....	8
2.1 Introduction .....	8
2.2 Brief profile of the context .....	8
2.2.1 Overview of Malawi .....	9
2.2.2 Health system in Malawi.....	11
2.2.3 Nursing education in Malawi .....	18
2.3 Critical care practice in Malawi .....	22
2.4 Critical care nursing education: The past and present.....	23
2.5 Competence requirements in critical care nursing .....	27
2.6 Continuing education in nursing .....	28
2.6.1 Mode of continuing education .....	31
2.7 Chapter summary .....	31
Chapter 3 Methodology.....	33
3.1 Introduction .....	33
3.2 Research Design .....	33
3.3 Mixed methods design.....	34
3.4 Philosophical assumptions .....	36
3.5 Interactive model of programme planning .....	36
3.6 Planning and formation of advisory team .....	37
3.7 Phase 1: Needs assessment.....	41
3.7.1 Strand 1: Quantitative study.....	41

3.7.2	Strand 2: Qualitative study .....	49
3.7.3	Presentation of preliminary findings .....	53
3.8	Phase 2: Developing stage .....	53
3.9	Phase 3: Implementation and evaluation of the training programme.....	54
3.9.1	Strand 3: Quantitative study .....	54
3.9.2	Strand 4: Qualitative study .....	55
3.10	Inference quality and rigour .....	56
3.11	Ethical considerations.....	57
3.12	Chapter summary .....	58
Chapter 4	Results of the Quantitative Strand .....	59
4.1	Introduction .....	59
4.1.1	Demographic profile .....	59
4.1.2	Nurses' competence on ICCN-CS-1 (Q1).....	60
4.1.3	Comparison of competence score in relation to groups of nurses .....	63
4.2	Perceived competence on additional competencies .....	65
4.3	Suggested topics for inclusion in in-service training .....	66
4.4	Preferred teaching strategies.....	66
4.5	Inferences drawn from quantitative results .....	66
4.6	Chapter summary .....	67
Chapter 5	Results of the Qualitative Strand .....	68
5.1	Introduction .....	68
5.2	Being unprepared .....	68
5.3	Challenge of limited resources .....	78
5.4	Knowing .....	87
5.5	Inferences drawn from qualitative findings.....	100
5.6	Chapter summary .....	101
Chapter 6	Development, Implementation, and Evaluation of the Training Programme .....	102
6.1	Introduction .....	102
6.2	Prioritisation of the learning needs.....	102
6.3	Designing instructional plans .....	107
6.4	Implementation of the training .....	110
6.5	Evaluation of the training programme.....	114
6.5.1	Quantitative results.....	114
6.5.2	Qualitative findings.....	116
6.6	Chapter summary .....	118
Chapter 7	Discussion .....	120
7.1	Introduction .....	120
7.2	Nurses' competence in intensive and critical care nursing .....	120
7.3	Learning needs .....	127

7.4	Contextual issues .....	131
7.5	Consequences of unpreparedness and contextual resources .....	133
7.6	Development of the training programme .....	136
7.7	Implementation and evaluation of the programme.....	138
7.8	Chapter summary .....	140
Chapter 8 Conclusion and Recommendations .....		141
8.1	Introduction .....	141
8.2	Key quantitative and qualitative findings.....	141
8.3	Contribution to knowledge .....	143
8.3.1	Contribution to knowledge on competence in critical care nursing.....	143
8.3.2	Contribution to critical care nursing education in developing countries	143
8.3.3	Contribution to critical care nursing practice in developing countries ...	144
8.4	Recommendations for critical care nursing education .....	145
8.5	Recommendations for critical care nursing practice .....	146
8.6	Recommendations for health policy .....	147
8.7	Recommendations for regulatory body .....	147
8.8	Recommendations for critical care nursing research.....	148
8.9	Strengths and limitations of the study .....	148
8.10	Reflective account of the research process.....	148
8.11	Conclusion of the thesis .....	152

References .....	153
Glossary .....	165
Appendix A: Ethics approval by AUTECH in New Zealand .....	166
Appendix B: Ethics approval from National Health Sciences Research Committee in Malawi.....	168
Appendix C: Amendment approval by AUTECH in New Zealand.....	169
Appendix D: Poster .....	171
Appendix E: Survey participant information sheet.....	173
Appendix F: Consent forms - Survey and Key Informant Interview Participant .....	177
Appendix G: Survey questionnaire (Q1).....	178
Appendix H: Survey questionnaire (Q2).....	186
Appendix I: Permission for ICCN-CS-1 .....	188
Appendix J: Focus group discussion participant information sheet.....	189
Appendix K: Key informant participant information sheet .....	193
Appendix L: Confidentiality agreement – Research Assistant .....	197
Appendix M: Interview guide for focus group discussions .....	198
Appendix N: Interview guide for key informant interviews.....	199
Appendix O: Confidentiality agreement – Transcriptionist.....	200
Appendix P: Training participant information sheet.....	201
Appendix Q: Consent form – In-service Training Participant .....	205
Appendix R: Survey questionnaire (Q3).....	206
Appendix S: Post-training interview participant information sheet.....	207
Appendix T: Interview guide for training participants .....	211
Appendix U: Copyright permission for images .....	212
Appendix V: Resources for the in-service training programme .....	218



## List of Figures

<i>Figure 1:</i> Map of Malawi and its location on the African continent.....	9
<i>Figure 2:</i> Levels of the health system in Malawi.....	14
<i>Figure 3:</i> Components of Interactive Model of Programme Planning for adult learners implemented in different phases of the study. ....	37
<i>Figure 4:</i> Illustration of the study design.....	40
<i>Figure 5:</i> Mean scores on scales domains .....	62
<i>Figure 6:</i> Competence scores among nurses.....	63
<i>Figure 7:</i> Prioritization of the learning needs .....	104

## List of Tables

Table 1. A comparison of health indicators between Malawi and Zambia.....	11
Table 2. Providers of health services in Malawi .....	12
Table 3. A summary of nurses' cadres, qualifications and their roles .....	21
Table 4. A summary of critical care courses in selected countries .....	25
Table 5. Impact of CE in Africa's critical care settings .....	29
Table 6. Demographic profile of members of the advisory team .....	38
Table 7. Data collection plan .....	43
Table 8. Profile of the experts .....	45
Table 9. ICCN-CS-1 items with low I-CVI .....	46
Table 10. Additional items identified by experts .....	47
Table 11. Demographic profile of focus group and key informant interview participants .....	51
Table 12. Demographic profile of the participants .....	60
Table 13. Items with highest mean scores .....	61
Table 14. Items with low mean scores .....	61
Table 15. Regression on site, professional qualification and work experience .....	65
Table 16. Nurses score on additional items .....	65
Table 17. List of topics which were merged .....	105
Table 18. Topics considered important but excluded from the training .....	107
Table 19. The demographic profile of the facilitators of the training.....	109
Table 20. Programme for Day 1 of the training .....	111
Table 21. Programme for Day 2 of the training .....	112
Table 22. Programme for Day 3 of the training .....	113
Table 23. Summary of participants' scores on ICCN-CS-1 and additional competencies .....	116

## **Attestation of Authorship**

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any degree or diploma of a university or other institution of higher learning.

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Rodwell Gundo

Date: 14/03/2019

## Co-Authored Works

- Gundo, R., Mearns, G., Dickinson, A., & Chirwa, E. (2017). Critical care nursing practice in Malawi – a qualitative study, *Brazilian Journal of Intensive Care*, 29 (Supplement 1), S121-S122. Proceedings from the 13th World Congress of Intensive and Critical Care Medicine, Rio de Janeiro, Brazil.
- Gundo, R., Mearns, G., Dickinson, A., & Chirwa, E. (2018). Evaluation of a needs-based training programme for ICU and HDU nurses in Malawi. Oral presentation at the *2018 Australian and New Zealand Intensive Care Society Annual Scientific Meeting*, Auckland, New Zealand. Received Best Oral Nursing Award. Details of the award are available at <https://www.eiseverywhere.com/ehome/260362/714966/>
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## **Ethics Approval**

The study was approved by Auckland University of Technology Ethics Committee (AUTEC) in New Zealand, reference number 15/439 dated 10<sup>th</sup> December 2015 (Appendix A, p. 166) and National Health Sciences Research Committee in Malawi, approval number NHSRC #1533 dated 21<sup>st</sup> January 2016 (Appendix B, p. 168).

## Abbreviations

AIDS	Acquired Immunodeficiency syndrome
AUT	Auckland University of Technology
AUTEC	Auckland University of Technology Ethics Committee
CCU	Critical Care Unit
CHAI	Clinton Health Initiative
CHAM	Christian Health Association of Malawi
CINAHL	Cumulative Index to Nursing and Allied Health Literature
CPD	Continuing Professional Development
CVI	Content Validity Index
DALY	Disability Adjusted Life Years
DFID	Department for International Development
GAIA	Global AIDS Interfaith Alliance
GNI	Gross National Income
HDI	Human Development Index
HDU	High Dependency Unit
HIV	Human Immunodeficiency Virus
ICCN-CS-1	Intensive and Critical Care Nursing Competence Scale, version 1
ICF	Inner City Fund
ICU	Intensive Care Unit
ID	Interpretive Description
IMPP	Interactive Model of Programme Planning



IMR	Infant Mortality Rate
I-TECH	International Training and Education Centre for Health
KCN	Kamuzu College of Nursing
MFAT	Ministry of Foreign Affairs and Trade
MoH	Ministry of Health
MSCE	Malawi School Certificate of Education
NCA	Norwegian Church Aid
NCD	Noncommunicable diseases
NEPI	Nursing Education Partnership Initiative
NGO	Nongovernmental organisation
PEPFAR	United States President's Emergency Plan for AIDS Relief
PFP	Private-for-profit
PNFP	Private not-for-profit
SDU	Stepdown Unit
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
WHO	World Health Organization

## Chapter 1 Introduction

This research explored the learning needs of critical care nurses and used these to guide the development of an in-service training programme for the nurses. Critical care nursing is a specialty which saves life by responding to the needs of critically ill patients with actual or potential life-threatening conditions requiring technical and/or artificial life support (Kamel, Fakhry, & Ibrahim, 2011; Lumb, 2013; Sole, Klein, & Moseley, 2009). This type of care is rendered in a critical care unit (CCU), which is an umbrella term for intensive care unit (ICU) and high dependency unit (HDU) or any unit that combines the two (British Association of Critical Care Nurses, 2010; Fulbrook, 2010). An ICU provides monitoring and support to critically ill patients with two or more failing body organs from which recovery is possible. Patients admitted to an HDU, also called a stepdown unit (SDU), are less critically ill but require an intermediary level of care between what is offered in general wards and the care in ICU (British Association of Critical Care Nurses, 2010; Prin & Wunsch, 2014). HDU/SDUs also admit deteriorating patients stepping up from the ward to the ICU (Prin & Wunsch, 2014). The care that is provided in these units is complex because of patients' critical illness, extensive use of technology, and the need for nurses to demonstrate technical knowledge and competence (Bagherian, Sabzevari, Mirzaei, & Ravary, 2017; Monks & Flynn, 2014; Price, 2013). However, there are disparities between countries in terms of physical structure, patients' profile, and availability of critical care units (Marshall et al., 2017).

By way of illustration, an ICU in America is defined based on the intensity of staff, nurses or physicians, while in Belgium the definition reflects the intensity of illness and ability to care for patients with specific illness (Murthy & Wunsch, 2012). In the Netherlands, ICUs are uniquely defined based on the number of beds, ventilators, and staffing (Kluge et al., 2015). However, there is limited information on the definition, and availability, of critical care resources in developing countries, and therefore what is known about the delivery of critical care services (Murthy, Leligdowicz, & Adhikari, 2015). Paradoxically, the demand for critical care in the developing countries is high due to the increased burden of illnesses, at a prevalence higher than those experienced in developed countries (Murthy et al., 2015; World Health Organization, 2016). These circumstances pose enormous challenges for nurses who are at the frontline of critical care service delivery.

## **1.1 Disease burden**

The profile of patients in CCU is influenced by disparities in disease burden. A range of natural causes and human-generated disasters contribute to the high prevalence of diseases in developing countries (Firth & Ttendo, 2012; World Health Organization, 2016). Africa has the highest burden of human immunodeficiency virus (HIV) in the world and the number of people acquiring HIV is still high. The pandemic poses a significant challenge and has led to the loss of young adults who would otherwise contribute to the development of their countries (Global Burden of Disease Study 2013 Collaborators, 2015; World Health Organization, 2015a). In 2014, there were 1.2 million HIV related deaths globally out of which 73% occurred in the African region. HIV increases the risk of opportunistic infections and non-communicable diseases (NCDs) such as cardiovascular diseases, diabetes and cancer, among others, because of the HIV infection or side effects of the HIV treatment (World Health Organization, 2015a). The prevalence of trauma is also high in developing countries. The World Health Organization (2015b) reported that there were 1.25 million road traffic accidents globally in 2013, of which 90% occurred in developing countries which possess only 54% of the world's registered vehicles. In addition, NCDs, which are a pathway to critical illness, are on the rise in Africa. For example, Africa has the highest percentage (66.7%) of undiagnosed diabetes, and the number of people with diabetes is expected to rise by 140.7% by 2040 (Ogurtsova et al., 2017). It is also estimated that the largest increases in NCD deaths will occur in African countries by the year 2020 (World Health Organization, 2014). These diseases culminate to critical conditions which increase the demand for critical care.

In Malawi, there is a double burden of both communicable and NCDs. HIV/Acquired Immune Deficiency Syndrome (AIDS) is the leading cause of Total Disability Adjusted Life Years (DALYs), accounting for 34.9% of total DALYs (Government of the Republic of Malawi, 2017a). Malawi is one of the worse affected countries by the AIDS pandemic in Africa. Since the first case of AIDS was diagnosed in Malawi in 1985 there has been significant increase in the HIV prevalence which reached 16.4% in 1999 among persons aged 15-49 years. However, there has been steady decline to 10.6% in 2010 and 10.3% in 2013 (Malawi National AIDS Commission, 2014). HIV infection and its associated opportunistic infections are the most common cause of hospitalisation and the cost of HIV-related hospital care creates a significant burden on Malawi's health system (Maheswaran et al., 2018). After HIV/AIDS, NCDs are the second

leading cause of deaths among adults, accounting for 16% of all deaths (Government of the Republic of Malawi, 2017a). The high cost of care related to communicable and NCDs negatively impacts on the health services including critical care.

Despite the burden of illness and the likelihood that this will increase, there are limited resources for the care of critically ill patients in developing countries. There is limited infrastructure to provide critical care, limited supply of drugs, medical equipment, electricity power failure, and lack of pre-hospital emergency medical systems (Carter & Snell, 2016; Limbu, Kongsuwan, & Yodchai, 2019; Murthy et al., 2015). The consequences of lack of pre-hospital care is that critically ill patients die or their conditions worsen before they reach the hospital (Munyiginya, Brysiewicz, & Mill, 2016; Stafford, Morrison, Godfrey, & Mahalu, 2014). Furthermore, there is a critical shortage of physicians and nurses with critical care training (Munyiginya et al., 2016; Ntogwiachu, Suiyven, & Williams, 2014; Stafford et al., 2014). Alongside the lack of medications and equipment, the lack of well trained staff is a major challenge in the delivery of critical care (Vukoja et al., 2014). Most CCUs in sub-Saharan African countries are manned by clinical officers in anaesthesiology who are not necessarily graduated physicians; rather, specially trained nurses and medical assistants (Henry, Frenkel, Borgstein, Mkandawire, & Goddia, 2014; Prin, Quinsey, Kadyaudzu, Hadar, & Charles, 2019). In the absence of well-trained staff and appropriate equipment, nurses rely on their knowledge, intuition, and skill of observation to recognise acutely ill patients. Furthermore, nurses in rural hospital CCUs perform extended roles such as intubating patients when anaesthetists are not available (Carter & Snell, 2016). This situation is different from some developed countries where health care spending on the care of critically ill patients is high (Marshall et al., 2017). The challenges in developing countries demand that critical care staff, especially nurses, gain appropriate competence to optimise their role in such resource poor settings.

## **1.2 Critical care nursing in Malawi**

In contrast to developed countries, like Australia, where direct patient care in CCUs is provided by registered nurses, prepared at degree level (Gill, Leslie, Grech, & Latour, 2012), the majority of nurses in Malawi and CCUs are nurse/midwife technicians who are prepared at diploma level (Government of the Republic of Malawi, 2011b; Holman, 2012; Mula, Ncama, & Maluwa, 2014). Furthermore, post-registration critical care courses, which exist in developed countries, are not available in most developing

countries including Malawi (Barnes & Paterson-Brown, 2017; Gundo et al., 2014b; Riviello, Letchford, Achieng, & Newton, 2011). Consequently, the majority of nurses working in critical care settings rely on basic nursing education to care for critically ill patients (Mula et al., 2014). This is despite undergraduate nursing training not equipping nurses with the required knowledge and skills for critical care practice (Skees, 2010).

Literature shows that lack of competence among critical care nurses in Malawi contributes to suboptimal care of critically ill patients and their families (Gondwe, Bhengu, & Bultemeier, 2011; Gundo, Bodole, Lengu, & Maluwa, 2014a; Mula et al., 2014). Mula et al. (2014) assessed nurses' level of knowledge and practice on enteral feeding in ICU and HDUs. Majority of the nurses (96.1%) reported that they had never attended in-service training on enteral feeding. Nursing school training was identified as the common source of knowledge on tube feeding. The authors concluded that the nurses do not use evidence-based information accessed from unit guidelines, journals, and in-service education. Other studies by Gondwe et al. (2011) and Gundo et al. (2014a) assessed nurses' perception of family needs and the challenges encountered by nurses in meeting patients' families' needs in ICU respectively. Both studies concluded that nurses underestimated the needs of patients' family members. In the study by Gondwe et al. (2011) nurses identified a lack of training in intensive care nursing, policies and preparedness to deal with the family members as contributing to their inability to meet family needs. In addition, Barnes and Paterson-Brown (2017) observed that competency gaps are aggravated by annual rotation of nurses to different departments of the hospital, which leads to loss of expertise in specific critical care settings. The lack of knowledge among nurses in the complex critical care environment, and mismatch between theory and practice, lead to nursing errors in these units (Valiee, Peyrovi, & Nasrabadi, 2014). This situation requires strategies that would address the gaps to ensure optimal care provision.

Literature indicates that continuing education is an essential process for improving health professionals' critical care competence in developing countries. According to Valiee et al. (2014), continuing education can help to reduce nursing errors in CCUs. Different authors have reported positive patient outcomes following staff training on different aspects of care (Barnes & Paterson-Brown, 2017; Mpambara, Musengimana, Ruhumuliza, & Carlson, 2015). In view of limited access to journals, textbooks, and internet in developing countries, short courses/trainings are considered practical for

knowledge and skill transfer (MacLeod, Jones, Aphivantrakul, Chupp, & Poenaru, 2011). To the researcher's knowledge, there is no formal in-service training or orientation resource for critical care nurses in Malawi.

### **1.3 Aim of the study**

To explore the learning needs of critical care nurses and use these to guide the development of an in-service training programme for critical care nurses in Malawi.

### **1.4 Design of the study**

Programme planning and evaluation approach using mixed methods were applied. Specifically, a multiphase design of mixed methods was used. According to Creswell and Plano Clark (2011), the design involves the combination of concurrent and/or sequential collection of quantitative and qualitative data sets over multiple phases of a study to achieve the overall objective. The approach is used in programme evaluation approaches in which quantitative and qualitative data sets are collected at multiple phases to support needs assessment, programme development and programme evaluation, which suits the overall objective of the current study.

Furthermore, stages of the study were guided by Caffarella's (2002) Interactive Model of Programme Planning for adult learners. The model was chosen because it is flexible and encourages programme planners to use components that are relevant to meet the needs of the people and the context (Cavanaugh & Huse, 2004). Furthermore, the model acknowledges that programme planning is a negotiated activity between and among educators, learners, and other stakeholders who contribute their own beliefs to the planning process (Caffarella, 2002; Caffarella & Daffron, 2013).

For the purpose of this study, the term CCU refers to an ICU or HDU (British Association of Critical Care Nurses, 2010). A critical care nurse is a nurse who administers care to critically ill patients admitted to any of these critical care settings (Nurses and Midwives Council of Malawi, 2014; World Federation of Critical Care Nurses, 2007). In Malawi, the term guardian refers to the patient's family members or significant others and will be the term used throughout this report when describing family members and significant others.

## **1.5 Significance of the study**

It is expected that the hospitals where the study was undertaken will be able to use the in-service training programme for orientation and continuing education activities for the nurses in critical care settings. This will improve the quality of critical care and patient outcomes in CCUs. In addition, the programme could be used by policy makers and donor agencies with an interest in the upskilling of nurses in hospitals with a similar context. It is also envisaged that the findings will inform nurse educators on what could be included in training curriculum for nurses. In the absence of a post-registration programme in critical care nursing, the findings will guide training institutions, policy makers, and donors in the development of such programmes for Malawi. Finally, the findings contribute to a body of knowledge on critical care nursing which does not exist in most developing countries like Malawi.

## **1.6 Structure of the thesis**

Chapter one: Presents background information on critical care, disparities in disease burden, critical care nursing in Malawi, aim of the study, design of the study, significance of the study, and structure of the thesis.

Chapter two: Describes the profile of Malawi, which is the context of the study. Based on available literature, the chapter discusses nursing education in Malawi, critical care practice and education, continuing education and its impact in critical care nursing.

Chapter three: Presents details of the study design, research paradigm, and the methods that were used in the phases of the study namely: identification of programme ideas, developing stage, implementation and evaluation of the training programme.

Chapter four: Presents findings of the quantitative strand in Phase 1 of the study. The aim of the quantitative strand was to identify learning needs by assessing nurses' competence in intensive and critical care nursing.

Chapter five: Presents findings of the qualitative strand in Phase 1 of the study. The aim of the qualitative strand was to provide further clarification of the quantitative results.

Chapter six: Outlines the steps that were followed during development, implementation and evaluation of the in-service training programme. The chapter focusses on prioritisation of the identified nurses' learning needs, design of the instructional plans, and implementation and evaluation of the training programme.

Chapter seven: Discusses the conclusions drawn at the end of each quantitative/qualitative strand and the whole study. The discussion relates to CCU nurses' competence, learning needs of the nurses, consequences of lack of preparedness for critical care nursing practice, and contextual issues that affect critical care nursing practice in Malawi. Lastly, the chapter discusses the training programme which was developed, implemented, and evaluated in the study.

Chapter eight: Presents a summary of the findings and discusses the contribution of the study to knowledge, recommendations for nursing education, practice, health policy and research. Lastly, the chapter discusses strengths, limitations, and conclusion of the thesis.

## **1.7 Chapter summary**

Critical care nursing practice is complex because of the critical illness of the patients admitted to critical care settings and the expected use of technology in the care of these patients and their families. There is a high burden of diseases in developing countries, such as Malawi, resulting from natural causes and human generated disasters. These diseases culminate in critical illness that increases the demand for critical care services. Despite the high burden of diseases, there are limited resources for critical care practice and a shortage of well-trained professionals, including nurses. In contrast to developed countries, there are no post registration courses specific to critical care nurses in developing countries like Malawi. So far, there is lack of structured on the job training for the nurses who work in CCUs. To address the gap, the aim of this study was to explore the learning needs of CCU nurses. The learning needs were used to develop an in-service training programme for the nurses. The next chapter will discuss the study context and literature related to critical care nursing.



## **Chapter 2 Literature Review**

### **2.1 Introduction**

The first chapter presented background information and an overview of the study. As highlighted, the demand for critical care in developing countries is high because of the high burden of diseases. Yet, there is a critical shortage of resources and health professionals, including nurses, with critical care training. The need for training has been identified as a priority for nurses in developing countries. This literature review was carried out to provide context for the study and better understand critical care nursing education, competence requirements and continuing education in critical care nursing.

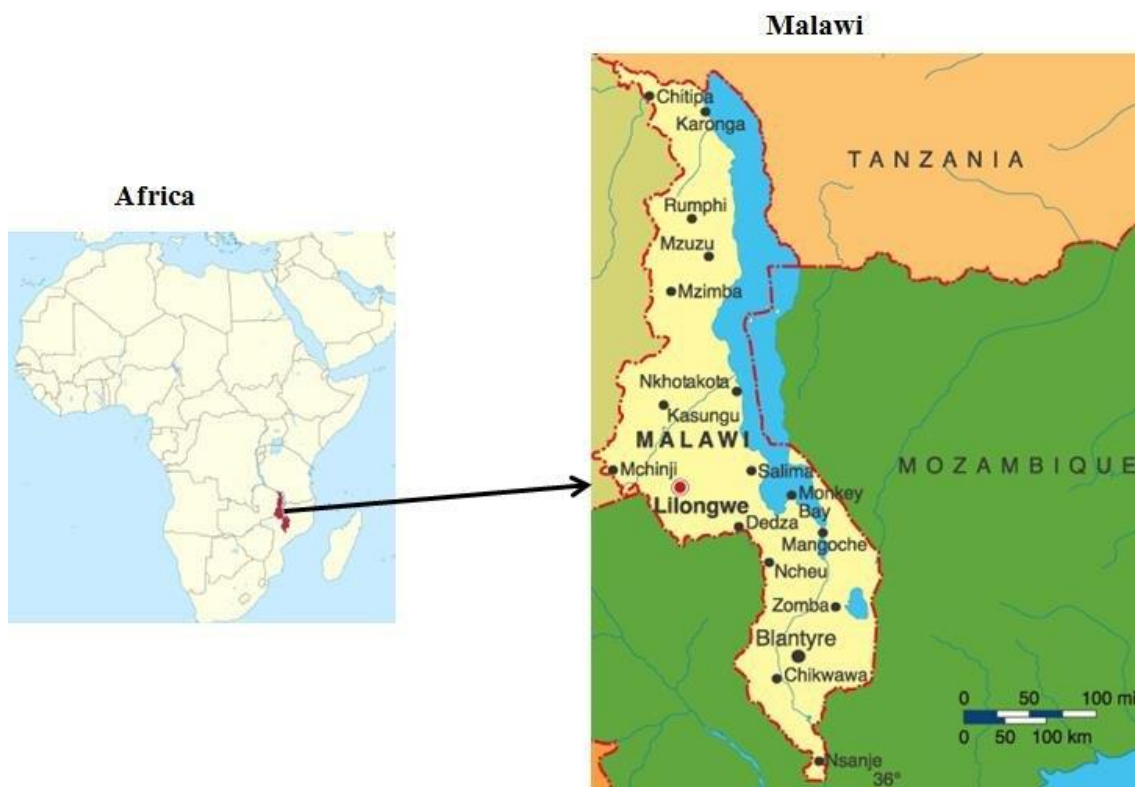
The review of literature involved online searches for published literature in the following databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL) plus full text (via EBSCO), Cochrane library (via Wiley), Scopus, Joanna Briggs Institute EBP database, and Google Scholar. The following search terms were used: continuing education, continuing professional development, training, education, staff development, clinical learning, intensive care, critical care, evolution, disease burden, nursing, developed countries, Malawi, developing and low-income countries. Where possible, truncation of the terms was done to widen the search; and where necessary, old sources were accessed to understand the evolution of critical care nursing. While a wealth of literature related to critical care nursing in developed countries was identified there was little published literature specifically relating to critical care nursing in Malawi. The review will be presented in the following sub-themes: brief profile of the context, critical care practice in Malawi, critical care nursing education, competence requirements in critical care nursing and continuing education in nursing.

### **2.2 Brief profile of the context**

This section presents an overview of Malawi and its health system. The WHO's (2007) health systems framework indicates that a health system comprises all organisations, people, and actions whose primary intent is to promote, restore or maintain health. The six building blocks of a health system presented in the framework will be used in this section to provide the context in which critical care services are provided and the setting in which the present study was carried out.

### 2.2.1 Overview of Malawi

Malawi is a small landlocked country located in sub-Saharan Africa, south of the Equator (Figure 1). The country is 901 kilometres long and 80 to 161 kilometres wide. The total surface area is 118,484km<sup>2</sup> of which 94,276km<sup>2</sup> is land and the remaining area is mostly Lake Malawi. The country shares boundaries with Zambia to the west, Mozambique to the east, south and southwest, and the United Republic of Tanzania to the north (Government of the Republic of Malawi, 2011a). The lake marks the country's eastern boundary with Mozambique. Spanning a distance of 587.4 kilometres and 83.7 kilometres between the widest points, the lake is the third largest in Africa and 11<sup>th</sup> in the world (Official Malawi Tourism Website, n.d). As a landlocked country, there is limited connectivity to the rest of the world. Most of the resources including those that relate to health care are imported through South Africa and Mozambique on the southern part, and Tanzania on the eastern part of Africa.



*Figure 1: Map of Malawi and its location on the African continent. Reprinted from “A review of heavy metals in soil and aquatic systems of urban and semi-urban areas in Malawi with comparisons to other selected countries” (Kaonga, C. C., Kosamu, I. B. M., Lakudzala, D. D., Mbewe, R., Thole, B., Monjerezi, M., ... Sajidu, S. M. I. (2017). *African Journal of Environmental Science and Technology*, 11(9), 450). Copyright 2019 by C.C. Kaonga. Reprinted with permission.*

The country has three administrative regions namely northern, central and southern, with a total of 28 districts. Six districts are located in the northern region, nine districts in the central region, and 13 are in the southern region. The districts are further divided into traditional authorities that are under the rule of Chiefs. Furthermore, the political system divides each district into constituencies and each constituency is represented by a Member of Parliament. The constituencies are further divided into wards, which are represented by local councillors at District council. With regard to the economy, it is primarily based on agriculture, which accounts for 30% of the gross domestic product (GDP) (Government of the Republic of Malawi, 2011b). More than 80% of the population are smallholder farmers with access to an average 0.23ha of arable land. The people's dependence on agriculture means that they are highly vulnerable to the effects of natural disasters such as annual dry spells and flooding (World Food Programme, n.d.). According to the United Nations Development Programme (n.d), Malawi is a low human development country, ranked number 174 with a Human Development Index (HDI) of 0.414 and Gross National Income (GNI) of US\$715. Compared to neighbouring countries, Mozambique, Zambia and United Republic of Tanzania are ranked number 178 (HDI 0.393), 141 (HDI 0.561) and 159 (HDI 0.488) respectively.

The population has increased by 35% from 13,029,498 in 2008 to 17,563,749 in 2018, according to preliminary results for the 2018 Population and Housing Census (Government of the Republic of Malawi, 2018). Consequently, the population density has increased from 138 persons per square kilometre in 2008 to 186 persons per square kilometre in 2018. Based on the current annual growth rate of 2.7%, the population is expected to reach 20.4 million people by the year 2022 (Government of the Republic of Malawi, 2017a). The population of males and females account for 49 and 51% of the total population respectively. Younger age groups constitute the highest proportion of the population with 51% (8,894,534) below the age of 18 years (Government of the Republic of Malawi, 2018). The people are very friendly with unique qualities of warmth and hospitality. These attributes, coupled with the safety that exists in the country, have earned the country the accolade: the 'Warm Heart of Africa' (Official Malawi Tourism Website, n.d).

The country's epidemiological profile shows a high burden of communicable and NCDs. NCDs are the second leading cause of deaths (16%) in adults (Government of the Republic of Malawi, 2017a). The high disease burden contributes to high demand for health services including critical care and there has been progress in some health

programmes and indicators. For instance, the country has a robust immunisation programme such that the percentage of children aged 12-23 months who received vaccinations recommended in the national immunisation schedule by the first birthday (excluding the recently introduced ROTA and PCV) in 2013 and 2014 was 71.5% (National Statistical Office, 2014). In addition, there has been steady decline in under-five mortality from 234 deaths per 1,000 live births in 1990 to 122 per 1,000 live births in 2006 and further decline to 64 deaths per 1,000 live births in 2015 (MamaYe, n.d; United Nations Children's Fund, 2017). The infant mortality rate (IMR) declined from 69 per 1,000 live births in 2006 to 43 per 1,000 live births in 2015 which surpassed the Millennium Development Goal target of 44 deaths per 1,000 live births (MamaYe, n.d; United Nations Children's Fund, 2016). Furthermore, there has been steady decline in maternal mortality ratio (MMR) from 675/100,000 live births in 2010 to 439/100,000 in 2016 (Government of the Republic of Malawi, 2017a).

Although most of Malawi's health indicators are still considered high compared to developed countries, they are slightly higher in relation to life expectancy and slightly lower in relation to HIV prevalence than that of neighbouring countries (Government of the Republic of Malawi, 2018; Republic of Zambia, 2018; United Nations Children's Fund, 2016). Table 1 below shows a comparison of health indicators between Malawi and neighbouring Zambia.

Table 1. A comparison of health indicators between Malawi and Zambia

<b>Indicator</b>	<b>Malawi</b>	<b>Zambia</b>
Population (Million)	17.5 (2018)	16.4 (2017)
Life expectancy at birth in 2015	64	61
Infant mortality (per 1,000 live births) in 2015	43	43
Adult HIV prevalence (%) in 2014	10	12.4

### **2.2.2 Health system in Malawi**

According to the WHO (2007) framework, a health system comprises six building blocks namely: service delivery; health workforce; information; medical products, vaccines and technologies; financing; and leadership and governance (stewardship).

#### **Service delivery**

The World Health Organization (2007) posited that good health services deliver effective, safe, good quality personal and non-personal care to those that need it, when

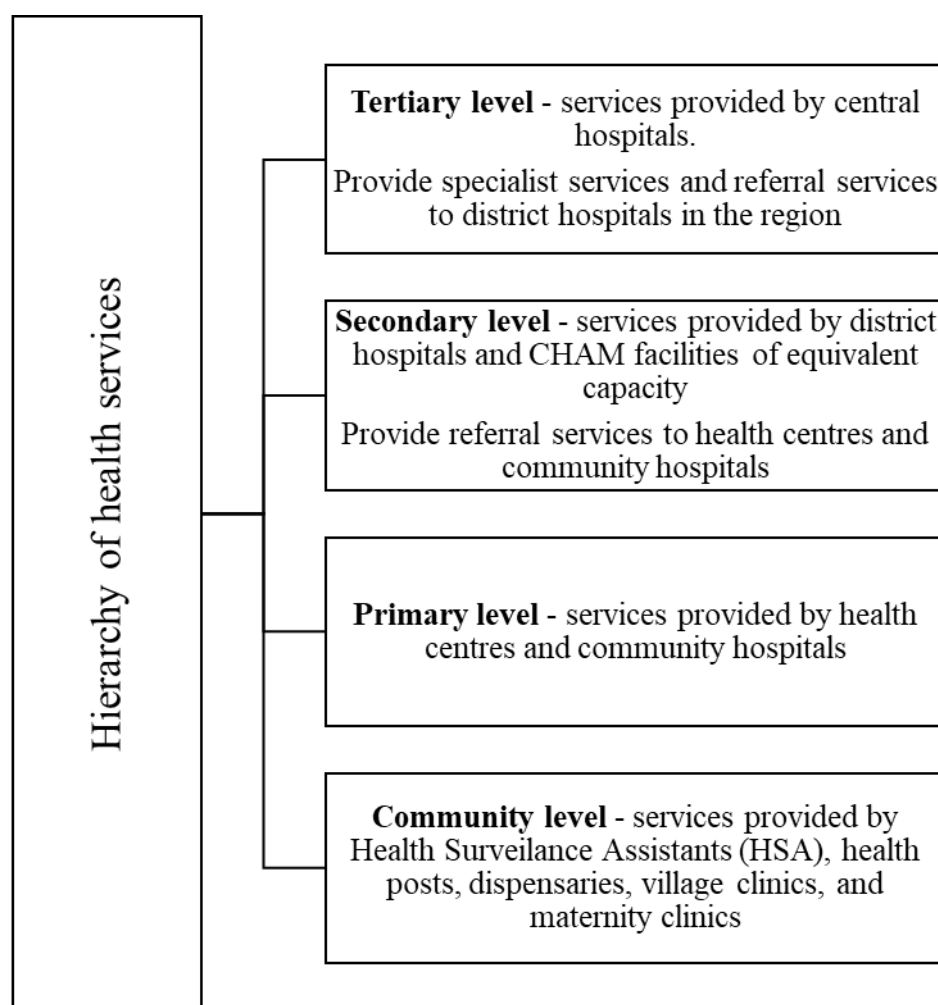
needed, and with minimum waste. In Malawi, health services are provided by the public and private sectors. The public sector, which comprises facilities under the Ministry of Health and other ministries, Police, Prison Services and Army, provide these services for free (Government of the Republic of Malawi, 2011a). In addition, patients admitted to district and central hospitals are provided with free meals but their guardians bring food stuffs and prepare their own meals at the guardian shelter where they are accommodated (Gundo et al., 2014a). The services are provided for free because majority of the people are poor and cannot afford to pay for health care. On the other hand, the private sector, which consists of private-for-profit (PFP) and private not-for-profit providers (PNFP), charge a user fee which varies amongst facilities. The PFP consists of private hospitals, clinics, and traditional healers. The PNFPs are facilities under religious institutions, non-governmental organisations (NGOs), statutory corporations and companies. The Christian Health Association of Malawi (CHAM), an umbrella organisation for all faith-based facilities, is the major religious provider of health services (Bandazi et al., 2013; Government of the Republic of Malawi, 2017a). Table 2 (p. 12) shows the number of facilities owned by each of these stakeholders. The data are based on findings of the Malawi Service Provision Assessment (2013-2014) which was conducted between July 2013 and February 2014 to assess the status of health facilities in Malawi (Ministry of Health (MoH) [Malawi] and ICF International, 2014).

Table 2. Providers of health services in Malawi

Facility type	Managing authority					Total
	Government	CHAM	Private	NGO	Company	
Hospital	51	44	22	2	0	119
Health centre	360	112	5	5	7	489
Dispensary	46	2	2	0	5	55
Clinic	25	11	223	52	58	369
Health post	27	1	0	0	0	28
Total	509	170	252	59	70	1,060

The Malawi health system comprises community, primary, secondary, and tertiary levels of care. As illustrated in Figure 2 (p. 14) the four levels are connected through a referral system (Government of the Republic of Malawi, 2017a). The services that are provided at community level are preventive, promotive, curative, rehabilitative, and

surveillance services. These services are delivered in urban and rural areas with the participation of the communities. In Malawi, a Health Surveillance Assistant (HSA) provides prevention and promotion services at community level with a catchment area of 1000. However, the HSAs perform other tasks including curative services without proper supervision because of a shortage of health professionals in the country. At the primary level, health centres and community hospitals provide outpatient and maternity services. The facilities at secondary level provide both outpatient and inpatient services (Government of the Republic of Malawi, 2017a, 2017b). Specialised services, including critical care, are rendered at the tertiary level of care. Details about critical care services are presented in the subsequent section. As earlier indicated, CHAM facilities, which are mostly located in rural areas where there are no government health facilities, charge reasonable fees to cover operational costs. However, most people in the rural areas are unable to access the services because they are not able to pay the user fee (World Health Organization, n.d). In order to reduce the financial burden on the people in the rural areas, the government entered into contractual agreements called Service Level Agreement with the CHAM facilities. According to the agreement, the CHAM facilities provide services to the people for free and the government pays for the services based on an agreed price list (Gama, 2013).



*Figure 2: Levels of the health system in Malawi*

### **Health workforce**

Health workers are defined as all people who are involved in actions whose primary intent is to protect and improve health. A strong positive correlation exists between health workforce density and health outcomes (World Health Organization, 2007). Malawi is one of the developing countries experiencing a critical shortage of health professionals. Based on primary data from 2007 to 2016, the density of physicians, nursing and midwifery personnel, and dentistry personnel is 0.0, 0.3 and 0.0 per 1000 population respectively (World Health Organization, 2018). The vacancy rate for all health workers is 45% and the shortage of nurse/midwives is estimated at 65% (Government of the Republic of Malawi, 2017a). Most health facilities lack nurses and midwives, particularly those in rural areas (Nursing Education Partnership Initiative, 2015). The country lost a significant number of nurses, especially registered nurses, who migrated to the United Kingdom (UK) around the year 2000 (Msiska, Simwaka, Munkhondya, Kabuluzi, & Munkhondya, 2018). At that time, the UK government had

embarked on recruitment of nurses from overseas, including Malawi, to improve its health system. From 2000-2002, the country lost 90-111 nurses every year and this worsened the brain-drain crisis in the country. The reasons for their migration included opportunities for further education, high living standards, better pay and working conditions (Adhikari & Grigulis, 2014).

The migration of nurses to the UK has tailed off over the years because of new UK immigration policies, which were introduced in response to calls for the UK government to review recruitment of nurses from low-income countries, including Malawi. In view of this development, nurses resorted to alternative employment offered by high paying NGOs, which are increasing in the field of health (Adhikari & Grigulis, 2014). The shortage of nurses is also attributed to misdistribution of health professionals across levels of care, districts, urban and rural areas (Government of the Republic of Malawi, 2011b, 2017a; Manafa et al., 2009). With regard to urban and rural areas, 74% of the health professionals are in the urban areas where they serve 19% of the population. In addition, studies reported that health professionals leave their jobs because of a lack of motivation due to low salaries, lack of job description for some cadres, lack of promotions and opportunities for career progression, unfair treatment by managers, and lack of resources and team work among staff (Bradley & McAuliffe, 2009; Manafa et al., 2009).

In response to the critical shortage of staff, the Government of Malawi implemented plans which aimed at increasing the production of health professionals. These plans include the Six-Year Emergency Pre-Service Training Plan and the Emergency Human Resources Programme which were launched in 2002 and 2004 respectively (Bandazi et al., 2013). Despite the increase in health professionals, the health sector continues to be hit by a critical shortage of health professionals for the reasons discussed. The shortage of staff leads to high workloads, especially for nurses and midwives who are at the frontline of health service delivery (Bradley et al., 2015). An example of the impacts was reported by Waitt et al. (2015) who noted a ratio of two nurses to 60-90 patients in adult medical wards at one of the referral hospitals. Furthermore, Msiska et al. (2018) reported that one nurse was responsible for 100 patients in other hospitals. This compromises quality of care rendered to patients, including those admitted to CCUs.



## **Information**

The World Health Organization (2007) observed that use of information and research on health and health systems is an integral part of the leadership and governance function. Health information in Malawi is collected at different levels using prescribed forms and registers. Challenges include lack of appropriate registers for specialised units, poor record keeping, lack of uniformity in recording information (Gundo et al., 2014b), late submission of health information to higher levels, and incomplete data that are passed on to the next level (Lungu, 2013; Zere et al., 2010). These problems limit the use of data for sound decision making at different levels including CCUs (Gundo et al., 2014b).

Furthermore, the Malawi Government recognises the importance of research in health. To this effect, the Ministry of Health (2012) developed a National Health Research Agenda which highlighted priority areas of research. Although research is being conducted in different sectors, there is limited research done with regard to critical care. Staff education on research and how to translate available data from published research is needed to generate scientific evidence to guide the care of critically ill patients.

## **Medical products, vaccines, and technologies**

Equitable access to essential medical products, vaccines, and technologies that are safe and cost-effective is an important attribute of a well-functioning health system (World Health Organization, 2007). In Malawi, the shortage of drugs and other medical supplies are a major challenge in health facilities (Government of the Republic of Malawi, 2011a; Wild & Cammack, 2013). According to Henry et al. (2014), equipment such as pulse oximeters and anaesthetic machines were either not functional or not available in more than half of their sample of hospitals in Malawi. With regard to technology, lack of equipment and other resources has been reported as having an impact on the delivery of care in the country's CCUs and operating theatres (Gundo et al., 2014b; Henry et al., 2014; Mula et al., 2014). Greater understanding of the experiences of critical care staff and their learning needs in such settings will help to improve patient care utilising the available resources.

## **Sustainable financing and social protection**

A good health financing system ensures that people have access to needed services (World Health Organization, 2007). Malawi is a signatory to The Abuja Declaration which calls on African Governments to increase their budgetary allocation to health to

at least 15% of the national budget. However, health financing in Malawi is unstable and unpredictable because of increased dependency on development partners. For example, the development partners, Government and households, contributed 61.6%, 25.5% and 12.9% of the total health expenditure (THE) respectively over the 2012/13-2014/15 period. In addition, the development partners contributed 95% of the total financing towards the HIV/AIDS subsector (Government of the Republic of Malawi, 2017). The major donors (development partners) include United States Agency for International Development (USAID), United Nations Children's Fund (UNICEF), Department for International Development (DFID), and United Nations Population Fund (UNFPA) among others.

Inadequate health financing affects health service delivery and training of health professionals. For instance, in the past 10 years, the Ministry of Health has only managed to send nine nurses to South Africa and Kenya for postgraduate training in critical care nursing because there are no critical care nurse training programmes in Malawi. Calibrated to the country's population in 2018, each of the trained critical care nurses is responsible for a population of 1,951,527. Some of these nurses joined training institutions while others hold management positions. With the current financial constraints, it is unlikely that the Ministry of Health will be able to sponsor nurses for specialised training outside the country. Therefore, nurses find working in critical care settings very challenging due to lack of training in this specialist area (Gondwe et al., 2011).

### **Leadership and Governance**

Leadership and governance of health systems is the most complex and critical building block of any health system. It highlights the role of the government in overseeing and guiding the whole health system to protect public interest (World Health Organization, 2007). In Malawi, the Government's Ministry of Health sets the agenda for health and is responsible for developing, reviewing, and enforcing health and related policies for the health sector with guidance from Cabinet Committee on Health, Parliamentary Committee on Health, Health Sector Working Group, Senior Management Committee and Technical Working Groups (Government of the Republic of Malawi, 2011a).

Local training and practice of nurses is regulated by the Nurses and Midwives Council of Malawi which was established by the Act of Parliament Cap 36:2 in 1995 (Bandazi et al., 2013; Government of the Republic of Malawi, 2011b). The Medical Council of

Malawi regulates the training and practice of physicians, clinicians, and other allied staff (Henry et al., 2014). The two regulatory bodies have mandated continuing education or continuing professional development (CPD) as a requirement for renewal of annual registration. Most health facilities have CPD coordinators who coordinate learning activities for nurses. In most instances, these activities relate to general nursing or midwifery care and are not specific to critical care nursing.

### **2.2.3 Nursing education in Malawi**

The training of nurses in Malawi was initiated by Scottish missionaries who arrived in the country (then Nyasaland) in 1860. The training was rudimentary and implemented independently by the missionaries in different parts of the country. Later, the missionaries teamed up and agreed to standardise the training of nurses. This led to the formation of a Medical Board in 1905 which was tasked to maintain the standards of the training of nurses. In 1926, the Missions persuaded the Government to establish a Department of Education and Medical Council. The council's responsibilities were to compile syllabus and issue certificates. This resulted in improved standards of nursing. The nurses were predominantly Christians, and the training included Christian character which earned them respect among the people in the country (Smit, 1988). Over the years, the training of nurses has evolved. As a former British colony, the country inherited the nursing education system of the UK (Adhikari & Grigulis, 2014).

There are 16 nurse training institutions accredited by the Nurses and Midwives Council of Malawi. Among other functions, the council prescribes nursing curriculum and training standards for the training institutions (Nurses and Midwives Council of Malawi, n.d.). The training institutions operate either privately under CHAM (11 institutions) or as government statutory institutions (5 institutions) and report to Ministry of Education (Government of the Republic of Malawi, 2011b). Nursing education is heavily subsidised by the Malawian Government, and students are expected to pay a certain percentage of the fees although some nursing students are not able to pay their contribution because of poor economic status (Bandazi et al., 2013; Schell, Rankin, Chipungu, Rankin, & Weiller, 2011). Additionally, government funding is unstable because of financial constraints, which leads in extreme cases, to temporary closure of some colleges (Bandazi et al., 2013). In response to the challenges, some development partners provide support, which includes college infrastructure development, capacity building for staff, provision of salaries for additional lecturers,

and provision of scholarships to nursing students. The development partners include the US President's Emergency Plan for AIDS Relief (PEPFAR)/Nursing Education Partnership Initiative (NEPI), Clinton Health Initiative (CHAI), Global AIDS Interfaith Alliance (GAIA), International Training and Education Centre for Health (I-TECH), Norwegian Church AID (NCA) and MCHIP (Bandazi et al., 2013; Bvumbwe & Mtshali, 2018; Schell et al., 2011). As an example of the support rendered to students, Schell et al. (2011) noted that some students benefit from GAIA scholarships which cover fees, uniforms, books, shoes, nurse's watch, blood pressure cuff, thermometer, stethoscope, and daily living allowance. The scholarship costs GAIA US\$1,200 per student per year. However, the scholarships are limited and very competitive because of the increasing student intakes to the training institutions.

There are several pre-service and postgraduate training programmes offered by the 16 training institutions. A four-year undergraduate nursing and midwifery programme (Bachelor of Science in Nursing and Midwifery) is offered at three training institutions, namely Kamuzu College of Nursing (KCN) which is a constituent college of the University of Malawi, Daeyang University, and Mzuzu University. The programme helps to increase the number of nurses who are also midwives (Bandazi et al., 2013). In addition, KCN recently introduced a Bachelor of Science in Nursing with the following direct options: midwifery, community health nursing, adult health nursing, child health nursing, psychiatric and mental health. The admission requirement is Malawi School Certificate of Education (MSCE) or its equivalent with a minimum of six credits, four of which should be in English, Mathematics, Biology and Physical Sciences. The MSCE is obtained after a minimum of 12 years of schooling at primary and secondary school level. KCN also offers upgrading courses for serving registered nurses with a diploma in nursing and midwifery. The upgrading course is a 2-year Bachelor of Science in Nursing programme with options in nursing education, child health nursing, community health nursing and adult health nursing. There are also plans to introduce critical care nursing and theatre nursing (Bandazi et al., 2013).

The other institutions offer a 3-year nurse midwife technician diploma programme. Applicants for these programmes are required to have an MSCE with three credit passes in science subjects. All of these programmes are competitive due to limited space in the training institutions. Thus, only candidates with best grades are selected. The students have to be 16 years of age by the time they enter nursing colleges. Upon successful completion, the students are required to write licensure examination for registration

with the Nurses and Midwives Council of Malawi before they start practising. However, serving nurse midwife technicians who enrol for the upgrading courses are exempted from the licensure examination. In addition, only KCN offers postgraduate courses in different specialties, except critical care nursing. Advertisements for the training programme are run in both print and electronic media. In addition, some training institutions conduct awareness campaigns in the community and schools to sensitise prospective students.

The graduates of the Bachelor of Science in Nursing and Midwifery, Adult Health and Child Health programmes are deployed to central, district and rural hospitals. Graduates of education programmes (Bachelor of Science and Master's) are recruited as tutors in the training institutions. Graduates of health service management programmes are deployed to health facilities to manage the institutions. Community health graduates work in the communities and focus on prevention of diseases. They are also multi-skilled in nursing and midwifery care which is provided where required. The direct entry programmes (Bachelor of Science in Child Health, Community Health, Mental Health, and Midwifery) are new and yet to produce the first graduates. Details of the other cadres are presented in Table 3 (p. 21).

Table 3. A summary of nurses' cadres, qualifications and their roles

<b>Cadre</b>	<b>Training and qualification</b>	<b>Role</b>
Nursing officers	Registered nurses with Bachelor of Science in Nursing and Midwifery, Adult Health and Child Health programmes. They are trained at KCN and Mzuzu University. The degree programme has been introduced recently at Daeyang University.	Highly qualified nurses/midwives. They play managerial and decision-making roles and are mostly available at central, district, and rural hospitals.
Nursing Educators	Registered nurses with Bachelor of Science in Nursing Education. They are trained through a two-year upgrading course at KCN.	Deployed to training institutions to work as tutors.
Nursing Managers	Registered nurses with Bachelor of Science in Health Service Management.	Registered nurses with Bachelor of Science in Nursing Education.
Nurse/Mid wife Technicians	Trained through a 3-year Diploma in many training institutions.	They are the largest nursing cadre. Most are placed in health centres and community hospitals. They provide general patient care and conduct uncomplicated deliveries in areas where nursing officers are limited in numbers.
Community Health Nurses	Trained at Degree and Diploma level through a two-year and one-year upgrading courses respectively. The degree programme is offered at KCN while Malawi College of Health Sciences offers the Diploma programme.	Work in communities and focus on disease prevention.
Psychiatric Nurses	Trained through upgrading courses at both Degree (St. John of God College of Health Sciences) and Diploma (Malawi College of Health Sciences) levels.	Serve patients with mental illnesses.
Advanced Practice Nurses	Trained at Master's degree level at KCN since 2008. Areas of specialisation include: Child Health Nursing, Adult Health Nursing, Reproductive Health Nursing, Community Health Nursing, Nursing Education and Midwifery.	Majority are posted to nurse training institutions. The others are available at Central Hospitals where they play managerial and decision-making roles.

### **2.3 Critical care practice in Malawi**

The history of critical care practice in Malawi is not clear. The literature search yielded only one study which attempted to elucidate the evolution of the specialty in the country. This is not surprising in view of the observation made by Murthy et al. (2015) that most low-income countries lack published information on critical care services. As such, some of the information presented in this section is based on the researcher's experience in critical care. According to Gondwe et al. (2011), the first ICU in Malawi was established in 1990 at Kamuzu Central Hospital, which is one of the four public tertiary hospitals in the country. As of the year 2015, there were six ICUs located at the country's central hospitals and two private hospitals with a total of 24 beds. The number of ICU beds translates to 1 bed per 625,000 Malawians, calibrated to the country's population. This is far below the ICU bed density per 100,000 population in Germany of 29.2 and Luxembourg, 24.8 (Rhodes et al., 2012). None of the district hospitals has an ICU although they provide anaesthesia and surgical services (Henry et al., 2014). As such, the demand for critical care is high because all patients who require critical care are referred from district hospitals to central hospitals.

The central hospitals have HDUs located in different departments. These units act as step-up or step-down units which provide intermediary care between what is offered in ICU and in general wards (Prin & Wunsch, 2014). As of 2015, there were 14 HDUs located at the four public central hospitals. Other HDUs are located in some district hospitals and CHAM hospitals, which provide secondary level of care. The HDUs do not have the capacity to ventilate patients. Demand for critical care is high because of the high burden of illness as previously discussed. Some critically ill patients are either admitted to these HDU or general wards due to limited space in ICU (Gundo et al., 2014a). Furthermore, a recent study by Prin et al. (2019) noted that the prevalence of brain death in Malawi's ICU is higher than in developed countries. Unfortunately, brain death is not legally accepted as clinical death because of religious and cultural beliefs. This means that some patients who are declared brain dead overstay in ICU although they do not benefit from intensive care. The acuity of illness and ethical dilemmas in these units demand that nurses should constantly update their knowledge and skills in the management of patients and their guardians.

As earlier indicated (p. 3), there is no training institution that offers a pre-service or post-registration critical care nurse training programme. Critical care components or

modules are taught as a component of undergraduate nursing education. Students for Bachelor of Science and some of the diploma programmes pass through ICUs and HDUs for a 2-3-week orientation in their third or final year of study. This period is not enough for them to master the required knowledge, skills, and attributes for critical care nursing. Upon completion of the degree or diploma programmes, registered nurses and midwife technicians are deployed to any hospital ward or unit. This means that the qualified nurses who work in CCUs have very little or no knowledge at all about critical care nursing at the time of their allocation to the unit. Furthermore, the majority of nurses who work in these units are nurse midwife technicians who are trained at diploma level (see p. 21). This is different from countries like Cyprus and Egypt where nurses are only considered qualified to practice in ICU when they are certified through a critical care nursing programme (Hadjibalassi et al., 2012; Kamel et al., 2011).

The nurse-patient ratio in ICU ranges from 1:1 (Prin et al., 2019) to 1:2 (P. Kanjakaya, personal communication, February 18, 2019). The nurse patient ratio in HDU is 1:3 on average (P. Kanjakaya, personal communication, February 18, 2019) and is higher than in general wards. However, some HDUs are part of the general wards. In such units, the HDU nurses are expected to help their colleagues in the general wards as well as providing care to the critically ill patients. It is also worth mentioning that hospitals in Malawi practise rotation of nurses whereby some nurses are moved from one ward/unit to another department every year. This allows the nurses to be exposed to different hospital departments; however, previous studies noted that this practice leads to loss of expertise and nurses who have acquired experience in a specific unit (Harris, Fioratou, & Broadis, 2016). The practice also affects CCUs where nurses extensively use technology in monitoring and managing critically ill patients. This is consistent with findings of previously cited studies conducted in Malawi which reported that nurses in CCUs lack knowledge and skills required for the care of critically ill patients and their families in these units (Gondwe et al., 2011; Gundo et al., 2014a; Mula et al., 2014). According to Benner, Tanner, and Chesla (2009), nurses gain competence after 2-3 years of practice in a specific area.

## **2.4 Critical care nursing education: The past and present**

The beginning of critical care nursing dates back to the days of Florence Nightingale, the pioneer of the nursing profession. Nightingale isolated the severely injured soldiers during the Crimean war in 1854-1856 and nursed them close to the nurses' station



where they received intensive care nursing (Grenvik & Pinsky, 2009). It is considered that this contribution led to the introduction of CCUs for the care of critically ill patients. However, other authors regard polio units, introduced by Dr. Bjorn Ibsen during the poliomyelitis epidemic in Europe and the United States in the 1950s, as the immediate predecessor of CCUs (Fairman & Lynaugh, 1998; Reisner-Senelar, 2011; Sole, Klein, & Moseley, 2013). Since then, the concept of critical care has been adopted by different countries and rapid advances in technology have augmented the care of the critically ill (Ristagno & Weil, 2009).

During the evolution of CCUs, doctors and nurses realised that the critical care environment, coupled with critical illness of the patients, required them to acquire new knowledge. Initially, physicians and nurses started teaching each other. Doctors taught nurses physiology, pathophysiology, how to read electrocardiographic rhythms and evaluation of results; while nurses taught the doctors patients' response to treatment and their behaviour in the course of illness (Pirret, 2011). However, the nurses later realised that the physiological instability of patients and the frequent occurrence of death in these units demanded that they learn more (Fairman & Lynaugh, 1998). Critical care nurses in the United States of America (USA) identified the required knowledge and skills which could not be attained in their facilities and formed the American Association of Critical Care Nurses in 1969 which later developed the first core curriculum for critical care in 1974. The Association also began examination and certification of critical care registered nurses (Fairman & Lynaugh, 1998). Simultaneous to these developments in the USA, other countries such as the UK, Australia and New Zealand developed courses for critical care nurses (Pirret, 2011). However, the courses vary in relation to qualification, duration, and admission requirements as illustrated in Table 4 (p. 25).

Although the events that led to establishment of CCUs and critical care nursing in most developed countries are well documented, little is known about low-income countries especially in Africa. With the exception of South Africa and Nigeria, there is limited published evidence of the existence of such programmes in developing countries. According to Meiring, Lumsden, Morrison, and Furnham (1969) the first ICU in South Africa was established at Grey's Hospital, Pietermaritzburg, in 1968. However, the South African Nursing Council granted permission for the first post-basic diploma course in intensive care nursing earlier, in 1964, and the first course was offered at Johannesburg Hospital in 1966 (Scribante, Schmollgruber, & Nel, 2006). In Nigeria, the

first ICU was established at University of Nigeria Teaching Hospital in 1973. The first training programme in intensive care nursing was developed at Jos University Teaching Hospital in 1982. Currently, training in intensive care nursing is offered at postgraduate diploma level by only two out of 66 schools of nursing in Nigeria (Oguariri & Kabara, 2008) (Table 4).

Table 4. A summary of critical care courses in selected countries

Country/Region	Qualification	Duration	Admission requirements
Australia and New Zealand	Graduate certificate	6 months	Nurses are required to be working in ICU 2-4 days per week or meet the specified number of hours per week
	Diploma	12 months	
	Masters	24 months (Minimum)	
WHO Europe	Not indicated	40 weeks (30 hours per week)	Nurses who successfully completed initial education 2 years post qualification experience
South Africa	Diploma	1 year	Proof of registration with South African Nursing Council
	Masters	2 years	Senior certificate or basic degree plus 6 months training in a critical care setting
Nigeria	Diploma	1 year	Registered nurse with 5 credit passes in English, Mathematics, Biology, Chemistry, Physics or its equivalent at basic education

Internationally critical care courses are provided by different institutions ranging from universities, non-university hospitals, and non-university nursing schools (Aitken, Currey, Marshall, & Elliot, 2006; Baktoft et al., 2003; Scribante et al., 2006). Teaching and competence assessment are undertaken by nurse educators who are qualified in the clinical specialty and registered by regulatory bodies (Scribante et al., 2006), university personnel, hospital clinical staff, nurse managers, and clinical educators (Aitken et al., 2006). The clinical educators who are based in CCUs are responsible for designing, planning, and delivering the critical care curriculum (Baktoft et al., 2003). However, previous studies in Australia and Europe reported inconsistencies in relation to

nomenclature of the courses, course content, employment requirements, assessment processes, and qualifications (Aitken et al., 2006; Endacott et al., 2015). The authors concluded that these variations may be perceived as positive since they provide a range of choices for prospective students to meet their clinical local needs. However, the variations may bring confusion to prospective students and employers with regards to the course content and the competencies that are acquired at the end of the course. It is possible that the authors could have identified serious inconsistencies had they included colleges and other institutions that offer similar courses in the country.

The World Health Organization (2003) developed the critical care curriculum for the European Region to guide member states; however, the uptake of this curriculum by European countries is not known (Gill et al., 2012). A survey by Baktoft et al. (2003) reported that two of the 17 European countries that were sampled, Iceland and Greece, did not offer critical care courses. The other countries offered more than one course but there were inconsistencies in relation to qualifications, admission requirement and how the course was taught, among other areas. This may not reflect the current situation considering the period that has elapsed since 2003. However, Labeau, Chiche, and Blot (2012) recently acknowledged the existence of variations across Europe and emphasised the need for a unified curriculum that matches with the profile, needs, and expectations of today's societies. Such differences indicate that critical care nurses trained in different countries have different levels of competencies in critical care nursing.

Despite the differences, education advances have given critical care nurses the ability to participate in planning patient care and clinical decision making (Pirret, 2011). Critical care nurses in many countries now hold Master's and PhD qualifications in different fields of critical care nursing. In addition, there are now established associations and organisations to support critical care nursing and those who identify with it (Williams et al., 2009). To date, the World Federation of Critical Care Nurses (2005) continues to urge governments, professional and education bodies that govern nursing practice to recognise the importance of specialised preparation of the critical care nurses in order to achieve optimum health care delivery. Through its position statement on provision of critical care nursing education, the Federation further suggested topics to be included in such programmes. As earlier indicated, little is known about the existence of these courses in African countries except South Africa and Nigeria.

## **2.5 Competence requirements in critical care nursing**

Critical care nursing is defined as specialised nursing care of critically ill patients who have actual or potential disturbances of vital organs (British Association of Critical Care Nurses, 2010). The World Federation of Critical Care Nurses (2007) stated that the aim of critical care nursing is to build a therapeutic relationship with patients and their relatives and to implement interventions that empower the individual's physical, psychological, sociological, and spiritual capabilities. The delivery of nursing care in critical care settings is complicated by the patient's condition and the need to manage equipment which is used to treat, support, and monitor vital organs (Monks & Flynn, 2014; Tunlind, Granstrom, & Engstrm, 2015). This demands that nurses are competent in their skills as they make complex decisions that impact on patients' lives (Skees, 2010). There is a fascinating analogy of critical care nurses to the aeroplane pilot in whose hands people's lives are trusted. Passengers board a plane with the hope that the pilot is competent. Similarly, nurses are entrusted with the care of critically ill patients with the hope that nurses are competent in their profession (Tedford, 2008). As such, competence is an issue of great importance in critical care nursing and has been explored by several authors.

A review of literature by Aari, Tarja, and Helena (2008) defined competence in relation to clinical and professional competence. The following areas were identified as main domains; knowledge base, skill base, attitude and value base, and experience base. Although these findings were based on few studies, they were similar to those reported by Lakanmaa, Suominen, Perttila, Puukka, and Leino-Kilpi (2012). However, Lakanmaa et al. (2012) considered the earlier descriptions of competence by Aari et al. (2008) as inadequate and identified personal base as an additional domain which included three new subdomains namely: 'humanity and ethicality', 'way of working' and 'work motivation'. Humanity and ethicality refer to the qualities of reliability, honesty, empathy, positiveness, kindness and patience. Way of working is the ability to deal with stressful situations, to adapt to the different situations and to be stable, agile, exact, alert, systematic and spontaneous. Work motivation means the nurse is committed to work, independent in professional role and active (Lakanmaa et al., 2012). These domains guided the development of a self-assessment test (ICCN-CS-1) on competence in intensive and critical care nursing by Lakanmaa et al. (2013a).

Although there are differences in terminology, the previously outlined competencies are also reflected in the American Association of Critical Care Nurses Synergy Model for Patient Care. According to the model, the required competencies of critical care nurses include: clinical judgement and reasoning skills; advocacy and moral agency in identifying and resolving ethical issues; caring practices that are tailored to the uniqueness of the patient and family; collaboration with patients, families, and health care team members; systems thinking that promotes holistic nursing care; responsiveness to diversity; facilitation of learning for patients and family members and the community; clinical inquiry and innovation to promote the best patient outcome (Sole et al., 2013). Understanding these competencies is helpful in self and peer evaluation of professional development. Most of the studies on competence were conducted in developed countries. It is not known how these might translate to developing countries such as Malawi in view of the differences in disease burden and availability of resources.

## **2.6 Continuing education in nursing**

Competence requirements form the basis for continuing education in nursing (Lakanmaa et al., 2012). Different terms have emerged in reference to continuing education. These include CPD, continuing professional education, life-long learning, continuing nurse education, clinical learning and knowledge translation, among others (Gallagher, 2007; Hegney, Tuckett, Parker, & Robert, 2010). Regardless of the differences in terminology, Gallagher (2007) observed that the underlying theme of continuing education is that education is continuous. For the purpose of this review, continuing nursing education will be used and is defined as professional learning activities which are prepared after the nurses' initial licensure to enhance their contributions to quality health care (Washington State Nurses Association, n.d.).

Nurses consider continuing education necessary, important and helpful (Ni et al., 2014). Nurses attend continuing education to update their knowledge, improve clinical practice skills, improve the quality of their comprehension, obtain the knowledge necessary to achieve professional status, raise their level of scholarship, improve communication skills and be assisted in coping with changes in the work environment (Chong, Sellick, Francis, & Abdullah, 2011; Hayajneh, 2009; Ni et al., 2014). Furthermore, Drey, Gould, and Allan (2009) observed that some nurses do additional CPD as a way of escaping the current job or to prepare for a future job. Although there is lack of information or

randomised trials which demonstrated causal relationship between continuing education and patient outcomes, there is evidence of benefits of continuing education in critical care. A study by Bloos et al. (2009) which was conducted in a 50-bed ICU in Germany demonstrated that staff training on the care of mechanically ventilated patients significantly increased adherence to the ventilator bundle. This reduced the number of days that patients spent on mechanical ventilation. On the other hand, there is limited literature on the impact of continuing education in Africa's critical care settings. The studies related to continuing education in Africa as identified in the literature review are presented in Table 5 (p. 29).

Table 5. Impact of CE in Africa's critical care settings

Authors	Details of the study	Findings
Mpambara et al. (2015)	<p><i>Aims:</i></p> <p>To improve the outcome of patients requiring resuscitation.</p> <p>To meet hospital accreditation standards in critical areas.</p> <p>To build a sustainable programme by educating instructors about local Basic Life Support (BLS) and Advanced Cardiac Life Support (ACLS).</p> <p><i>Participants:</i> Nurses from intensive care, emergency department and operating theatre.</p> <p><i>Setting:</i> Rwanda</p>	<p>There was significant increase in the number of survivors. Survival rates increased from 34-52% from March to October 2014.</p>
MacLeod et al. (2011)	<p><i>Aim:</i> To determine the usefulness of the Fundamental Critical Care Course as a short educational curriculum for health care personnel in critical care setting.</p> <p><i>Participants:</i> Medical doctors, clinical officers and nurses</p> <p><i>Setting:</i> Kenya</p>	<p>Participants identified the following areas to be included in a critical care training programme: mechanical ventilation, critical care, intubation, central lines and patient monitoring.</p> <p>Post-test scores were significantly higher than pre-test scores</p>

The studies presented in the above table were conducted in two countries with different disease burden and economies which impact on availability of health care resources. For

instance, the prevalence of HIV/AIDS in Rwanda is 2.8% which is lower than Kenya's 5.3%. In addition, the percentage of population below the international poverty line of US\$1.90 per day is 60.3% in Rwanda which is higher than Kenya's 33.6% (United Nations Children's Fund, 2016). It is expected that these differences would influence disease burden and learning needs of critical care staff in the two countries. A study that focuses on the learning needs of nurses in Malawi would guide a training programme specific for the nurses and tailored to the context.

In view of the benefits of continuing education, it is not surprising that continuing education has been mandated internationally by some nursing regulatory bodies as a requirement for renewal of annual registration. This means that nurses are expected to achieve the required number of hours or points of continuing education to be able to renew their registration (Hegney et al., 2010; Ni et al., 2014). For instance, nurses in New Zealand are expected to achieve 60 hours of professional development in 3 years (The Nursing Council of New Zealand, n.d.). In other countries, mandatory continuing education has also been introduced to ensure that nurses are able to perform core nursing skills, such as infection prevention and emergency procedures like cardiac resuscitation (Drey et al., 2009). Similarly, in Malawi, each nurse is required to earn 25 points on CPD as a prerequisite for annual renewal of registration with the Nurses and Midwives Council (Nurses and Midwives Council of Malawi, n.d.).

Despite its popularity and enforcement by nursing regulatory bodies, CPD has received criticism in some quarters. Hegney et al. (2010) summarised the arguments in relation to the learner, what is learnt and outcome of the learner. For learner factors, many continuing education activities do not involve nurses as active participants; consequently, they fail to meet the needs of the participants. Consistent with these findings, Gould, Drey, and Berridge (2007) observed that 'one size does not fit all' meaning that different nurses in different contexts have different learning needs. Furthermore, Hegney et al. (2010) observed that most continuing education programmes do not build on evidence and are rarely evaluated; therefore, nurses do not appreciate the relationship between CPD and improvement in patient care. Although much has been written about continuing education in nursing, most of the studies were conducted in developed countries. As observed by Riviello et al. (2011), studies from the developed world may not be useful in developing countries due to differences in population characteristics, disease burden, and available diagnostics. Research on continuing in developing countries like Malawi is required to generate a body of

knowledge that would inform and develop nursing practice which is central to health service delivery in these countries.

### **2.6.1 Mode of continuing education**

Continuing education for nursing staff is offered in different forms including courses for additional qualification, short courses, seminars, conferences, in-service education, online learning, internet-based courses, spontaneous interactions with colleagues, clinical hand-over meetings and professional reading (Giri et al., 2012; Muula et al., 2004). In some developed countries there are clinical nursing educators who are permanently employed to teach new staff and organise refresher courses for nurses (Baktoft et al., 2003; Bray et al., 2010). There is no evidence of the existence of nursing educators in critical care settings in developing countries including Malawi. Reported modes of delivery for on-the-job training of critical care nurses include lectures, skill stations, and small group discussions (MacLeod et al., 2011; Pubudu et al., 2015).

The African context encourages sharing of knowledge in different forms which are part of life and cannot be separated from the people (Nafukho, 2006; Omolewa, 2007). Traditionally, knowledge is stored in memories and passed from one generation to the other through stories – a rich source of teaching, songs, folklores, proverbs, dances, myths, cultural values, beliefs, rituals, local language among others (Omolewa, 2007). Based on this understanding, Omolewa (2007) argued that adult education in this context should match the experience and environment of the learner. Furthermore, technological advances in the modern world provide enormous opportunities for increasing information flow and dissemination of evidence-based practice among health professionals (McNamara, 2007). However, Muula et al. (2004) and Harris et al. (2016) observed that attendance to such meetings as seminars and workshops in Malawi is influenced by the provision of allowances to participants. In view of economic challenges in most developing countries including Malawi, there is need to identify cost effective CPD strategies which suit the context.

## **2.7 Chapter summary**

The care of critically ill patients in CCUs is challenging because of the severity of the patients' illness and the extensive use of technology. The nurses who work in these units are expected to be well equipped with appropriate knowledge, skills, attitude, and experience required for the care of critically ill patients and their guardians. Malawi is a



developing country with a high burden of diseases which increases the demand for critical care services. Unlike developed countries, where critical care is well established, critical care practice in developing countries like Malawi is still in infancy stage. Alongside shortage of resources for the care of critically ill patients and their guardians, there is critical shortage of well-trained professionals with critical care training. One of the contributing factors is the lack of post registration courses specific for critical care staff including nurses. In the absence of programmes that are specific for critical care nurses, there is a need for innovative ideas to address the shortage of well-trained nurses. This study addressed the need for a training programme which suits the context in order to improve the quality of care that is rendered to critically ill patients and their guardians in Malawi. The next chapter will discuss the methodology that was applied in the study.

## **Chapter 3 Methodology**

### **3.1 Introduction**

The previous chapter discussed background information related to the context of the study and the disparities that exist between developed and developing countries. This chapter will discuss the methodology and rationale for its use in addressing the overall objective of the study. The discussion will cover research design, philosophical assumptions and specific methods which were used at different phases of the study, as well as the ethical considerations that were applied in the study.

### **3.2 Research Design**

The overall objective of the study was to develop an in-service training programme for critical care nurses in Malawi. To achieve this objective, a programme planning and evaluation approach using a multiphase mixed methods design was applied. Programme planning is defined as a set of steps followed by planners from the beginning through implementation, evaluation of the programme and planning for the future (Schmidt & Lawson, 2018). Evaluation research is a form of applied research, which involves systematic collection of data and thoughtful analysis to examine effectiveness of policies and programmes that are designed to bring about change (Clarke, 1999; Patton, 1990). The approach was considered appropriate for this study because of its ability to generate information which relates to the people for whom, and the context in which, an intervention will be designed. In addition, the approach allows assessment of the effectiveness of the developed intervention (Gittelsohn et al., 1999; Patton, 2002). There are two forms of evaluation: formative and summative. Formative evaluation is also referred to as formative assessment, process evaluation, needs assessment, preprogramme research and developmental research (Gittelsohn et al., 1999; Stetler et al., 2006). This evaluation is conducted before a programme is designed and aims to collect as much information as possible which guides programme goals, objectives, and content to suit a specific context. Formative evaluation also helps to identify barriers and opportunities for the intended intervention (Bonvecchio et al., 2014; Gittelsohn et al., 1999). On the other hand, summative evaluation involves collection of data to assess the degree of success or effectiveness of a programme (Stetler et al., 2006). A multiphase mixed methods design was used during the formative and summative evaluation stages of this research.

### **3.3 Mixed methods design**

A mixed methods research design is defined “as research in which the investigator collects and analyses data, integrates the findings, and draws inferences using both qualitative and quantitative approaches or methods in a single study or a programme of inquiry” (Tashakkori & Creswell, 2007, p. 4). A multiphase mixed method design involving the combination of concurrent and/or sequential collection of quantitative and qualitative data sets over multiple phases of a study was chosen to achieve the overall objective of the present study (Creswell & Plano Clark, 2011). According to Creswell and Plano Clark (2011) the design is appropriate in situations where the researcher cannot achieve the overall objective of the study with a single mixed methods study. In the context of programme evaluation, the multiple phases address incremental research questions which advance the overall objective. The quantitative and qualitative data sets are collected at multiple phases to support needs assessment, programme development and programme evaluation, and this suited the overall objective of the current study (Creswell & Plano Clark, 2011).

Within each phase of a multiphase design, the procedures reflect the approaches for implementing one or more basic mixed methods designs. In the present study, explanatory sequential approach was used in the application of quantitative and qualitative methods in two different phases. The approach consists of collection and analysis of quantitative data which subsequently guides collection and analysis of the qualitative data. The results of the quantitative strand provide understanding of the problem while the qualitative strand helps to explain, confirm or disconfirm the quantitative results (Creswell & Plano Clark, 2011; Hayes, Bonner, & Douglas, 2013; Teddie & Tashakkori, 2009). The mixing of the two strands occurs at two stages. First, the researcher connects the two strands through selecting participants and developing tools for the qualitative strand based on quantitative results. The process begins with collection and analysis of quantitative data. The researcher then connects to the second step which is referred to as point of interface where mixing of the two strands occurs. Based on quantitative results, the researcher identifies specific areas which require explanations in the subsequent qualitative strand. In the qualitative strand, the researcher refines the methods to follow the quantitative strand. This is followed by collection and analysis of the qualitative data. The second stage of mixing the two strands occurs by integrating the results of the two strands during interpretation and

discussion of the findings (Creswell & Plano Clark, 2011; Tashakkori & Creswell, 2007; Teddie & Tashakkori, 2009).

The strength of an explanatory sequential approach is that it is manageable to conduct by a single researcher because the two strands are implemented separately. However, the approach requires time because of the dependence of the qualitative method on interpretation of the quantitative data, and the later integration of both strands of the study (Bonvecchio et al., 2014; Creswell & Plano Clark, 2011; Hayes et al., 2013; Teddie & Tashakkori, 2009). There are other considerations for choosing the explanatory design and these include situations where:

- the researcher and the research problem are quantitatively oriented
- the researcher is aware of the important variables and has access to the instruments that measure the construct
- the researcher is able to return to the participants for the qualitative strand
- the researcher has sufficient time to conduct the quantitative and qualitative strands
- the researcher has sufficient resources for the study that requires one type of data collected and analysed at a time
- the researcher has developed questions based on the quantitative results and the questions cannot be addressed with quantitative data (Creswell & Plano Clark, 2011)

In the present study, the researcher identified an instrument to assess nurses' competence in critical care nursing as a way of identifying their learning needs. However, the tool was developed in a developed country and had never been used in a developing country like Malawi. As such, more detail was required to identify additional information needed in the instrument to make it relevant for assessing nurses' competence for the Malawian context. An explanatory sequential mixed methods design was, therefore, considered an effective way of assessing and understanding the nurses' competence and their learning needs.

### **3.4 Philosophical assumptions**

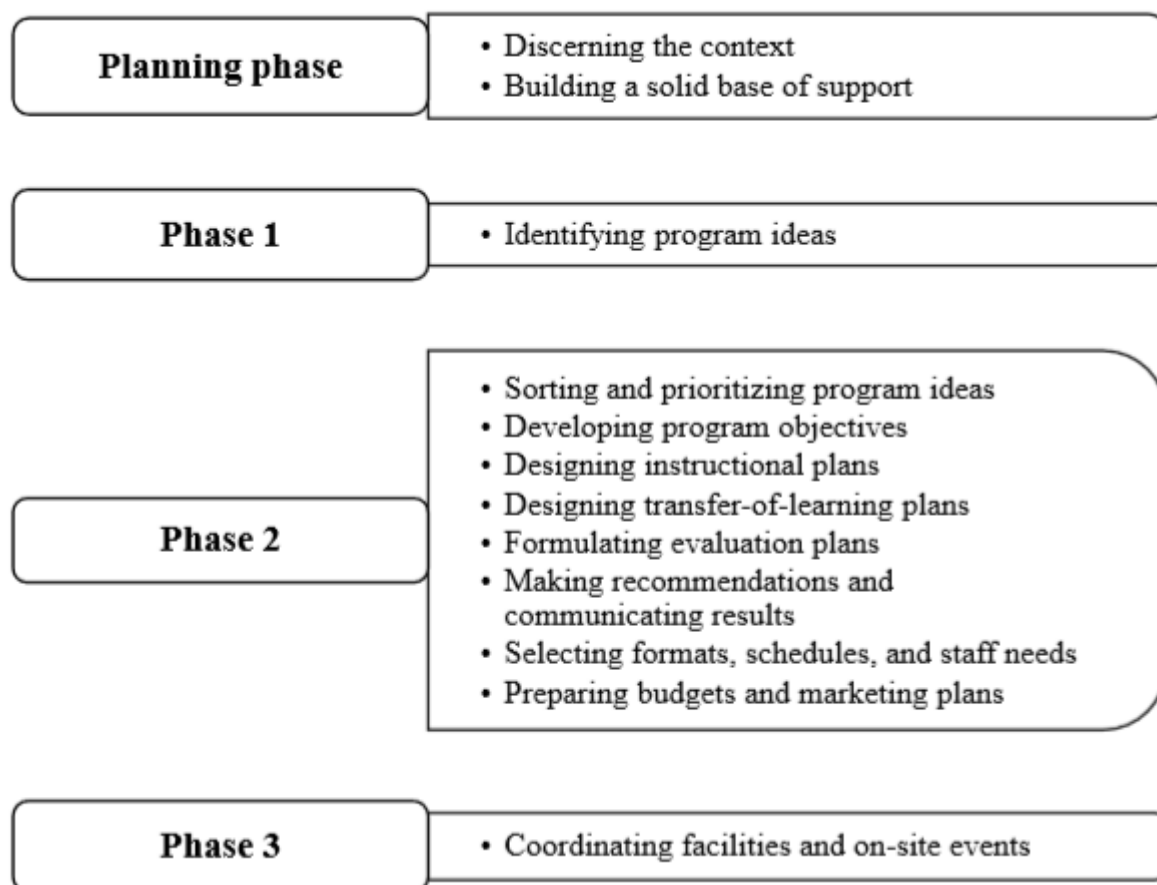
The study was underpinned by postpositivism and constructivism paradigms across the multiple phases. In the context of sequential mixed methods, postpositivism is used for the quantitative strand while constructivism is used for the qualitative strand (Creswell & Plano Clark, 2011). Similarly, Teddie and Tashakkori (2009) argued for a dialectical approach in which both paradigms are used on the basis that each paradigm offers something which contributes to a greater understanding of the phenomenon. Postpositivism focuses on detailed observations and measures of variables and testing of theories. The assumption of postpositivism paradigm is that there is an objective reality which can be investigated (Creswell & Plano Clark, 2011; van Griensven, Moore, & Hall, 2014). On the other hand, the qualitative component of the study was built on constructivist epistemological assumptions. The design was informed by key axioms of a naturalistic inquiry which acknowledge that reality is complex and contextual; there are multiple views of reality which can be studied holistically; no priori theory encompasses the multiple realities, instead the theory is grounded in the data; and the realities are co-constructed through the inseparable interaction between the knower and known (Kahlke, 2014; Thorne, 2016; van Griensven et al., 2014). The process of developing the training programme for the critical care nurses was informed by Caffarella's (2002) Interactive Model of Programme Planning for adult learners.

### **3.5 Interactive model of programme planning**

Interactive Model of Programme Planning for adult learners can be used to guide practitioners through a programme planning process (Schmidt & Lawson, 2018). The model is grounded on the ways of thinking related to the approaches used by different scholars, and the voices of practitioners. The three approaches; namely conventional or traditional, pragmatic, and radical, consider programme planning as a systematic process from needs assessment through evaluation. The approaches also acknowledge that changes are made throughout the programme planning process in response to the realities in the context; and value the participation of those affected in the process of programme planning (Caffarella & Daffron, 2013). The second source, voices of practitioners, relates to the experience which programme planners bring to the process. Furthermore, the model is grounded on nine assumptions as follows: focussing on learning and change; applying what is known about adults as learners; honouring and taking into account cultural differences; discerning the importance of power and interests; building relationships; making use of technology; being ethical is

fundamental; accepting that programme planners work in different ways; and understanding that programme planners are learners (Caffarella & Daffron, 2013).

The model was chosen in the present study because it is flexible and allows programme planners to use components that are relevant to meet the needs of the people and the context. Although there is no evidence of its use in an African context, the model was used in other studies to develop in-service nursing programmes (Cavanaugh & Huse, 2004; Schmidt & Lawson, 2018). The model acknowledges that programme planning is a negotiated activity between and among educators, learners and other stakeholders who contribute their own beliefs to the planning process (Caffarella, 2002; Caffarella & Daffron, 2013). As illustrated in Figure 3 (p. 37), the model has 12 components which are embedded/addressed in the different phases of the study. The model guided the planning of this study through the process from Phases 1 through 3.



*Figure 3: Components of Interactive Model of Programme Planning for adult learners implemented in different phases of the study.*

### 3.6 Planning and formation of advisory team

In keeping with assumptions of Caffarella's (2002) Interactive Model of Programme

Planning for adult learners, the preparation for the study and development of the training programme involved consultation with experts and formation of an advisory team. The advisory team comprised four Malawian nursing experts who are trained in critical care nursing at Master's degree level, and a senior anaesthetist (See Table 6, p. 38). These experts were drawn from the two hospitals where the study was conducted and one nursing college, a constituent college of the University of Malawi. It was important to seek expert guidance and input on learning needs and the training programme requirements because the experts have the knowledge on critical care nursing practice in the Malawi context. The roles negotiated with the team included assessing feasibility of the study and monitoring the process, as proposed by McNiff (1991) and Waterman, Tillen, Dickson, and de Koning (2001). In addition, members guided the development and facilitation of the in-service training programme. Communication with the team was through phone calls, emails and face to face discussions.

Table 6. Demographic profile of members of the advisory team

<b>Facility</b>	<b>Member</b>	<b>Highest qualification</b>	<b>Total experience as a nurse or anaesthetist (Years)</b>	<b>Experience in critical care (Years)</b>
Hospital A	1	MSc – Intensive and critical care nursing	20	4
	2	MSc – Intensive and critical care nursing	30	4
	3	Diploma – Anaesthesia	23	13
Hospital B	1	MSc – Intensive and critical care nursing	20	6
Nursing College	1	MSc – Intensive and critical care nursing	27	10

It is worth noting that I previously worked as nurse in-charge in ICU at Hospital A. I initially planned to recruit one Research Assistant (RA) to assist with recruitment of participants and data collection at Hospital A. This was necessary to allow potential participants at the hospital to make independent decisions about their participation in the study without feeling compelled to do so. However, the experts observed that it was also necessary to recruit an RA at Hospital B to facilitate data collection. The

suggestion was included in the application for AUTECH's approval for minor amendment (Appendix C, p. 169). The RAs were registered nurses with Bachelor of Science in Nursing and Midwifery and had previous experience in critical care. An illustration of the study design and methods applied in the study is presented in Figure 4.



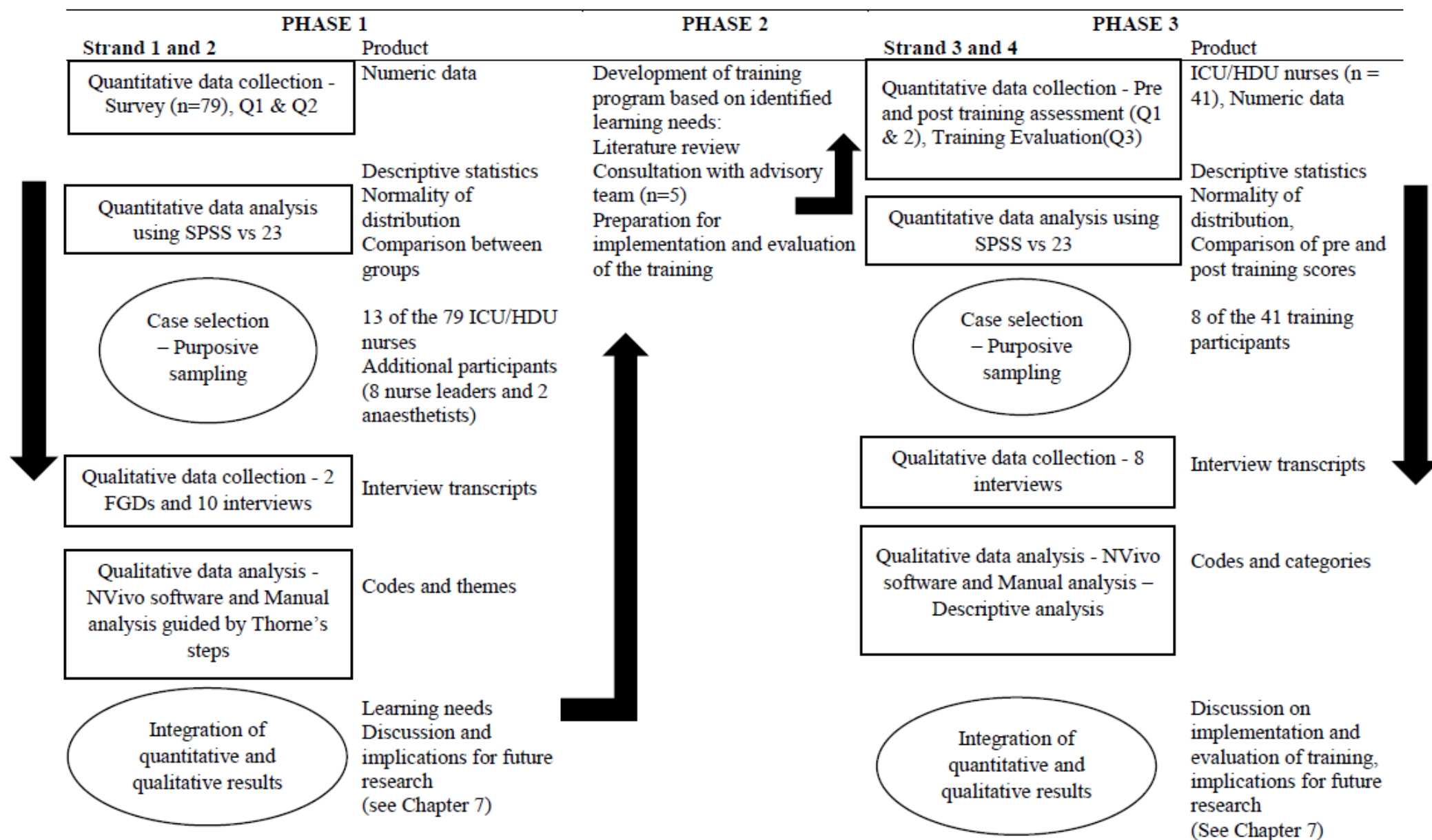


Figure 4: Illustration of the study design

### **3.7 Phase 1: Needs assessment**

The purpose of this phase was to identify programme ideas and learning needs for the training. The phase comprised quantitative and qualitative strands, referred to as strands 1 and 2 respectively. Explanatory sequential mixed methods design was used in the implementation of the two strands. This section will present the methods that were used in the two strands.

#### **3.7.1 Strand 1: Quantitative study**

A cross-sectional survey was used to assess nurses' competence in intensive and critical care nursing. The study participants were also requested to suggest topics and appropriate approach for the training programme.

##### **Target population**

The target population comprised nurses working in ICU and adult HDUs at the two hospitals. The two hospitals were purposively selected because they are the biggest tertiary facilities with busy ICUs and HDUs. Preliminary consultation with nurse leaders during proposal development showed that there were 82 nurses working in two ICUs and nine adult HDUs at the two hospitals in 2015. However, the population had increased to 102 nurses at the time of data collection in 2016. The 24.3% increase resulted from recruitment of new nurses and shifting of nurses from other departments as a way of addressing a critical shortage of nurses in the units.

##### **Recruitment of participants**

The proposed study was presented by the researcher at the hospital departmental meetings to create awareness about the study and invite potential participants. The meetings were routinely organised to discuss patient care, share good practice activities and research findings, among other reasons. Nurse in-charges of the CCUs were also briefed about the study and requested to share information with nurses in their departments. In addition, posters (see Appendix D, p. 171) were placed in all ICUs and adult HDUs inviting nurses, who would be willing, to participate in the study. Information on the poster included details of the study, the researcher's and RA's contact details.

##### **Inclusion and exclusion criteria**

Participation in the study was limited to nurses who were working full or part-time (locum) for at least 3 months in any of the ICUs and adult HDUs. Part time or locum

nurses are nurses from other departments or wards who are allowed to work in ICU or HDU on temporary basis due to shortage of staff. Nurses with less than three months of experience or working in ICU and adult HDU as part of orientation to the hospital were excluded from the study. The period for orientation ranges from 1-7 days. It was expected that these nurses would not be familiar with the required competencies in these units. Those who expressed willingness to participate in the study were given an information letter (Appendix E, p. 173) with details of the study and were requested to give written consent (Appendix F, p. 177).

### **Sample size and sampling**

The sample size was calculated based on a response rate of 54% reported by Lakanmaa et al. (2013a) in a study which used the same test (ICCN-CS-1 questionnaire) in a similar population. As mentioned earlier, there were 82 nurses in ICUs and adult HDUs at the two hospitals (although this number had increased to 102 at the date of data collection). The expected 54% response rate translated to 44 nurses; however, a decision was made to extend the invitation to all nurses because of the small population.

### **Data collection**

The nurses who expressed willingness to participate in the study were requested to contact the RAs. Each of the nurses was then given an envelope with a consent form to sign. The signed consent forms were collected by the RAs at a time convenient to the nurses. The nurses who returned their signed consent forms were invited to complete two questionnaires: the ICCN-CS-1 (Q1) (Appendix G, p. 178) and a second tool (Q2) (Appendix H, p. 186). Details of the instruments are presented in the subsequent section (data collection instruments). The questionnaires were in English language because Malawi is an Anglophone country where English is compulsory in schools and colleges. Health professionals are fluent in English after a minimum of 12 years of formal education and a minimum of 3 years of nursing or health related training. Completion of Q1 and Q2 took 20-30 minutes and 10-15 minutes respectively. Completed questionnaires were collected by the RAs at a time convenient to the nurse. Details of the data collection plan throughout the study are presented in Table 7.

Table 7. Data collection plan

	<b>Data collection method</b>	<b>Participants</b>	<b>Sample size</b>	<b>Eligibility criteria</b>	<b>Location</b>
<b>Time 1:</b> Exploration of learning needs	Survey – Q1 and Q2	Nurses	79	Working in ICU or adult HDU	L1 L2
	Focus Group Discussion (FGD)	Nurses	2 FGDs (6-10 nurses in each group)	Working in ICU or adult HDU	L1 L2
	Key informant interviews	Nurse leaders	8	Chief/Principal/Senior Nursing Officer responsible for CCUs	L1 L2
		Anaesthetist	2	Working in ICU or HDU	L1 L2
<b>Time 2:</b> Development of the training programme	FGD	Expert nurses in critical care nursing/ Anaesthetist	5	Master of Science in Intensive and Critical Care Nursing Qualification in Anaesthesia	L1 L2
<b>Time 3:</b> In-service training programme	Baseline data – Q1, Q2	Nurses	41	In-service training participants	L1 L2
<b>Time 4:</b> Evaluation of the training programme	Post course evaluation, Q1, Q3	Nurses	41	In-service training participants	L1 L2
	In-depth interviews	Nurses	8	In-service training participants	L1 L2

*Note.* L1=Hospital A; L2=Hospital B; Q1=ICCN-CS-1; Q2=Questionnaire on additional competences and training approach; Q3=Questionnaire on additional competences and course evaluation

### **Data collection instruments**

Two instruments were used for the data collection in this phase. The instruments were ICCN-CS-1 and an additional instrument. The next section will present details of the instruments.

### ***ICCN-CS-1***

The ICCN-CS-1 was used in this study with permission from the copyright author, Riitta-Liisa Lakanmaa (Appendix I, p. 188). The ICCN-CS-1 is a self-assessment scale which was developed through literature review, Delphi study, and pilot testing followed by reliability and construct validity testing. The process yielded 144 items which relate to domains of competence in intensive and critical care nursing namely knowledge, skill, attitude and value, and experience (Lakanmaa et al., 2012; Lakanmaa et al., 2013a). Items 1-36 constitute knowledge base, items 37-72 relate to skill base, items 73-108 relate to attitude and value base, and items 109-144 relate to experience base. Each of the items is assessed on a 5-point Likert scale as follows: knowledge and skill bases (1- very poorly, 2- poorly, 3- neither poor nor good, 4- well, 5- very well), attitude and value base (1- fully disagree, 2- disagree, 3- neither disagree nor agree, 4- agree, 5- fully agree) and experience base (1- fully insufficiently, 2- insufficiently, 3- neither insufficiently nor sufficiently, 4- sufficiently, 5- fully sufficiently).

Content and face validity were based on literature review and opinion from 45 experts comprising nurses and physicians. In previous studies which used the tool, Cronbach's alpha ranged between 0.87 and 0.98 for students, 0.83 and 0.97 for nurses (Lakanmaa et al., 2013a). In a similar study, Shouryabi, Ghahrisarabi, Anboohi, Nasiri, and Rassouli (2017) assessed psychometric properties of the Persian version of the ICCN-CS-1 among Iranian nurses. The results showed that Cronbach's alpha coefficient for the total scale was 0.98 and the Cronbach's alpha coefficient of the four domains was as follows: basic knowledge (0.93), skills (0.96), attitude and values (0.95) and experience (0.96). These values indicate good internal consistency reliability because the values are above minimum acceptable value, 0.7 and the minimum preferred value, 0.8 (Pallant, 2016). The use of self-assessment aligns with critical social theory by promoting critical reflection on competence and encouraging active participation of the participants in the learning process (Kamel et al., 2011). The tool was chosen because it assesses competences that are specific to intensive and critical care nursing, and is recommended for identification of learning gaps in clinical practice (Lakanmaa et al., 2012; Lakanmaa et al., 2013a; Lakanmaa, Suominen, Ritmala-Castrén, Vahlberg, & Leino-Kilpi, 2015; Shouryabi et al., 2017). In addition, the researcher did not find an instrument that is specifically designed for use in developing countries like Malawi. However, the ICCN-CS-1 is relatively new and its content validity has never been assessed in developing countries like Malawi. In this study, a content validity index (CVI) was calculated

through expert assessment to determine the relevance of the tool in the Malawi context. The details of this process are presented in the next section.

### ***Assessment of Content Validity Index***

Content validity is defined as a degree to which items of a scale represent a construct. Content Validity Index (CVI) is a standard index of content validity (Polit & Beck, 2006). A minimum of three experts or specialists in specific areas is required to determine the content validity of an instrument (Lynn, 1986). Different researchers have reported about the criteria for selecting experts (Davis, 1992; Rubio, Berg-Weger, Tebb, Lee, & Rauch, 2003). The required characteristics include clinical experience with the target population; professional certification in a related topic area; presentation of professional papers on the topic area; research work in the topic area (Davis, 1992); work experience and publication on the topic area (Rubio et al., 2003).

In this study, it was important to use Malawian nurse experts familiar with the Malawi context and who have expertise in intensive and critical care nursing. The experts were identified by the researcher based on prior knowledge of their training, experience, and publication. Three experts were drawn from the two hospitals where the present study was conducted and one expert from a nursing college which is a constituent college of the University of Malawi. A summary of the experts' profile is presented in the Table 8.

Table 8. Profile of the experts

<b>Expert</b>	<b>Qualification</b>	<b>Experience in critical care (Years)</b>	<b>Publication</b>	<b>Presentation</b>
1	MScN <sup>a</sup>	6	Yes	Yes
2	MScN <sup>a</sup>	10	Yes	Yes
3	MScN <sup>a</sup>	4	No	Yes
4	MScN <sup>a</sup>	4	No	Yes

*Note.* The qualification is the highest academic qualification. Experience is the number of years of experience after specialisation in intensive and critical care nursing. <sup>a</sup>Master of Science in Nursing (Intensive and Critical Care).

The four experts were requested to rate the relevance of each item on the following 4-point Likert scale: 1- not relevant, 2- somewhat relevant, 3- quite relevant and 4- highly relevant. Basing on previous studies, the 4-point scale is preferable because it does not include a neutral middle rating (Davis, 1992). Furthermore, the experts were requested to identify and list areas of competence that are not included in the tool but are relevant

in the Malawi context. The data were entered on Microsoft Excel 2016 for analysis. As suggested Polit and Beck (2006), the 4-point scale was collapsed into two categories. The first two levels, 1- not relevant and 2- somewhat relevant were collapsed into one category, 1- not relevant. The other two levels, 3- quite relevant and 4- highly relevant were collapsed to form another category, 2- relevant. This was necessary for the calculation of CVI which focuses on the relevance of the item.

The content validity of the ICCN-CS-1 was assessed by calculating two types of CVI namely item-level CVI (I-CVI) and scale-level CVI (S-CVI). According to Polit and Beck (2006), I-CVI refers to content validity of the individual items. S-CVI refers to content validity of the overall scale. S-CVI is further classified into S-CVI/UA (Universal Agreement) and S-CVI/Av (Average) based on method of calculation. S-CVI/UA refers to the proportion of items rated quite or very relevant by all the experts. S-CVI/Av is the proportion of items rated as relevant by each of the experts. In this study, both S-CVI/UA and S-CVI/Av were computed as recommended by Polit and Beck (2006). I-CVI was calculated by dividing the number of experts giving the rate of 2 by the total number of experts (four). To calculate the S-CVI/UA the number of items rated as relevant by all experts was divided by 144 which is the total number of items in the tool. S-CVI/Av was calculated by averaging the I-CVI for all the 144 items.

### ***Results of the validation process***

The I-CVI ranged from .5-1.0. All the items except four had an I-CVI of 1.0. The four items with I-CVI of .5 are presented in Table 9.

Table 9. ICCN-CS-1 items with low I-CVI

<b>Number</b>	<b>Item</b>	<b>I-CVI</b>
23	I know how I adhere to organ transplantation law	.5
59	I am able to adhere to organ transplantation law	.5
95	I think it is important that I adhere to organ transplantation law	.5
131	I have experience of adhering to organ transplantation law	.5

The S-CVI/UA and S-CVI/Av were 0.97 and 0.99 respectively. Based on recommendations by Polit and Beck (2006), a scale which is assessed by 3-5 experts should be composed of items with I-CVI of 1.00, S-CVI/UA of .80 and S-CVI/Av of .90 or higher to be judged as having excellent content validity. Ideally, the four items

with I-CVI of .5 would require improvement to yield an I-CVI of 1.00. In the present study, the copyright author did not permit alterations to the tool. The experts were requested to identify items or required competencies which are not included in the tool but are relevant to the context in Malawi.

### ***Identification of additional competencies***

After assessing the relevance of the items included in ICCN-CS-1, the experts identified 10 additional competencies which were deemed relevant but are not included in the tool (Table 10).

Table 10. Additional items identified by experts

<b>Number</b>	<b>Item</b>
1	Meeting nutritional needs of patients
2	Recognition and management of electrolyte imbalance
3	Performing Cardiopulmonary Resuscitation (CPR)
4	Caring for a patient with endotracheal tube
5	Caring for a patient with tracheostomy
6	Basic interpretation of electrocardiogram (ECG)
7	Preparation and management of emergency drugs
8	Documentation of patient care
9	Interpretation of arterial blood gases
10	Implementation of discharge plan

Given the copyright author of the ICCN-CS-1 did not permit any changes to the tool, the additional items were included in a second questionnaire (Q2). Each item was assessed on 4-point Likert scale based on the score classification of the ICCN-CS-1 as follows: 1- poor competence, 2- moderate competence, 3- good competence and 4- excellent competence. The first section of the additional questionnaire assessed the additional competencies and the second section assessed preferred approaches for the in-service training. On the other hand, the ICCN-CS-1 questionnaire had the following five sections: demographic section consisting of age, gender, professional qualification, type of critical care unit, years of experience in the unit and years of experience as a nurse; knowledge base; skill base; attitude and value base; and experience base.



## **Data analysis**

The data were entered on IBM SPSS statistics version 23 data set for analysis. The two questionnaires were analysed separately as follows:

*ICCN-CS-1 (Q1) Questionnaire:* Descriptive statistics were used to summarise demographic characteristics and scores on the questionnaire. Mean scores and standard deviations were calculated for individual items, subgroup scores, and overall scores. According to Lakanmaa et al. (2013a), the scores are classified as follows: poor competence (=1, 144-288, Likert scale 1-2 x 144), moderate competence (=2, 289-432, Likert scale 2-3 x 144), good competence (=3, 433-576, Likert scale 3-4 x 144) and excellent competence (=4, 577-720, Likert scale 4-5 x 144). Independent sample t test, Mann-Whitney tests, and multiple regression were used to compare competence scores of different groups of nurses. The assumptions for each test were met before running the tests. Kolmogorov-Smirnov and Shapiro-Wilk tests were used to assess the normality of distribution of the data. The level of significance was set at 0.05.

*Additional Questionnaire (Q2):* The data were entered in a separate data set of IBM SPSS statistics version 23 data set for analysis. Frequencies were calculated to summarise the scores on additional competencies, suggested topics, and teaching approach.

## **Inferences**

Inferences are conclusions that are drawn based on the data collected in a quantitative or qualitative strand. In the context of sequential explanatory study, the researcher refines the subsequent qualitative strand based on results and conclusions from the quantitative strand. This connection between the two strands is one of the mixing strategies related to the point of interface in a sequential mixed methods design (Creswell & Plano Clark, 2011; Teddie & Tashakkori, 2009). In the present study, the qualitative strand was designed in advance as suggested by Creswell and Plano Clark (2011) to meet the requirements of proposal development and ethics application. The results and conclusions of the quantitative strand did not merit significant changes to the qualitative strand. However, the quantitative results guided the researcher when probing for clarification during the collection and analysis of the qualitative data, as discussed in the next phase.

### **3.7.2 Strand 2: Qualitative study**

#### **Research design**

Interpretive description (ID) design was used in the qualitative strand. It was first articulated in 1997 by Thorne, Reimer Kirkha, and MacDonald-Emes as a noncategorical methodological approach to respond to the need for knowledge that is required in applied disciplines. It is defined as a qualitative approach in which decisions in the study are made based on the angle of vision which is informed by the philosophical underpinnings of the nursing discipline. Interpretive description aims to generate knowledge for clinical application and yields interpretive accounts based on informed questioning (Thorne, Kirkham, & MacDonald-Emes, 1997; Thorne, Kirkham, & O'Flynn-Magee, 2004; Thorne, Stephens, & Truant, 2016). The name ID reflects the nursing disciplinary thinking which seeks direction of the knowledge that is generated (Hunt, 2009; Thorne, 2013). Informed by key axioms within the naturalistic inquiry, ID studies are conducted in a naturalistic context; acknowledge that subjective and experiential knowledge are fundamental sources of applied practice insight; acknowledge that there are multiple realities; and the knower and known influence one another (Thorne, 2016).

Thorne et al. (2016) argued that disciplinary epistemology forms an appropriate forestructure/scaffolding for an applied study. The theoretical and practical knowledge that researchers bring to a project is considered to be a platform on which to design the project and helps to establish its anticipated boundaries. In particular, clinical expertise is acknowledged as a useful starting place for orienting research, particularly when the area of inquiry has yet to be evaluated in rigorous fashion. Such experientially derived foreknowledge of the phenomenon provides a beginning point to orientate the research design rather than an overarching organisational structure. The theoretical scaffolding that is created as the researcher begins the inquiry is then challenged and refined as the research progresses (Hunt, 2009; Thorne, 2008). The strength of ID is that it provides useful guidance in executing research which generates findings relevant to the clinical context. Interpretive description accounts for the clinical context of research and the orientation is manifested at different stages of the research process (Hunt, 2009). The present study was conducted to address a gap in critical care nursing practice in Malawi. The specific methods that were used are outlined in the next section.

### **Study participants**

In keeping with explanatory sequential mixed methods, the population for the qualitative strand comprised CCU nurses who participated in the initial quantitative strand. There were 79 nurses who returned completed questionnaires in the preceding phase; however, nurse leaders and anesthetists were also invited for key informant interviews because of the nature of the study. In Malawi, the nurse leaders play a supervisory role to the nurses and the anesthetists work alongside the nurses in the CCUs. The experienced health professionals are considered a source of clinical wisdom, insights, and interpretations that guide knowledge generation (Thorne, 2013). In the context of ID, multiple sources of data are used to provide triangulation of the phenomenon under study and contribute to the trustworthiness of the generated findings. Triangulation is appropriate because nursing relies on multiple sources of information (Hunt, 2009; Thorne, Stephens, & Truant, 2016; Thorne, 2016). The multiple or diverse sources are required to confirm the conclusions that are made in a study (Thorne, 2013). In addition, the inclusion of nurse leaders and anesthetists had implications for acceptability of the in-service training programme at the two hospitals where the study was conducted.

### **Sample and sampling**

Purposive sampling methods were used to identify participants for the qualitative strand. In the context of ID, purposive sampling reflects the researcher's awareness of expected and emerging variations within the phenomenon understudy (Hunt, 2009; Thorne, Stephens & Truant, 2016). As earlier indicated, participants for this phase comprise CCU nurses, nurse leaders, and anaesthetists. Eligibility criteria required the CCU nurses to have participated in the initial quantitative strand. The results of the quantitative strand showed that nurses self-rated their competence on ICCN-CS-1 as good and excellent. There was no significant difference of the scores between registered nurses and nurse midwife technicians, and between the two hospitals. However, the nurses rated their competence on additional competencies as poor. These findings did not merit changes to the initial decision to sample registered nurses and nurse midwife technicians for the focus group discussions. The selection of participants who belong to a specific subgroup is called homogenous sampling, a type of purposive sampling method used in explanatory sequential mixed methods (Creswell & Plano Clark, 2011; Teddie & Tashakkori, 2009). In addition, the sampling of participants for focus group discussions and key informant interviews aimed for maximal variation, hence the reason

they were purposively selected. Maximal variation sampling is also a type of purposive sampling which focuses on the selection of participants who would provide a different perspective of the phenomenon under study (Creswell & Plano Clark, 2011; Teddie & Tashakkori, 2009). In the present study, the nurse leaders and anaesthetists were expected to contribute their perspective of learning needs of the critical care nurses. The demographic profile of the participants is presented in Table 11 (p. 51). Participants who accepted to participate in the focus group discussion and key informant interview were given information sheet (Appendices J and K, p. 189 and 193) and were requested to provide written consent.

Table 11. Demographic profile of focus group and key informant interview participants

<b>Variable</b>	<b>Category</b>	<b>Focus Group Discussion Participants (n=13)</b>	<b>Key Informant Interview Participants (n=10)</b>
Age	Mean (SD) in years	30 (3.57)	42.90 (8.56)
Experience	Mean (SD) in months	27.77 (18.76)	166.80 (90.94)
Gender	Male (%)	2 (15.38)	2 (20)
	Female (%)	11 (84.62)	8 (80)
Qualification	Master's Degree (%)	-	5 (50)
	Degree (%)	6 (46.15)	4 (40)
	Diploma (%)	7 (53.85)	1 (10)
Professional cadre	Registered nurse (%)	6 (46.15)	8 (80)
	Nurse midwife technician (%)	7 (53.85)	-
	Anaesthetist (%)	-	2 (20)
Training in Critical Care Nursing	Yes (%)	-	2 (20)
	No (%)	13 (100)	6 (60)
	Not applicable (%)	-	2 (20)
Facility	Hospital A (%)	7 (53.85)	5 (50)
	Hospital B (%)	6 (46.15)	5 (50)
Type of unit	ICU (%)	2 (15.38)	5 (50)
	HDU (%)	11 (84.62)	5 (50)

## **Data collection**

The interviews and focus group discussions were conducted within the hospital at the most convenient time and place for the participants. They were conducted in English language; however, participants were allowed to use vernacular language, Chichewa, where necessary in order to freely express themselves. To ensure homogeneity of the groups, nurse midwife technicians (trained at diploma level) and registered nurses (trained at degree level) constituted separate focus group discussions. A homogenous group prevents power differences and gives participants the freedom to express their thoughts, feelings, and behaviours honestly (Burns & Grove, 2009; Côté-Arsenault, 2013).

The interviews and discussions were facilitated by the researcher and a RA took field notes. The RA signed confidentiality agreement (Appendix L, p.197) before the interviews and discussions. The researcher started each session by welcoming and thanking participants for accepting to participate in the study. Participants were encouraged to elaborate on learning needs of the nurses in CCUs and share their experiences and issues that affected their learning and practice in the units. A semi-structured interview guide was used for the interviews (Appendices M and N, p. 198 and 199). The content of the semi-structured interview guide was generated from components of the ICCN-CS-1 and additional questionnaire on nursing competencies which relate to knowledge, skill, attitude and values, and experience. Participants were requested to use pseudonyms of their choice during the interview. Where necessary, further probing was done based on the results of the quantitative strand of the study. At the end of each session, the researcher thanked the participants for sparing their time for the interview. Each participant was given a packet of sugar as a gift for participating in the interview. Transport refund was provided to participants who travelled from home to the hospital for the interview. In Malawi, the majority of nurses use public transport. In addition, participants were given refreshments and snacks at the end of the discussion. The interviews and discussions were audiotaped and later transcribed verbatim in English by an individual who is bilingual, fluent in Chichewa and English. A confidentiality agreement was signed by the individual who helped with transcription (Appendix O, p. 200). The researcher is fluent in the two languages and crosschecked the translation. As suggested by Côté-Arsenault (2013), the researcher listened to the recording and compared it with typed transcript and field notes. As planned the interview with each key informant lasted 30-40 minutes while each focus group

discussion lasted 2-2.5 hours.

### **Data analysis**

The goal of analysis in an ID study is to identify themes and patterns among individuals while accounting for variations (Hunt, 2009). In the present study, data analysis followed an iterative process in which data were gathered and analysed concurrently. The transcribed data were entered into NVivo version 11 to aid data management. The data were then analysed manually, informed by Thorne (2008) steps of analysis. The initial stages of analysis involved familiarisation with, and immersion in, the data to understand the overall picture. This was achieved through critical reading and reflecting on the interview transcripts. Next followed preliminary coding, wherein initial codes were identified and progressively refined during an iterative process of recoding and analysis. After organising data into various groups, the next step involved making sense of relationships between the groups. This was achieved by sequencing the focus of attention from individual cases to the whole data set, considering similarities and differences with respect to a range of dimensions. During the entire process, key decisions, questions, interesting issues and concept maps were recorded in a notebook. The notes helped to refine ideas, groups, and relations as data collection and analysis progressed. The identified codes and relationships between groups of codes were shared and discussed with supervisors to support trustworthiness of the findings.

#### **3.7.3 Presentation of preliminary findings**

At the end of Phase 2, the preliminary findings on learning needs were shared with the participants, advisory team, other health professionals, and hospital authorities through hospital meetings, including departmental and grand round meetings. The presentation gave the nurses and other health professionals an opportunity to confirm the findings and offer more input. The researcher invited feedback from the audience which was noted in a writing pad. The feedback was incorporated during development and implementation of the programme. The identified learning needs and programme ideas guided development of an in-service training programme in the subsequent phase of the study.

### **3.8 Phase 2: Developing stage**

A training programme was developed based on learning needs and programme ideas identified in Phases 1 and 2 of the study in consultation with the advisory team.

Development of course content was led by the researcher. The content was generated from review of literature and existing frameworks such as Oh's framework for critical care nurses' education (Bersten & Soni, 2014). The proposed content was presented to the advisory team for their input. Meetings with the advisory team were convened at a venue deemed convenient to all members. The schedule for the meetings was negotiated with the members. The activities in this stage included: prioritising learning needs; developing programme objectives; selecting and organising content; selecting instructional techniques and resources; selecting instructional plans; and preparing for programme evaluation. Details of this process are presented in Chapter 6. This phase was followed by transfer of knowledge and skills (implementation) and evaluation in the subsequent phases of the study.

### **3.9 Phase 3: Implementation and evaluation of the training programme**

The programme was implemented at the two hospitals and involved two sessions of training, one at each hospital, over 3 days. Teaching strategies included lectures, group discussions, skill sessions and return demonstrations. Details of this process are presented in Chapter 6. This phase comprised quantitative and qualitative strands which are referred to as strands 3 and 4 respectively. The next section will present the methods that were followed in the two strands.

#### **3.9.1 Strand 3: Quantitative study**

##### **Sample size**

A biostatistician was consulted on sample size required to power the study in view of the limited contextual research available from which to derive values for sample size calculations. From the studies by Pubudu et al. (2015) and MacLeod et al. (2011), on the effect of training on pre and post-test scores, we calculated effect sizes (Cohen's  $d$ ) of 1.2 and 1.7 respectively, from the published means and standard deviations. Given that there was no similar training research conducted in Malawi and that the ICCN-CS-1 questionnaire had not been previously tested on a Malawi population of nurses, we selected a more conservative effect size of  $d=0.5$  from which to calculate the sample size using GPower (Mayr, Buchner, Erdfelder, & Faul, 2007). For the study to be powered at 80%,  $\alpha = 0.05$ , a sample size of 34 was required. To allow for a dropout rate of no more than 20%, 41 participants were required to take part in the training.

### **Sampling**

Participants (n=41) who received the training were nurses who worked in ICU and adult HDUs at the two hospitals. Potential participants were approached by the RA and primary researcher at Hospitals A and B respectively. Participants who expressed interest provided their contact details. The primary researcher then negotiated with nurse leaders to allow the participants to attend the training. In Malawi, consultation with nurse leaders is important to ensure that staffing levels and hospital services are not disrupted while nurses are attending a training course.

### **Data collection**

As illustrated in Figure 4 (p. 40) and Table 7 (p. 43), assessment of the effectiveness of the programme was based on comparison of competence scores on ICCN-CS-1 (Q1) and additional competencies (Q3) before and after the training. The section on course evaluation (content and approach) was analysed separately. The results of the quantitative data analysis guided the subsequent qualitative strand in the same phase. Results of the quantitative strand guided further probing during the interviews.

### **Data analysis**

IBM SPSS Statistics version 23 was used to analyse the quantitative data. Descriptive statistics were used to analyse responses to the evaluation form. A paired-samples t-test was conducted to evaluate the impact of the training on nurses' scores on ICCN-CS-1 and the additional competencies before and after the training.

## **3.9.2 Strand 4: Qualitative study**

### **Sample**

The training participants were invited for in-depth interviews after the training. Eligibility criteria for the interviews were that the nurses must have attended the 3-days training. Out of the 41 participants, eight chose to participate in the post training interviews. The researcher stopped recruiting after four participants at each facility accepted to be interviewed. This was a pragmatic sample size which considered the small population of the participants and the large amount of data collected during the whole study.

### **Sampling**

Homogenous sampling was used to identify participants for the interviews. In this study, the participants for the training were registered nurses (n=24) and nurse midwife



technicians (n=17). Out of the 41 nurses, six nurse-midwife technicians, (n=6, 75%) and two registered nurses (n=2, 25%) granted permission for the post training interviews.

### **Data collection**

Each interview was conducted at a quiet and comfortable room within the hospital. The interviews were facilitated by the researcher and were audiotaped with permission from the participants. Participants were requested to use pseudonyms of their choice during the interview. At the end of the interview, each participant was given a packet of sugar as a gift for his/her participation. Interviews were transcribed verbatim in English by an individual who is bilingual, fluent in Chichewa and English. The researcher crosschecked the translation.

### **Data analysis**

Analysis of the qualitative data followed the steps presented in Phase 1 of the study. The feedback was incorporated in the findings and recommendations of the study.

## **3.10 Inference quality and rigour**

Inference is defined as “a conclusion or interpretation in response to a research question, made on the basis of the results of the data analysis” (Teddlie & Tashakkoru, 2009, p. 336). A crucial stage of mixed methods study is to integrate the two sets of inferences generated by the two strands of the study. As suggested by Teddlie and Tashakkoru (2009) there are two broad categories of criteria for evaluating quality of inferences namely, design quality and interpretive rigour. Interpretive rigour was enhanced through consultation with the supervisor in the interpretation of quantitative and qualitative findings, comparison of the findings with published research, and the use of a reflective log. Where necessary, plausible explanation has been given for inconsistent findings.

Rigour was achieved through measures that ensure trustworthiness of the outcomes. These measures include credibility, transferability, dependability, and confirmability (Stringer, 2014). Credibility was achieved through prolonged engagement and the use of multiple sources of information namely survey questionnaires, focus group discussions, and individual interviews. Dependability was achieved through the use of an advisory team. As proposed by McNiff (1991) and Waterman et al. (2001), the purpose of the team is to assess the research process. The use of two hospitals helped to ensure transferability of the findings. Preliminary findings were presented at the two hospitals which gave an opportunity to the participants and nurse leaders to verify the findings.

Furthermore, strategies were implemented to minimise validity threats related to data collection, data analysis, and interpretation issues. Participants of the follow-up qualitative strands were selected from the same pool of participants who participated in the initial quantitative phase. Other participants, namely nurse leaders and anaesthetists, did not participate in the initial quantitative strand in Phase 1 but were selected for key informant interviews because their experience and expertise were considered critical in the development of the training programme. A pragmatic approach was used to calculate sample size at different phases. The connecting of the phases of the study was informed by Caffarella and Daffron's Interactive Model of Programme Planning.

### **3.11 Ethical considerations**

The study was approved by Auckland University of Technology Ethics Committee (AUTEC) in New Zealand, reference number 15/439 dated 10th December 2015 and National Health Sciences Research Committee in Malawi, approval number NHSRC #1533 dated 21st January 2016. During development of the full research proposal in New Zealand, I was in touch with Malawian critical care nursing experts, who were later included in the advisory team of the study. Although the researcher was familiar with the context, the consultations were necessary to get the experts' input on the feasibility of the study, selection of the survey instrument, learning needs of the nurses and the training programme requirements.

When the researcher went to Malawi for data collection in December 2015, the experts provided suggestions on the survey instrument, research advisory team, inclusion criteria, koha and recruitment of a RA at Hospital B. These suggestions were not included in the initial ethics application which was submitted to AUTEC. I applied for AUTEC approval for the minor amendments which was granted on 3rd March 2016. Furthermore, the following ethical considerations were followed:

- Permission to use the ICCN-CS-1 was obtained from the copyright author, Riitta-Liisa Lakanmaa. The approval documents have been attached.
- Permission to conduct the study at the two hospitals was sought from the Hospital Director at each hospital (REF/KCH/GA/0.01 and QEC/GEN/2).
- Information about the study was provided to potential participants verbally and in writing. Potential participants were given an information letter with details of

the study. Those who expressed willingness to participate in the study provided written consent.

- Participant privacy and confidentiality were protected throughout the study as follows: code numbers instead of real names were used on the questionnaires; the participants for key informant interviews and focus group discussions were requested to use pseudonyms of their choice. The researcher emphasised the importance of not sharing details of the discussion with other people outside the focus group discussion. Any identifying participant details in the records/transcripts and resulting research publications have been changed. Names of the two hospitals where the study was conducted have not been reported.

### **3.12 Chapter summary**

The study explored learning needs of CCU nurses in Malawi. The identified learning needs were used to develop an in-service training programme which was implemented and evaluated at two hospitals in the country. The study followed programme planning and evaluation approach and utilised a multiphase mixed methods design. The study was implemented in three phases. The implementation of quantitative and qualitative studies in two of the three phases followed the steps of explanatory sequential mixed methods. The specific methods in each phase and ethical considerations have been discussed. Throughout this process the researcher consulted local experts who provided guidance and suggestions on the training programme. In keeping with the principles of explanatory sequential mixed methods, the quantitative strand was implemented first followed by the qualitative strand. The next chapter will present results of strand 1, the quantitative study in Phase 1 of the study.

## **Chapter 4 Results of the Quantitative Strand**

### **4.1 Introduction**

The previous chapter presented the methodology of the study. A programme planning and evaluation approach utilizing a multiphase mixed methods design was applied to achieve the overall objective of the study. The Phase 1 quantitative strand discussed in this chapter was implemented before the Phase 1 qualitative strand. The purpose of the quantitative strand was to identify the learning needs of critical care nurses through assessment of their competence on the ICCN-CS-1 and additional competencies identified by the nursing experts. The nurses were also requested to suggest topics and strategies for the in-service training on the additional questionnaire. This chapter will present results of the quantitative study, referred to as strand 1 in Figure 4 (p. 40). Nurses' competence in intensive and critical care nursing.

The nurses' competence in intensive and critical care nursing was assessed using the ICCN-CS-1. The results will be presented in relation to demographic profile, and nurses' competence on the ICCN-CS-1 in relation to different demographic variables.

#### **4.1.1 Demographic profile**

Out of 102 nurses who received the questionnaire, 79 returned them (77% response rate). The majority of participants were females, nurse midwife technicians, and over 50% had less than two years of experience in the unit. A summary of the demographic data is presented in Table 12 (p. 60).

Table 12. Demographic profile of the participants

<b>Demographic Variable</b>		
Age	Mean (SD)	32.29(8.32)
Age distribution	23-32 years	51(64.55)*
	33-42 years	19(24.05)*
	43-52 years	6(7.59)*
	53-62 years	3(3.8)*
Gender	Male	19(24.05)*
	Female	60(75.94)*
Professional Qualification	Nurse technicians	45(56.96)*
	Registered nurses	34(43.03)*
Distribution of nurses	ICU	20(25.31)*
	HDU	59(74.68)*
Distribution of nurses by facility	Hospital A	26(32.91)*
	Hospital B	53(67.08)*
Experience	3-24 months	42(53.16)*
	25-48 months	23(29.11)*
	48-132 months	14(17.72)*

Note. \*n(%)

#### 4.1.2 Nurses' competence on ICCN-CS-1 (Q1)

The expected score on each item ranged from 1-5; a higher score means higher competence on the item. The results showed that item mean scores ranged from 2.22 (SD = 1.18) to 4.86 (SD = 0.35). Most of the items with high mean scores were related to attitude and value domain of the questionnaire. The items with high and low mean scores are presented in Tables 13 and 14 respectively (p. 61).

Table 13. Items with highest mean scores

Number	Item	Mean (SD)
77	While caring for an intensive and critical care patient I think it is important that I adhere to aseptic rules	4.86(0.35)
84	I think it is important that I master the recognition of an intensive and critical care patient`s need of fluid therapy	4.86(0.38)
81	I think it is important that I master the recognition of an intensive and critical care patient`s signs of abnormal vital signs	4.81(0.39)
102	I think it is important that I develop	4.81(0.39)
100	I think it is important that I prioritize my work	4.80(0.40)
93	I think it is important that I adhere to nurses` ethical code	4.80(0.44)

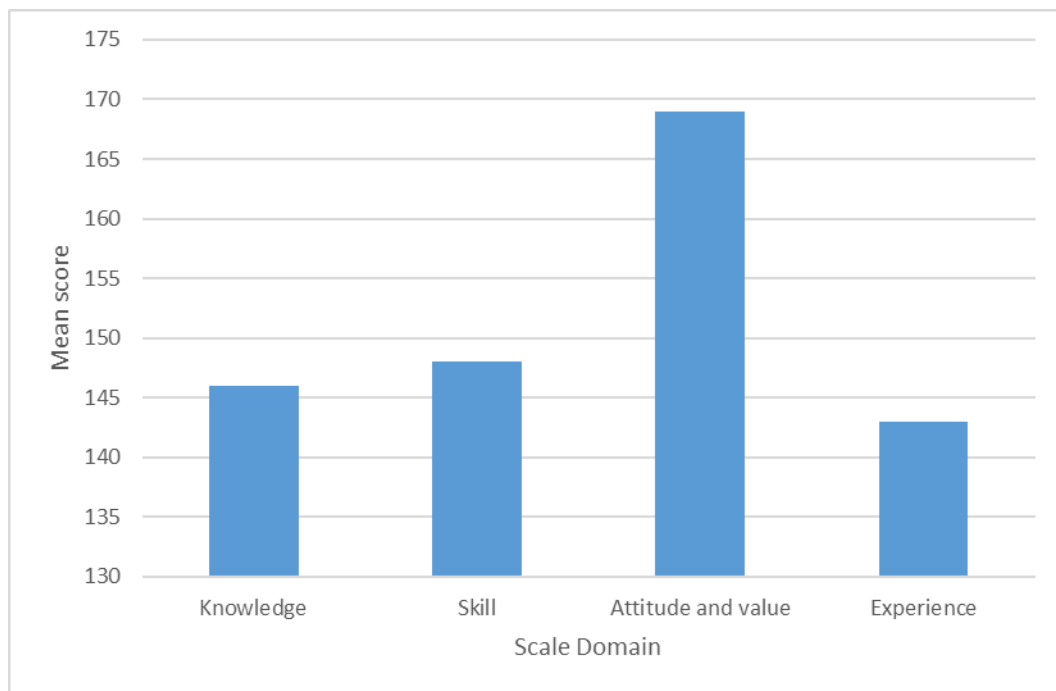
*Note.* These items relate to attitude and value base domain of the ICCN-CS-1

Table 14. Items with low mean scores

Number	Item	Mean(SD)
24 <sup>a</sup>	I know how I adhere to economic efficiency	2.99(1.06)
59 <sup>b</sup>	I am able to adhere to organ transplantation law	2.40(1.23)
23 <sup>c</sup>	I know how I adhere to organ transplantation law	2.22(1.13)
131 <sup>d</sup>	I have experience of adhering to organ transplantation law	2.22(1.18)

*Note.* The items relate to different domains of the questionnaire: <sup>a</sup>Knowledge domain; <sup>b</sup>Skill domain; <sup>c</sup>Attitude and value domain; <sup>d</sup>Experience domain

The mean scores for each domain of the scale: knowledge, skill, attitude and value, and experience were also calculated. As presented in Figure 5 (p. 62) the mean score on attitude and value was higher than the other domains. The scores were rounded to the nearest whole number for easy presentation.



*Figure 5: Mean scores on scales domains*

The expected range of total competence was 144-720 as presented. In the present study, the total competence score on the scale ranged from 475-708 ( $M = 604.97$ ,  $SD = 55.08$ ). Based on score classification presented by the copyright author Lakanmaa et al. (2013a), the nurses' scores in the present study represent good or excellent competence. The proportion of the nurses in relation to good and excellent competence is presented in Figure 6 (p. 63).

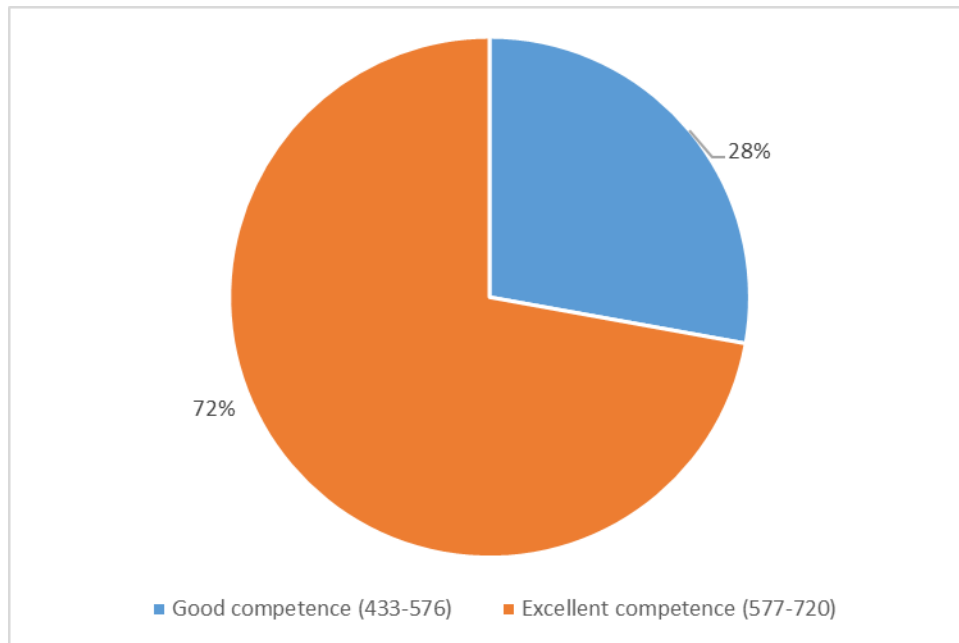


Figure 6: Competence scores among nurses

### 4.1.3 Comparison of competence score in relation to groups of nurses

#### Comparison of nurses' scores in relation to hospital

The mean competence score of the nurses at Hospital B ( $M = 605.21$ ,  $SD = 57.29$ ) was higher than the mean competence score of nurses at Hospital A ( $M = 604.50$ ,  $SD = 51.37$ ). Although the difference was small, it was necessary to determine whether the scores differed significantly or not. Basing on assumptions of both non-parametric and parametric tests, the data were explored for normality of distribution to determine the type of tests to be used for the comparison.

There were variations on the tests that were used to explore normality of distribution. The Kolmogorov-Smirnov test showed that the distributions of scores for the two groups were not significantly different from normal distribution, Hospital A ( $M = 604.50$ ,  $SD = 51.37$ ),  $p = .20$ ,  $d = 26$  and Hospital B ( $M = 605.21$ ,  $SD = 57.29$ ),  $p = .07$ ,  $d = 53$ . Similarly, the Shapiro-Wilk test showed that the distribution of competence scores of the nurses at Hospital A was not significantly different from normal distribution ( $M = 604.50$ ,  $SD = 51.37$ ),  $p = .66$ ,  $d = 26$ . However, the Shapiro-Wilk test on competence scores of the nurses at Hospital B was significant ( $M = 605.21$ ,  $SD = 57.29$ ),  $p = .04$ ,  $d = 53$ .

Based on these results, a decision was made to run both parametric and non-parametric tests to compare the scores. The Independent sample  $t$  test was not significant,  $t(-.06)$ ,  $p$



= .96 (2-tailed),  $d = 54.97$ . Similarly, the Mann-Whitney Test was not significant  $p = 0.770$  (2-tailed).

### **Comparison of scores in relation to professional qualification**

The mean competence score of registered nurses was higher ( $M = 609.74$ ,  $SD = 60.28$ ) than the mean competence score of nurse technicians ( $M = 601.38$ ,  $SD = 51.21$ ). The difference between the scores was tested for statistical significance. According to the assumptions of both non-parametric and parametric tests, the distributions of the competence scores were explored for normality. The Shapiro-Wilk test demonstrated that the scores of registered nurses only were significantly different from normal distribution ( $M = 609.74$ ,  $SD = 60.28$ ),  $p = .02$ ,  $d = 34$ . However, the Kolmogorov-Smirnov test showed that the distributions for the two groups were not significantly different from normal distribution; registered nurses ( $M = 609.74$ ,  $SD = 60.28$ ),  $p = .09$ ,  $d = 34$  and nurse technicians ( $M = 601.38$ ,  $SD = 51.21$ ),  $p = .20$ ,  $d = 45$ . A decision was made to run both parametric and non-parametric tests to compare the scores. The Independent sample  $t$  test was not significant,  $t(-.65)$ ,  $p = .52$  (2-tailed),  $d = 64.43$ . Similarly, the Mann-Whitney Test was not significant  $p = 0.36$  (2-tailed).

### **Further analysis**

Multiple linear regression was run to explore the relationship between competence score and other variables including site, professional qualification, and work experience. Using enter method, all three variables were entered in the model as follows: competence score (dependent variable), block 1 of 1 (site and professional qualification), and block 2 of 2 (work experience). As illustrated in Table 15 (p. 65), work experience was a significant predictor of competence when adjusted for site and professional qualification.

Table 15. Regression on site, professional qualification and work experience

Variable	<i>B</i>	<i>SE B</i>	<i>B</i>
Model 1 (Constant)	594.24	27.26	
Site	-.846	13.53	-.007
Professional Qualification	8.50	12.84	.077
Model 2 (Constant)	543.29	35.36	
Site	9.15	13.97	.08
Professional Qualification	19.46	13.50	
Work Experience	.58	.27	.28*

Note.  $R^2 = .006$  for Model 1;  $R^2 = .065$  for Model 2; \* $p < .05$

## 4.2 Perceived competence on additional competencies

Majority of the nurses, 85.7% (n=66) and 84.6% (n=66) rated their competence as either poor or moderate on basic interpretation of 3 lead ECG and interpretation of Arterial Blood Gases (ABGs) respectively. A summary of the scores is presented in Table 16.

Table 16. Nurses score on additional items

Competence item	Frequency, n(%)			
	Poor	Moderate	Good	Excellent
Meeting nutritional needs of patients	5(6.3)	12(15.2)	37(46.8)	24(30.4)
Recognition and management of electrolyte imbalance	5(6.3)	29(36.7)	34(43)	10(12.7)
Performing Cardiopulmonary Resuscitation (CPR)	7(8.9)	31(39.2)	34(43)	6(7.6)
Caring for a patient with endotracheal tube	13(16.5)	33(41.8)	20(25.3)	12(15.2)
Caring for a patient with tracheostomy	8(10.1)	23(29.1)	26(32.9)	20(25.3)
Basic interpretation of 3 lead ECG	40(50.6)	26(32.9)	9(11.4)	2(2.5)
Preparation and management of emergency drugs	4(5.1)	19(24.1)	42(53.2)	13(16.5)
Documentation of patient care	1(1.3)	6(7.6)	33(41.8)	39(49.4)
Interpretation of ABGs	44(55.7)	22(27.8)	9(11.4)	3(3.8)
Implementation of discharge plan	3(3.8)	10(12.7)	34(43)	32(40.5)

### **4.3 Suggested topics for inclusion in in-service training**

Participants suggested topics to be included in the programme for in-service training. The topics that were suggested by the majority of the participants were:

1. Interpretation of ECG, 54.4% (n=43/79)
2. Cardiopulmonary Resuscitation (CPR), 51.9% (n=41/79)
3. Interpretation of ABGs, 44.3% (n=35/79)
4. Fluid and electrolyte balance, 39.2% (n=31/79)

### **4.4 Preferred teaching strategies**

The majority of the participants preferred lectures as a teaching strategy to be used during the in-service training.

1. Lectures 78.5% (n=62/79)
2. Practical experience 74.7% (n=59/79)
3. Group discussion 64.6% (n=51/79)

### **4.5 Inferences drawn from quantitative results**

The inferences drawn from the quantitative results were as follows:

- Results of this strand showed that nurses' competence on ICCN-CS-1 was either good or excellent with the highest score registered in the attitude and value domain. The items which yielded low scores were related to organ transplantation which is not done in the country. The experts had earlier considered these items not relevant to the Malawian context.
- The differences between scores in relation to hospital and professional qualification were not statistically different. However, experience of the nurse was a significant predictor of competence.
- With regard to the additional competencies, majority of the nurse self-rated their competence on basic interpretation of ECG and interpretation of ABGs as either poor or moderate.
- The topics that were suggested by the majority of the nurses for inclusion in the training programme were: interpretation of ECG, CPR, interpretation of ABGs, fluid and electrolyte balance.

- The most preferred strategies for the training were: lectures, practical experience, and group discussion.

## **4.6 Chapter summary**

The purpose of this chapter was to present results of the first quantitative study, strand 1. Basing on ICCN-CS-1 scale, nurses rated their competences as either good or excellent. The score on attitude and value domain was higher than scores on knowledge, skill, and experience domains of the ICCN-CS-1. The differences between scores in relation to professional qualification and hospital were not statistically different. Work experience was a significant predictor of the overall competence score. Furthermore, nurses rated their competences as either poor or moderate on most of the additional competencies identified by expert nurses. The most common topics suggested for inclusion in the in-service training were basic interpretation of ECG and ABGs. The inferences of this strand have been provided. Based on the results of this strand, a decision was made to maintain the earlier plan to sample participants for focus group discussions from the groups of registered nurses and nurse midwife technicians who had participated in the quantitative strand. The inferences from the quantitative strand guided the researcher's probing during interviews in the subsequent qualitative strand. As indicated in the methodology chapter, nurse leaders and anaesthetists were invited for key informant interviews although they had not participated in the quantitative study. The nurse leaders and anaesthetists' contribution on nurses' learning needs and the training programme were considered valuable because of their role and experience in these units. In addition, their inclusion had implications for acceptability of the in-service training programme at the two hospitals. Having presented the Phase one quantitative results, the next chapter presents Phase one qualitative results.

## Chapter 5 Results of the Qualitative Strand

### 5.1 Introduction

The previous chapter presented results of the quantitative study in Phase 1 of the research. This chapter reports on the Phase 1 qualitative study. While the aim of the preceding quantitative study was to explore nurses' learning needs by assessing the nurses' competence in intensive and critical care nursing, the qualitative study presents findings from interview data about nurses' learning needs in CCUs. Although most of the nurses rated their competence on ICCN-CS-1 as either good or excellent, there were some competencies where competence level was rated as poor or moderate. The qualitative findings reported in this chapter add depth to the previously reported quantitative findings and explore the nurses' managers and colleagues' experiences around these competencies. Using Thorne's (2008) steps of data analysis, three key themes were identified in the qualitative study; '**being unprepared**', '**challenge of limited resources**' and '**knowing**'. These themes are discussed in detail in this chapter.

### 5.2 Being unprepared

**Being unprepared** to work in CCUs was a dominant theme within this study. The theme refers to the perception of nurse leaders, anaesthetists, and nurses in ICU and HDU that the nurses did not have the required knowledge and skill to safely care for critically ill patients when commencing work in these units. Factors that contributed to this sense of unpreparedness are *educational preparation*, *organisation factors*, and *workforce issues*. The consequences were fearfulness, change of nurses' attitude, and elevation of risk to the patients. The nurses managed unpreparedness by relying on other health professionals and learning on the job.

#### **Educational preparation**

The subtheme, *educational preparation* was evident throughout the data as one of the factors that contributed to unpreparedness of the nurses who worked in CCUs. The subtheme refers to the observation by nurse leaders, anaesthetists, and nurses that the nurses did not possess any critical care nursing education qualification or had not attended any short course on critical care nursing. Basic nursing education was considered inadequate to prepare the nurses for critical care practice because the CCUs are specialised areas which provide monitoring and support to critically ill patients.

Therefore, the expectation was that nurses in these units should possess some competence appropriate for the care of critically ill patients on entry to the unit and undergo some training. However as expressed by one of the nurse leaders this was not the case:

*Most of the times the nurses that are placed in the ICU, they are not trained as ICU nurses and they have not undergone even any short course or a training on what they are expected to do, the care that they are supposed to provide to critically ill patients. (DC)*

Furthermore, some nurse leaders observed that majority of the nurses at the two hospitals were nurse midwife technicians who were trained at diploma level. The level of training, performance and critical thinking of these nurses is lower than those trained at degree level, and it is not clear if the curriculum for the diploma training included components of critical care nursing. Nevertheless, the nurse midwife technicians were deployed to all CCU departments due to shortage of nurses trained at degree level. The nurse leaders considered these nurses inadequately prepared to work in the highly specialised units as explained by one of the nurse leaders:

*First and foremost, I would like you to appreciate or understand that the bulk of nursing personnel at...are nurse technicians and therefore you and I know that their knowledge is limited in terms of the nitty gritty of what goes with critical care nursing, so they need a lot of help and a lot of preparation. Ah! In a nutshell, what I would say is that they are not adequately prepared. (KG)*

Similarly, the anaesthetists who worked alongside the nurses in these units noted that the nurses had not gone through any specialised training in critical care nursing. This was reported by one of the anaesthetists “*most of them who are working in ICU are not adequately prepared to work in ICU because they did not undergo specialised intensive care nursing programme*” (H). As is clear in the above excerpt, the anaesthetists considered specialised nursing education in intensive care nursing as a prerequisite for practice in these units in addition to basic nursing.

On their part, the nurses admitted that they lacked the knowledge, skills and experience required for practice in the units because they did not possess any educational qualification in critical care nursing. Working in the units was perceived as challenging by the nurses because of the mismatch between their level of education and the expectation for them to perform to the level of a trained critical care nurse. This is explained by one of the nurses:

*When you are working in ICU as a nurse, every person who comes to the unit expects you to do things like a trained critical care nurse not knowing that you don't have knowledge, skills and resources. It's like you have a limit so there are high expectations from us. Since we don't have adequate appropriate knowledge and experience, it becomes very challenging. (K)*

In addition, the nurses observed that undergraduate nursing education programmes did not prepare them for practice in these units because the content was related to general nursing and there were few concepts related to critical care nursing. Furthermore, the nurses observed that some of the things learnt during undergraduate training were different from actual practice in critical care settings. Although the differences were not outlined, the observation was expressed by one of the nurses:

*When I was in another department, before being transferred to ICU, we were managing conditions like the way we were taught at school but when I moved to ICU, I realised that the approach is different from what I learnt at school. (J)*

It appeared there was agreement between nurse leaders, anaesthetists, and nurses that educational preparation for practice in CCU was required but was inadequate.

### **Organisational factors**

The subtheme *organisational factors* related to how the two hospitals were managed and perceived by nurse leaders, anaesthetists, and nurses as contributing to unpreparedness of the nurses to work in CCU. Specifically, these factors included rotation of nurses and lack of support from other health professionals. Authorities at the two hospitals transferred nurses from one department or general ward to another department or ward every year, a system which is referred to as annual rotation of nurses. The nurses were deployed to any ward or unit including CCUs depending on need and regardless of the nurses' preferred career path. Nurse leaders observed that the annual rotation led to loss of nurses who had gained experience in the units, as explained by a nurse leader:

*Actually, I can say NO, the nurses are not adequately prepared because we have lost a lot of nurses who have moved from ICU to other departments and we have new nurses. At the moment, we have only two old nurses who have worked in the unit for some time, but the rest are new in the department. (PK)*

Likewise, the anaesthetists observed that the annual rotation of the nurses compromised the quality of care due to the loss of nurses who had gained experience in the units. Furthermore, new nurses required a considerable amount of time to gain the required

experience in the unit. Therefore, the rotation system denied some nurses the opportunity to master the knowledge and skills in critical care as reported by one of the anaesthetists:

*Because some new nurses...they come, they don't know anything, the experienced ones...they are put to the ward, they got used to ICU care, now somebody is put for example is going to paediatric ward or outpatient department, so these new nurses for them now to acquire some basic knowledge and skills, it takes time and that in the process is also compromising the care of the patient. (KM)*

These excerpts demonstrate that experienced nurses were considered critical in ICU and HDU. The loss of experienced nurses to other departments or wards left few or no experienced nurses who could teach the new nurses basics of critical care nursing and prepare them for practice in the units. Apart from that, the rotation arrangement denied the nurses an opportunity to master competencies and become fully prepared to work in the units. Not surprisingly, the new nurses who had been transferred from other wards were not willing to work in the units because they felt unprepared to work in such units as expressed by one of the nurses:

*I remember the day that I was told to move to HDU, I refused and even told the Matron that maybe you should move me to ward.... I was not comfortable to work in the HDU because I could see that I didn't have the necessary skills like the monitors. When I looked at the set up in HDU, I asked myself, "what am I going to do here?" (M)*

In addition, the nurses felt frustrated when fellow health professionals could not provide answers to their questions or were not readily available to support them:

*We don't know how to interpret the waves. When we ask the doctor to help, surprisingly, they also say they don't know. Then we say, let's call the anaesthetist but you find that the anaesthetist is busy in theatre or in another department. (FI)*

In addition to not being trained in critical care nursing, nurses also lack access to professional support. It appears organisational factors conspired against the nurses. The annual rotation led to loss of experienced nurses from the units and denied the nurses an opportunity to acquire appropriate competencies.

### **Workforce issues**

The subtheme *workforce issues* revealed critical shortage of nurses at the two hospitals because of international and in-country migration of nurses. The shortage led to



deployment of newly qualified nurses in large numbers to specialised units like CCU. The new nurses worked without support from experienced nurses because they were not available in most units. As such, the nurses relied upon anaesthetists to teach them, but these clinical officers were not conversant with the nursing care of critically ill patients. As described by one of the nurse leaders:

*They need to go through a lot of training or work under somebody who is experienced. At the moment, we have been privileged to work with anaesthetists who most of the times are there. Here and there, they might help us, but they are not conversant with nursing component. As a result, there are a lot of issues in relation to competence. Most of the nurses are not competent and some even mention it that they are not competent. (W)*

Similarly, the anaesthetists expressed frustration with newly qualified nurses being allowed to work in CCUs. They observed that newly qualified nurses lacked experience and did not know how to care for patients in these units. This was recounted by one of the anaesthetists,

*There is also a problem that some nurses, they are new nurses who are just coming in, they are just posted there, they have just completed their training. They are put in ICU; they don't know the basics of ICU care, so the knowledge is not adequate. (U)*

On their part, nurses admitted that as newly qualified nurses they lacked experience and found it difficult to work in the units because there was nobody to assist as described by one nurse:

*On knowledge, I think I have it. I have the theory because the time I was joining ICU I found procedure manuals but what am lacking is the actual skill because you can think of doing it but if there are no resources or someone to demonstrate to you it is difficult. (K)*

In addition, health professionals at the two hospitals, and all hospitals across the country, were allowed to do locum duties. These duties were temporary arrangements whereby staff from other departments worked in understaffed departments as a way of addressing a critical shortage of staff. The locum duties are paid for by the hospitals at a rate set by the Ministry of Health. As such, nurses from other departments were allowed to work in CCUs when there was shortage of staff in the unit. This means that locum nurses only worked briefly in the units; therefore, could not gain the required competencies.

It is evident that *educational preparation, organisation factors and workforce issues* contributed to unpreparedness of the nurses to work in CCUs. The unpreparedness of the nurses led to *fearfulness, change of nurses' response to patients and guardians and elevation of risk to the patients*.

### **Fearfulness**

*Fearfulness* was reported by nurse leaders and nurses as an emotional feeling experienced by nurses who perceived the CCU environment as specialised and, therefore, stressful. The units were considered specialised because of the nature of equipment that is used in the units and challenging because of the severity of patients' illness. The nurse leaders noted that this feeling was evident among nurses who had no previous experience and felt unprepared to work in the units. One of the nurse leaders observed, "*some nurses, it is always their first time to work in ICU. As such they are always scared*" (PK). This nurse leader suggested that the level of fearfulness diminished with time and experience in ICU.

Similarly, the nurses admitted that when they were told to transfer to CCUs they felt afraid because they did not have previous experience, knowledge and skills required to work in the units. Majority of the nurses were fearful about having to use unfamiliar equipment and making decisions. On the other hand, few nurses were fearful about not having support. Even though the nurses appeared fearful, they looked forward to the transfer into CCUs because they were required to respect decisions made by seniors. Similar to the observation of the nurse leaders, the nurses noted that the levels of fear decreased with time as the nurses gained knowledge and skills while working in the CCU.

### **Response towards patients and guardians**

Nurses' *response towards patients and guardians* was influenced by unpreparedness to work in CCUs. The nurse leaders observed that the attitude of some nurses towards patients was not supportive. For instance, some nurses shouted at patients who were critically ill. Some of the nurse leaders suspected that the nurse's attitude was a response to the feeling of inadequacy, as expressed by one of the nurse leaders: "*I still feel maybe it's because of lack of knowledge, lack of skills you tend to like [brief silence], if you don't know what to do sometimes you might throw back something to the patient who is innocent*" (DC).

The same nurse leader further described nurses' attitude towards guardians as bad, particularly towards guardians who came from remote areas, perhaps because they were perceived as ignorant. This attitude was also attributed to lack of understanding of the needs of guardians who had their relative admitted to CCU, as illustrated in the following narrative:

*There was an old lady who came, she did not know what to do. She stayed a long period of time outside without being told that...what's the condition of her child. She just opened the door, came in and one of the nurses shouted at her. But to her it was a concern because she knew my child is here has stayed for a long time, but I have I have not been given any information how the child is. (DC)*

However, one nurse leader gave a contrasting view. She noted that the attitude of some nurses was good towards both patients and guardians. As recounted by the nurse leader, the attitude to guardians was good because the guardians helped with nursing care of their sick relative due to shortage of nurses,

*Towards guardians, the attitude is not that bad, maybe because of heavy workload, the nurses leave most of the things to guardians to take care of patients. Maybe it's because we allow guardians in our wards and HDU. They take part in the care for patients. The attitude towards guardians is not that bad. (H)*

In Malawi, patients' guardians stay at the hospital's guardian shelter for the entire period of their relative's admission. They are allowed to visit their relative in the ward, and CCU at designated times depending on hospital policy. However, a guardian is allowed to stay with the patient, especially in the ward and some HDUs, when the patient is very sick and requires close observation. In such circumstances, the guardians help with nursing care of their sick relative.

The anaesthetists also observed that some nurses showed a good attitude towards patients and guardians. However, there were other nurses who shouted at both patients and guardians. In particular, nurses did not like guardians who asked questions. It appears that the nurses were not confident to respond to the questions posed by guardians and, as a result, they shouted at the guardians as recounted by one of the anaesthetists,

*Yeah like let's say a guardian wants to know the condition of the patient... So instead of maybe saying wait for a clinician who is on duty, sometimes the guardians are shouted at, say "no it's not your duty, why do you want to know about that?" So, I think such types of remarks are not good for the guardians. (KM)*

On their part, the nurses explained that they experienced problems not with patients but with guardians. It is possible that nurses found it easier to deal with patients because they were critically ill and were in a state that they could not question the nurses. However, they acknowledged that their relationship with patients' guardians was not good; although the guardians assisted them in performing some of the nursing activities. The guardians were perceived as difficult and uncooperative. For instance, the nurses claimed that guardians did not follow the hospital policy and always wanted to be close to their patients, as commented by one of the nurse participants:

*The attitude towards patients is good but we experience problems with guardians. For example, when we admit a patient we explain to the guardians that there should be one guardian but you will see that even the other guardians would want to be close to the patient. You try to explain to them, they pretend to have understood but barely after two hours you find another group of guardians coming to see the patient. They always claim that the patient is their so so so so and they want to see him or her. You try to explain to them but they don't understand. (ZA)*

It is possible that the nurses guarded their incompetence by developing a negative attitude to scare the guardians, as expressed by one of the nurses:

*I feel when you don't know how to manage a condition, the attitude changes. I feel all is centred on training. If we are well trained and we know how to manage different conditions, then the attitude will also be good. (J)*

This suggests that the nurses realised their own knowledge and skill gaps in their training and preparedness for ICU training, and this impacted on their relationship with the patient and guardians.

### **Elevation of risk**

*Elevation of risk* referred to potential for complications to patients because of the nurses' lack of preparedness to work in the unit. Nurse leaders observed that nurses did not know what to do, or when and why they did some interventions. This lack of understanding increased the risk of infection and complications to the patients. An example was given by one of the nurse leaders who noted the risks associated with incorrect suctioning procedure,

*They just use the suctioning maybe as long as the patient is in ICU, they use the same suction tube, they don't change the suctioning pack as a result we are introducing more infections to the patient so I would really want the nurses to learn. (QE)*

The same participant further described circumstances where nurses failed to initiate resuscitative measures or CPR on their own. The nurses either did not know what to do or lacked confidence to initiate the resuscitative measures as illustrated in the following excerpt, “*when there is a patient who requires cardiopulmonary resuscitation, they shout for help without doing anything, waiting for an anaesthetist to come and help them out*” (QE). In the process, the patient could have easily died or developed complications as the nurses waited for the help from the doctor or anaesthetist.

In some instances, the patient’s condition was not monitored appropriately, and patients developed complications because no action had been taken. Furthermore, nurse leaders reported that nurses did not understand the rationale for certain interventions; for instance, the reason why patients are supposed to be fed every hour and why patients received certain medications. The patients could develop complications due to underfeeding or overfeeding and inappropriate doses of medications.

The reports from anaesthetists were similar to those expressed by nurse leaders. They noted that nurses could not perform suctioning appropriately and patients desaturated during the procedure. In addition, the nurses were not able to undertake a thorough patient assessment and plan the care based on assessment findings or, as this anaesthetist noted, understand the medications frequently used in ICU, “*we are using a lot of these inotropic drugs like the adrenaline, epinephrine, dobutamine some of them do not have knowledge of these drugs*” (U).

Furthermore, some nurses did not know the type, amount and electrolyte composition of some intravenous fluids they were administering. Not surprisingly, the nurses relied on doctors and anaesthetists whose prescriptions they took as correct and, therefore, would not question the management of patients. It is evident that the patients were not safe under these nurses who provided care without adequate knowledge.

On their part, the nurses observed that there was lack of uniformity of nursing practice between departments because the nurses lacked requisite knowledge and skills for practice in these units. In each unit, the nurses performed some activities without understanding their implications, as explained by one of the nurse participants:

*Even when feeding patients through nasogastric tube, our friends in ICU give, for example, 150mls every hour. When the patient is in HDU, we feel giving feeds hourly is just too much. [All participants laugh]. What we do is that we just add 150, 150, 150...for 6 hours and give the patient at once. [All*

*participants continue laughing]. It's like we don't know if there is any harm in doing that. (FI)*

The nurses had a sense that some activities, if done incorrectly, would increase the risk to patients. However, they performed the activities blindly, relying on intuition to determine whether or not that would cause harm to the patients. These challenges compelled the nurses to identify strategies of managing their unpreparedness to work in the units.

### **Dealing with unpreparedness**

*Dealing with unpreparedness* referred to the strategies that nurses used to effectively work in the ICU or HDU. Despite the unwillingness to work in the units the nurses realised that they had to respect decisions made by authorities. The nurses relied on doctors or anaesthetists for guidance on the care of critically ill patients. They also used different methods to gain knowledge and skills while working in the units.

Nurse leaders noted that the nurses relied heavily on other ICU staff to guide them in relation to patient management. Nurses sought guidance from doctors or anaesthetists or some expatriate nurses, while others learnt from fellow nurses. They also observed that some CCUs opened by expatriate nurses and doctors included training of the first batch of nurses who worked in the units. Unfortunately, some of these nurses had been moved to other departments. The new nurses were informally trained on the job by anaesthetists and fellow nurses. However, the teaching by anaesthetists focussed on medical care, not the required nursing competencies. Furthermore, some of the things learnt from colleagues were incorrect because none of them had been specially trained. Illustrating this, one of the nurse leaders commented, *“the person who was also picked from the ward to come to HDU starts to orient the other one who has just come in...if he or she is not using the correct technique, the other one is bound to learn the wrong things”* (KG).

The reports by anaesthetists were similar to nurse leaders' observation that nurses in the units depended on anaesthetists or doctors for basic things like calculation and balancing of fluids. The nurses were expected to perform independently in some areas but lacked confidence. Illustrating this, one of the anaesthetists said, *“I think both calculation of fluids and balancing because...I have noted that nurses rely upon doctors or anaesthetists or the consultants to prescribe or to calculate for them”* (U). This

observation was supported by the nurses who noted, *“there are also conditions that we don’t know how to manage. We just rely on doctor’s prescription”* (LA).

It was evident in nurses’ reports that, in addition to local doctors, they learnt from expatriates, colleagues, through self-directed learning and observing. The expatriates visited the country and worked in the hospitals while teaching nurses and doctors as part of capacity building. One of the HDUs partnered with experts in Norway who used to visit the hospital and train staff in the HDU. The nurses appreciated the role played by these expatriates and felt that they were *“learning a lot from these people”* (CF).

However, the expatriates were not always available in the units and hospitals, so some participants learnt from colleagues who oriented them to the environment and taught them how to do procedures. As described by one nurse, *“my friends were telling me that when you see this on the monitor, it means so so... may be alarm etc”* (GE). In addition, some participants initiated their own learning by reading procedure manuals available on the units. Others learnt by observing colleagues performing a procedure, *“some of the procedures that I do are done just because I saw somebody doing it”* (K); while recognising this was not ideal and they required experienced guidance, *“I need the real experience whereby somebody would teach me how to do it and everything that is necessary for that procedure”* (K).

### **5.3 Challenge of limited resources**

The theme **challenge of limited resources** describes the impact of staff shortage and lack of material resources on nursing practice in CCUs at the two hospitals. The reports from all participants about the challenge of limited resources demonstrated *discrepancy between available resources for patient care and expected level of care in the units*. The challenge resulted from institutional factors which existed at the two hospitals. However, nurses endeavoured to provide optimum care by *sacrificing their time, taking risks, improvising resources and engaging patients’ guardians*. The consequences of the challenge were *moral distress among the nurses, ethical dilemma and compromised nursing care* which increased risk to patients. Although the theme, **challenge of limited resources**, is being presented separately, it appeared influential across all themes reported in the study.

#### **Discrepancy between available resources and expected level of care**

The subtheme *discrepancy between available resources and expected level of care* reflects the shortage of resources required to achieve the anticipated quality of nursing care in CCUs. Nurses, nurse leaders, and anaesthetists acknowledged that these are specialised units expected to provide high level of care to critically ill patients. However, the expected level of care could not be achieved because of shortage of staff and lack of material resources.

#### Shortage of staff

The nurses expected the units to be staffed with adequate numbers of nurses to achieve a 1:1 nurse-patient ratio. However, the desired nurse-patient ratio seemed unrealistic because the two hospitals were understaffed and that affected staffing in CCUs. During the period of data collection, the average nurse-patient ratio was 1:2 in ICUs and 1:4 in HDUs. This was expressed by a nurse participant, “*ideally, it is supposed to be 1:1, one nurse against one patient in ICU. But nowadays, that is difficult because of shortage of nurses. As a result, for some shifts it is one nurse to four patients*” (LA).

Participants further observed that the shortage of nurses was not just about numbers but lack of nurses with the required training in critical care nursing. Apart from the shortage of nurses, nurses at Hospital A reported that there were a few support staff, namely porters and hospital attendants, whose absence negatively affected the delivery of nursing care in the units. In Malawian hospitals, porters are responsible for transferring patients between departments and deceased patients from the ward or unit to the mortuary. Hospital attendants are responsible for cleaning the unit or ward and, in some cases, they also assist with the transfer of patients and deceased patients to the ward and mortuary respectively. Reports about the impact of shortage of porters and hospital attendants on nursing care were evident during interviews with the nurses as recounted by a nurse participant from HDU:

*I think as nurses we have a lot of work to do. We tend to be porters, sometimes we tend to be maids [hospital attendants] in addition to caring for our patients. Hospital authorities should allocate permanent porters who will be responsible for transferring patients to and from different departments. Imagine, sometimes we leave the patients and the whole ward just to transfer a dead body to the mortuary. (FI)*

The above reports clearly demonstrate that shortage of nurses, lack of nurses trained in critical care nursing, and shortage of support staff contributed to the challenge of limited



resources and negatively affected nursing care in ICUs and HDUs. Furthermore, the units experienced lack of material resources.

#### Lack of material resources

Participants observed that ICUs and HDUs at the two hospitals lacked material resources. Some of the resources not available included medications, monitors, suction catheters, perfusors, masks, gloves, colostomy and urine bags. The lack of resources was contrary to nurses' expectations of these units which admitted very sick patients. This was reported by one of the nurses, "*when working in HDU, one expects to have adequate resources but, in our case, lack of resources has been a major challenge e.g. lack of medications, monitors*" (TD).

Similarly, nurse leaders and anaesthetists acknowledged the lack of resources in these units. As presented in the subsequent section, *impact of institutional factors*, the nurse leaders sympathised with nurses but appeared powerless to address the problem. One of the nurse leaders said:

*It is also unethical and unprofessional to let nurses do those things without the materials, resources. Let's take gloves, you know these are patients who are not talking and sometimes we do not have their background records in terms of health, so we don't know whether they are immune compromised or not, so really those are the resources I really see that nurses get frustrated when they do not have, masks and gloves and sometimes of course ah! Ah! Things to use like colostomy bags, urine bags, those are issues that it's a must in in Intensive Care Unit or High Dependency Unit, those material resources are supposed to be there day in and day out.* (KG)

The lack of resources varied between ICUs and HDUs across the two hospitals. Reports indicated that ICUs were better resourced than HDUs. During the data collection period, patients who were admitted to ICUs had illnesses which required mechanical ventilation for respiratory support. This intervention was not performed in HDUs. However, participants expected HDUs to be equipped with the resources required for treatment and monitoring of critically ill patients as reported by a nurse leader participant, "*the equipment that we have [in HDU] is the basic equipment like the monitors we do have, the perfusors we don't have. The basic equipment that we have is the blood pressure machines and sometimes the oxygen saturation probes*" (Q).

The study revealed that participants recognised CCUs as special units for the care of very sick patients. However, their reports demonstrated that the units experienced the

challenge of shortage of resources. The challenge was attributed to the impact of institutional factors across the two hospitals as presented in the next subtheme.

### **Impact of institutional factors**

*Impact of institutional factors* referred to circumstances that were beyond the control and mandate of the nurses, nurse leaders, and anaesthetists. These factors included set up of some of the units, recruitment of staff, supply of resources, and preparation of the nurses for practice in these units. The nurse leaders at the two hospitals reported that they actively lobbied for recruitment of more nurses. However, recruitment of nurses was not under the jurisdiction of the nurse leaders and this made filling vacancies difficult. At the time of data collection, the country experienced economic challenges which led to the dichotomy of shortage of nurses in hospitals and an increase in the number of unemployed new graduate nurses. The shortage of nurses was so critical that the hospitals relied on nurses who had just graduated from college and were awaiting recruitment by the Government, the biggest employer of health professionals. The hospitals hired the new graduate nurses on a temporary arrangement as a way of addressing the shortage of nurses and some of these nurses were allocated to work in CCUs. Unfortunately, these nurses received low wages compared to their colleagues who were on the Government payroll. As such, the nurses were not reliable because they left the hospitals as soon as they obtained a job with better pay. The nurse leaders seemed to have accepted the status quo and just hoped the situation would improve in future, as expressed by a nurse leader:

*We have been lobbying to have special nurses for the HDU but with the current staffing problems we are not making any progress. Even in the wards, we have only five nurses to cover the ward day and night. At the moment, we are relying on temporary nurses who are waiting for Government to employ them but to be honest they are not very reliable, so we have a critical shortage of staff. From the nurses that we have we cannot say that let's have special nurses for the HDU and also nurses for the ward. We cannot afford to do that right now unless things improve on the number of nurses. Maybe we can try to do that in future.*  
(H)

The nurse participants reported that the shortage of nurses was worse in some HDUs at Hospital B. Unlike Hospital A, where every HDU had its own staff, some of the HDUs at Hospital B were rooms demarcated from general wards and managed as part of the ward. The nurses in the general ward managed the HDUs by allocating nurses to the unit at the beginning of every shift. However, the nurses allocated to HDU were

expected to assist with nursing activities in the general ward because of the high number of patients admitted to the ward. This compromised the quality of nursing care rendered to critically ill patients in the HDUs because the nurses could not spend all the time in the unit, as expressed by one nurse participant:

*In our case, you may have few patients in HDU but the combination of HDU and the ward becomes a challenge.... Even if you have been allocated to HDU and there are only two patients it's not easy to just focus on the two patients. Your colleagues are looking after the general ward and if they are doing drug administration then you are forced to go and assist them. By the time you come back to HDU it's more than an hour. (M)*

Similarly, the supply of material resources to the two hospitals was the responsibility of the Government of Malawi. With prevailing economic hardship, the two hospitals experienced erratic supply of resources which affected delivery of care in all departments including CCUs. The nurse leaders sympathised with the nurses but appeared powerless to address the problem.

As noted previously, the majority of the nurses who worked in the units were not trained in critical care nursing. As a result, the nurses were unable to use and care for some of the equipment. This led to breakdown of some of the equipment and aggravated the lack of resources in the units. One of the nurse leaders observed:

*Most of the times the nurses do not take care of the equipment that they use, whether it is monitors, oxygen concentrators, suctioning machines. It's one thing to know how to use the equipment and it is another thing to know how to care for the equipment. You find that we get new equipment, we start using the equipment and you find that very soon it gets broken down. (CB)*

Furthermore, there was lack of consensus on the job description of the nurses in CCUs because of the absence of a critical care nursing training programme in the country. Although nurse leaders and anaesthetists acknowledged the challenge of lack of material resources, they deflected the task of managing the units and mobilising resources to the nurses. The nurse leaders and anaesthetists considered searching for resources as one of the skills that nurses required for their practice in these units; as expressed by one nurse leader participants:

*They also need to have like management skills because sometimes we have shortage of resources in HDU. They just sit down because they don't have resources, they will not do anything, but they need to have those skills whereby they need to look for resources and mobilise resources wherever they are and consult if possible. They also need to have knowledge and skills on planning not*

*necessarily of patient care, but they also need to plan on how to manage the HDU. (H)*

Likewise, anaesthetists acknowledged that the units lacked material resources. Like nurse leaders, the anaesthetists expected the nurses to find solutions to the challenge and mobilise resources for the units. At each of the two hospitals, nurses order material resources, including medications, from one central unit, the pharmacy. When resources are not available at the pharmacy, the nurses are expected to fetch the resources from other wards or departments. This was expressed by one of the anaesthetist participants, “*maybe when we have little resources, they need to be resourceful to address the problems, rather than just saying that we don’t have ABCD then it ends there*” (U).

The above reports clearly demonstrated that institutional factors contributed to the challenge of shortage of staff and lack of material resources. However, the nurses endeavoured to make it work for the sake of the patients as presented in the next subtheme.

### **Making it work**

The subtheme, *making it work*, reflected the participants’ expectations of the nurses to provide the required care to critically ill patients regardless of the shortage of staff and lack of material resources. The nurses bore the burden and worked hard to make things work for the sake of patients. The nurses worked for extended hours to cover the shortage of nurses in their department. During one of the focus group discussions, nurses concurred with the following account presented by one of the nurse participants:

*Sometimes we get affected by the shortage by staff. For instance, if you are working straight shift then when you are about to knock off, you hear that the one who was supposed to come for night duty will not report for duties. If you decide to continue, you get tired and that affects how we manage our patients. (M)*

Apart from working for more hours, the nurses performed extended roles in cases where there were no porters or hospital attendants, as earlier reported under the subtheme shortage of staff. The nurse juggled between patient care and performing functions of the support staff. This affected the delivery of nursing care in the units. Their stories were infused with frustration and concern for the patients as recounted by one of the nurses, “*imagine, sometimes we leave the patients and the whole ward just to transfer a*

*dead body to the mortuary. Yet you have a patient who has tracheostomy with lots of secretions and requires frequent suctioning” (LA).*

In addition, the nurses were prepared to do everything possible to save patients who were in danger by either searching for or improvising the resources. However, the same nurse participant from HDU appeared frustrated at improvising resources as expressed in the additional comment:

*One day, I noted that a tracheostomy for a certain patient was blocked. Unfortunately, we did not have proper suctioning tubes. I agreed with my friend to check in one of old cartons which was on top of a cupboard. So, we took a chair to step on so that we could reach the carton. Unfortunately, the carton was too heavy and both of us fell down as we were trying to get it off the cupboard. We then decided to call Casualty Department for assistance, but nobody was picking the phone.... Sometimes, we try to improvise the nasogastric tubes but, on that day, they were not available. (LA)*

Furthermore, the nurses solicited support from patient guardians in performing nursing activities when there were few nurses on duty. This was illustrated by a nurse participant from HDU, “*like in Medical HDU, we have challenges in terms of resources as a result we sometimes engage the guardians in doing some of the work, but they are not allowed to stay in the HDU all the time” (SP).*

Although patients’ guardians were not interviewed in this study, participants noted that guardians were comfortable to help with the care because the culture demanded them to be close to the patient; as observed by one of the nurse leader participants:

*Our culture as Malawians we would always want to be as close as possible to our patients to observe every procedure that is being done on our patient, if there is need for assistance or any help but also, we would want to be monitoring the condition of our patients. (Q)*

It is evident that the system expected nurses to find means of either addressing or mitigating the impact of the challenge of resources in CCUs. Although the nurses tried their best to make things work, the shortage of staff and lack of resources resulted in consequences to nurses, patients and guardians, as presented in the next section.

### **Consequences of limited resources**

The consequences of the shortage of staff and lack of material resources were *moral distress, ethical dilemma and elevated risk to the patients.*

## Moral distress

*Moral distress* is defined by Burton and Tuckett (2012) as a feeling experienced in situations in which one is unable to implement the right course of actions due to institutional constraints. The contributing factors are related to the individual, site, and broader external environment. The outcomes of moral distress include anger, loss of morale, helplessness, depression, guilt, emotional exhaustion and frustration, among others.

In this study, the shortage of staff and lack of resources invoked signs indicative of moral distress namely feelings of exhaustion, frustration, disappointment and anger. Nurses in ICU and HDUs reported that they experienced increased workload because of the disparity in numbers of available nurses and job requirements. The increase in workload, for the few available nurses, caused physical exhaustion which affected their attitude, as reported by this nurse participant:

*I just want to add that sometimes attitude depends on the workload.... Sometimes after working day duty, you realise that there is no one reporting for night duty. When you force yourself to take the next shift, you become very tired by the end of that shift as a result your attitude changes. What am saying is that generally our attitude is good but sometimes it changes depending on the situation. (TD)*

The nurses felt emotionally upset when they searched for, but could not find, the required resources. Similarly, nurse leaders observed that the shortage of resources affected the nurses emotionally, “*they get frustrated because of lack of resources, that is very true*” (KG).

In addition, the nurses expressed remorse when some of their colleagues failed to appreciate the challenges and efforts made to make things work in difficult situations. This was reported by a nurse participant:

*Generally, the way nurses treat each other is not good. For example, if a patient is discharged from ICU, they expect us to quickly rush to collect the patient. If we delay, may be by 3 or 5 minutes, the ICU staff just report to bosses that HDU nurses are not coming to collect the patient. It's not only ICU staff but even theatre staff. They forget that there is distance from our department to ICU or theatre. It's not easy to wheel a bed from HDU to ICU or theatre. Sometimes, that happens because there is no space in HDU. Maybe a doctor has just discharged a patient from HDU to a general ward, but we are still waiting for ward staff to come and collect the patient. (FI)*

As earlier reported, nurses involved the patients' guardians in providing care to the patients. However, some nurses appeared overwhelmed by the presence of a patient's guardians in the unit regardless of the contribution they made in addressing the shortage of staff and lack of resources. The nurses expressed their emotional upset by reacting with anger to the presence of guardians as earlier reported by one nurse participant:

*We have challenges in terms of resources as a result we sometimes engage the guardians in doing some of the work, but they are not allowed to stay in the HDU all the time.... Some guardians are difficult, they come to the unit any time. When you ask them, "why are you here?" They say, "I just want to see my patient". What for? That's why I said my attitude to patients is OK but for guardians, my attitude changes because of their behaviour. (SP)*

However, as discussed earlier, some nurse leaders noted that the change in attitude was not always a result of workload but could be attributed to their lack of training and preparedness to work in the ICU environment.

#### Ethical dilemma

The challenge of limited resources posed ethical challenges to nurses who worked in ICUs and HDUs. *Ethical dilemmas* occurred in situations where the nurses encountered problems on allocation of the available few resources to equally deserving patients. This was expressed by a nurse participant:

*Sometimes, you may have the knowledge but if resources are not there it becomes a challenge. For instance, I know that every critically ill patient requires FAST HUG [Feeding, Analgesia, Sedation, Thrombolytic agents, elevation of Head of the bed, prevention of Ulcers and Glucose control] it's not easy to implement that due to lack of resources. Another example is that, you may have a patient who is desaturating, and you know that the patient requires oxygen but there is only one flow meter which may be on another patient. It means this patient will suffer because we don't have another flow meter. (J)*

#### Elevated risk to the patients

*Elevated risk to patients* was reported in the earlier theme, being unprepared. However, a different aspect is presented here. The risk within this subtheme related to the possibility of causing harm and introducing infection to the patients because of shortage of staff and lack of resources.

The available nurses were few and could not adequately care for the very sick patients. This posed risk to the patients because the nurses could easily make a mistake because of exhaustion. In addition, both nurse leaders and nurses observed that the shortage of

resources in some units made it difficult for the nurses to practice infection control. Therefore, patients were at risk of developing infection. This was expressed by one of the nurse leaders, *“they just use the suctioning may be as long as the patient is in ICU, they use the same suction tube, they don’t change the suctioning pack as a result we are introducing more infections to the patient”* (DC).

In addition, nurse leaders observed that patients in HDU were at high risk of developing complications because nurses could not recognise changes in the patients’ condition as a result of lack of appropriate equipment as recounted by one of the nurse leader participants:

*The other reason why they don’t differentiate whether the patient requires CPR or not is the same problem of lack of equipment because if there are no monitors so you can’t monitor their vital signs, you can’t monitor their ECG. It’s difficult for them to know in what state the patient is at that time.* (Q)

## 5.4 Knowing

To be an effective nurse in CCU is about **knowing**. There are different dimensions of knowing which are expected to be demonstrated by an effective nurse in these units. Knowing comprises *theoretical knowing*, *practical knowing*, *technical knowing*, *managerial knowing* and *professional knowing*. In addition, knowing is about *interpretation* and *taking action*. Knowing is influenced by the context in which the nurses practise. The consequences of knowing are confidence in caring for critically ill patients and improved patient care. On the other hand, the consequences of not knowing are fear and increased risk to the patients and guardians as discussed in the earlier theme, **being unprepared**.

### Theoretical knowing

*Theoretical knowing* refers to knowledge which nurses should possess and integrate in the treatment and care of critically ill patients and guardians. Consistent throughout the interviews and focus group discussions was the need for nurses to acquire knowledge on disease conditions which were common in ICUs and different HDUs, medications and fluids which are administered in the units. This was not surprising because the data were collected from different HDUs for medical, surgical, neurological, gynaecological and



obstetric conditions. However, the ICUs were general units where patients with any condition could be admitted as long as they met the admission criteria.

#### Disease conditions

Participants suggested that nurses should know the following diseases: diabetes in pregnancy, kidney failure, pre-eclampsia, pulmonary oedema, head injury, spinal cord injuries, bowel obstruction, peritonitis, upper gastrointestinal bleeding, medical emergencies, sepsis, and shock. The nurses had learnt about these diseases during basic nursing and midwifery education; however, the patients admitted to ICUs and HDUs were critically ill. Therefore, the approach in managing the diseases was different from the general wards. As noted by the nurse leaders, the type of knowing which the nurses required was what they were expected to do in caring for patients with such diseases in the units, *“I think they need to know management of a patient with head injury because we have lots of them.... So, the nurses also need knowledge on that”* (PK).

Similarly, anaesthetists observed that it was important for the nurses to know some of the common conditions as suggested by this anaesthetist *“most of the patients have shock, so I think if this is also included in the in-service, about the shock...and then some pathology of common medical conditions that are admitted in intensive care”* (KM). The expectation being that by knowing the diseases which were common in the units, nurses would effectively care for patients in these units.

Because of the rotation system and nurses being requested to temporarily work in other departments or wards because of nursing shortages (even during data collection), the nurses wanted knowledge on a wide range of conditions which would help them to work both in ICU and in any department at the hospital. This was reported by one of the nurse participants:

*As a nurse, you should be able to work in any critical care unit...if I go to Surgical HDU, I should be able to manage patients with surgical conditions. If I go to Medical HDU, I should be able to manage patients with medical problems.*  
(PCM)

Furthermore, the nurses observed that they needed to learn different conditions because some patients admitted to the units had multiple problems. Specifically, some nurses were interested in understanding the treatment part of the disease conditions as reported by one nurse participant, *“we sometimes have patients with multiple problems....*

*Sometimes, we fail to manage the blood pressure just because we don't know the current treatment of hypertension. So, I feel we need to be taught about all those conditions” (CF).*

## Medications

The participants reported that nurses should have knowledge on medications used in CCUs. Most of the nurses learnt pharmacology during their basic nursing education but they did not have experience in administering some of the medications like vasoactive medications which were commonly used in these units. As per hospital policy, some of the nurses who worked in these units had been transferred from wards where these medications were rarely used. It was also evident that there were no guidelines on calculation and administration of these medications in some of the units. Therefore, it was important for the nurses to know these medications; as explained by one of the nurse leaders, *“the drug calculations like for noradrenaline. I think some nurses just memorised that they should give 8mls per hour but they don't know the dosage like how many milligrams per hour” (PK).*

Similarly, anaesthetists observed that nurses lacked knowledge on medications which were commonly used in the units. Most of the times, nurses are the ones who prepared and administered medications in the units. Like nurse leaders, one of the anaesthetists observed nurses simply memorised the preparation and dosages of the medications but lacked understanding of mechanism of action and adverse effects as basis for their actions.

On their part, the nurses admitted that they lacked understanding of vasoactive medications. Therefore, they administered the medications based on doctor's prescription. It meant patients were not safe under the care of the nurses because they could not administer the medications at any time, including emergencies, in the absence of the doctors. In addition, they could not question the doctors' prescription even when there was an error in the dosage. One of the nurses explained:

*Adrenaline, we just give the medication because the doctor has ordered the drug. If somebody asks the rationale for administering that drug, sometimes nurses will just say that it's because the doctor has prescribed. I feel a nurse has to understand why the patient is getting that drug. (PCM)*

## Fluid calculation and monitoring

Participants observed that nurses were unable to calculate and monitor the flow of the fluids. Although the nurses might have learnt fluid administration during their basic nursing education, the approach to fluid calculation and administration in ICUs and HDUs is different from that of general wards because of the severity of patients' illness. Fluid administration in these units is closely monitored to prevent under- or over-hydration. Unlike similar units in developed countries, there were no infusion pumps for administration of the fluids in most of the units at the two hospitals. Therefore, nurses were expected to know the calculation of fluids and closely monitor fluid administration as expressed by one of the nurse leaders, *"fluid management is also a problem. It's basically because most of the nurses do not know how to calculate amount of fluids, the flow of fluids, and balancing of the input and output"* (W).

Likewise, anaesthetists noted that nurses were unable to calculate and balance the fluids on their own. This is not surprising because most of the nurses who worked in the units were nurse technicians, trained at Diploma level; therefore, could not make independent decisions. In the absence of registered nurses or nurses who specialised in intensive care nursing, the nurse technicians lacked guidance and mentors. One of the anaesthetists reported:

*I think both calculation of fluids and balancing because what happens.... what I have noted is that a nurse can hardly do that, normally they rely upon doctors or anaesthetists or the consultants to prescribe or to calculate for them.* (U)

On the other hand, nurses in ICUs and HDUs reported that there were inconsistencies in fluid administration in different units. In the absence of a critical care nursing course in the country, the nurses relied on their basic nursing education and did not understand how fluids should be monitored in critically ill patients. As a result, the nurses followed practices on fluid administration and monitoring without understanding the correct procedure. One of the nurses explained:

*In ICU, in the course of administering the 2 litres they sum up the output every 2 hours. For us in HDU, we know that the output is supposed to be summed up at the end of 24 hours. That's what we learnt at school. We wonder ... who is correct or maybe those in ICU do not do it correctly.* (GE)

Lastly, there were differences among nurse leaders, anaesthetists, and nurses in the need for the nurses in ICU and HDU to know the following areas: patient involvement,

counselling, assisting with intubation, care of family members, infection prevention, care of a patient who is undergoing mechanical ventilation and documentation. These topics were suggested by either one or two groups of participants because of the differences in the levels of care provided in the units. For instance, mechanical ventilation was only done in ICUs at the two hospitals. In addition, perception of an effective nurse in the units was different among participants because there was no common scope of practice for the nurses in the absence of critical care nursing courses in the country. Despite the differences, theoretical knowing was perceived as integral to knowing in ICUs and HDUs as it underpins nursing practice in the units.

### **Practical knowing**

The subtheme, *practical knowing*, refers to the ability to perform skills that are required in the treatment and care of patients in the units. This demonstrates that knowing in CCU was not just about theory but having the skills required in the units. It is obvious that the nurses were competent in basic nursing care. However, the severity of patients' illness and the treatment approach in these units required the practical knowing of CPR, suctioning and patient assessment.

#### **Cardiopulmonary resuscitation (CPR)**

CPR was considered an important resuscitative skill that nurses in ICUs and HDUs needed to know. CPR was part of the basic nursing education curriculum in the country. However, the nurses lost the skill because the procedure was not common in most hospital departments or wards. In addition, there was no policy for mandatory first aid training in Malawi, which includes CPR regardless of the profession, as is the case in some developed countries. The nurse leaders expected the nurses to intervene during emergencies. This was reported by one of the nurse leaders:

*We have encountered a number of cases whereby you find that the patient has collapsed, maybe in Labour ward and they rush this patient to HDU but you find that some of the nurses who are there are not able to do CPR, or they attempt to do it but not the way we are supposed to do the CPR. I feel this is important because they have to do that procedure before the patient is taken to main ICU. Maybe, in a month we have two or three patients who require CPR in HDU. (H)*

Similarly, anaesthetists observed that some nurses did not know what to do in situations where CPR was required. The nurses were unable to perform CPR and could not administer medications required during emergencies like cardiac arrest. This could be a

manifestation of lack of experience of the procedure as reported by one of the anaesthetists,

*I have seen nurses not knowing what to do. They don't even know how to do the compressions. They don't know when to give adrenaline and what dose should be given. All I can say is that there is a big gap as far as performing cardiopulmonary resuscitation is concerned. (U)*

On their part, nurses admitted that they were unable to recognise cardiac arrest or perform CPR. In the absence of cardiac monitors in most departments, the nurses were unable to recognise imminent cardiac arrest. It is also possible that this mindset was influenced by the cultural definition of death as the absence of chest movements for breath. In addition, some nurses observed that lack of recognition was common among nurses who worked in units where cardiac arrests were not common. While referring to fellow nurses one of the nurse participants said:

*Nurses do not know that it is an arrest... It happens because the nurse doesn't know that it is an arrest. To them, maybe they just think that the patient is dead. Such things happen in units where such things as cardiac arrest are not common. (ZA)*

Furthermore, some nurses were unable to perform CPR even in situations where they were able to recognise cardiac arrest. This was attributed to lack of confidence in performing CPR. It is evident practical knowing on CPR was a critical component of knowing in ICU and HDU.

### Suctioning

Participants observed that suctioning was a common skill in CCUs hence the need for nurses to know the correct procedure. Nurse leaders observed that suctioning was not properly done and that nurses could be introducing infection in the patients. At the time of data collection, the two hospitals were affected by lack of resources including suctioning catheters. However, the nurse leaders observed that the nurses could do better for the safety of the patients. This demonstrates that the nurse leaders expected the nurse to know how to optimise care in resource limited settings. This was reported by one of the nurse leaders:

*They just use the suctioning ...may be as long as the patient is in ICU they use the same suction tube, they don't change the suctioning pack as a result we are introducing more infections to the patient so I would really want the nurses to learn. (W)*

The anaesthetists had a similar observation and emphasised the need for nurses to learn about suctioning. The procedure was mostly done by nurses and most of the patients in these units were either intubated or had tracheostomy. In contrast, patients admitted to general wards, where most of the nurses worked before, were not intubated and tracheostomies were rare. The anaesthetists noted that patients could develop complications if suctioning was not properly done. This was summarised by one of the anaesthetists:

*As for suctioning, yes, I think there is really a need for the nurses to know how to properly suction a patient. Why am I saying that? It's because while suctioning anything can happen. Most of the patients go into complications, maybe cardiac arrest or hypoxia during the period of suctioning. So, it's really important for these nurses to be taught or learn how to properly suction a patient. (U)*

On their part, the nurses admitted that they were unable to properly do suctioning. It was expected that the nurses had some knowledge and skill on the procedure from their basic nursing education. However, the nurses acknowledged that suctioning done on intubated patients or those with tracheostomy required to be done properly to avoid causing harm to the patient as reported by one of the nurse participants, “*some of us just get a tube and insert it into the tracheostomy but generally that procedure has its own skill so that the patient is not injured*” (TD).

#### Patient assessment

The participants identified patient assessment as an important skill for the nurses in ICUs and HDUs. The nurses were expected to learn this skill during basic nursing education. However, participants observed that the nurses need to learn the assessment skills required for critically ill patients. The data were collected at hospitals where, in some circumstances, the nurses in units extended their roles to that of clinicians due to shortage of staff shortage. Practical knowing was seen in this context as the nurses being able to collect assessment data required for understanding patients' conditions and their progress. This skill, which currently nurses appear afraid or reluctant to do, would give nurses confidence in the care of their patients as illustrated by one of the nurse leaders,

*I mentioned about examination of the unconscious patient, the GCS, pupil reaction, the reflexes. They are things that even now, when we have neuro patients the nurses are afraid to even do the GCS so those are the issues that you can also include in the training. (W)*

Similarly, the anaesthetists noted that it was important for the nurses to know how to assess the patients. The nurses stayed close to the patient for more hours compared to other health professionals. It was expected that the nurses should be able to assess their patients, identify problems in their patients and plan care based on the identified problems. This was expressed by one of the anaesthetists as follows, *“they should also be able to assess the patient.... identify the problems of the patient and plan their care according to their assessment”* (KM).

The nurses also identified patient assessment as an important skill for them to know for therapeutic purposes. Some of the nurses observed that this skill would help them assess for pain and intervene appropriately so that the patients do not experience pain. Furthermore, the nurses observed that this skill is important for them to be able to collect baseline data which could be used to monitor the progress of the patients. As one nurse said *“it is important to assess the patient to have baseline data. This will help us to know whether the patient’s condition is improving or deteriorating”* (GE).

Nursing is a practice profession; therefore, practical knowing was perceived as a critical component of knowing in ICUs and HDUs. This dimension of knowing would help nurses to effectively practice in the units.

### **Technical knowing**

*Technical knowing* refers to the need for the nurses to know how to use and care for the equipment and be able to manage the units. The environment in these units is different from other units or wards because of the presence of specialised equipment. The nurse leaders acknowledged that a nurse cannot work in any of the units before understanding how to use the sophisticated equipment. In particular, they noted that nurses needed to know how to use ventilators, cardiac monitors, and perfusors. Surprisingly, there was no proper orientation programme for new nurses on how to use equipment in the unit. This is despite the fact that most of the nurses in these units are transferred from general wards where there is no specialised equipment. Consequently, the nurses developed fear to either work in the unit or use the equipment. This was illustrated by one of the nurse leaders:

*There is no way we can talk of caring for a patient in ICU without knowing the ventilator. Knowledge of the type of equipment that we use. You see that sometimes they are afraid to even touch the ventilator. Others would do it but most of them are afraid to even touch the ventilator.* (W)

Likewise, the anaesthetists observed that knowing how to use equipment was a prerequisite for nursing practice in the units. The anaesthetists cited ventilators and perfusors as some of the equipment that nurses needed to learn how to operate. In acquiring technical knowing, the nurses would be able to properly monitor the patient, identify problems, and intervene appropriately. As observed by one of the anaesthetists:

*The nurses must be able to operate ICU equipment like the, the perfusors and even have basic knowledge of mechanical ventilations in terms of to say which mode is the patient on, and if there are alarms, must be able to identify the problems and also rectify the problem. (KM)*

On their part, the nurses acknowledged the importance of learning how to use the equipment that is used in CCUs. Specifically, the nurses mentioned perfusors, cardiac monitors, and ventilators. In the absence of formal orientation programmes for new nurses to the units, the nurses learnt how to use the equipment from colleagues while working in the units as expressed by one of the nurses. However, there was no prescribed format for peer teaching in the units. Consequently, the nurses failed to do activities such as administration of medication because of their inability to operate perfusors. The nurses sounded desperate to learn about the equipment as expressed by one of the nurses:

*I don't know how the dots (electrodes) are connected to the patient. I just see the different colours, red, black, green etc. Sometimes, I just connect them without knowing whether it is right or not. (Laughs and the whole group laughs). Honestly, I do not know where and why the different colours are placed on different spots. We need to know how they should be placed and may be what happens when they are connected correctly. (J)*

The environment in CCUs was different from other hospital wards because of the presence of specialised equipment. The nurses were, therefore, expected to acquire technical knowing for them to be able to use the specialised equipment in the treatment and care of the patients.

### **Managerial knowing**

This subtheme, *managerial knowing*, reflects how knowing in CCU extended to management of the units. This dimension of knowing was dominant in the interviews with nurse leaders and anaesthetists. Ideally, registered nurses trained at degree level were the ones who were entrusted with managing the hospital wards and CCUs. However, there was shortage of these nurses at the two hospitals where data were



collected. Therefore, nurse technicians, who were in the majority, were expected to manage the units although they did not have adequate management knowledge. One of the nurse leaders said:

*They also need to have like management skills because sometimes we have shortage of resources in HDU.... They also need to have knowledge and skills on planning not necessarily of patient care, but they also need to plan on how to manage the HDU. (QE)*

Similarly, anaesthetists expected the nurses to ensure that resources were available in the units. The study hospitals are usually congested hence the high demand for resources in all departments including CCUs. The nurses were expected to find solutions and ensure resources were available in the units; as noted by one of the anaesthetists, “*when we have little resources, they need to be resourceful to address the problems, rather than just saying that we don’t have ABCD then it ends there*” (U).

However, the nurses in CCUs did not identify managerial skills as important in the care for critically ill patients and their guardians; perhaps because this was not part of the scope of practice of the nurse technicians. Unfortunately, organisational factors conspired against the nurses as they were expected to address the problems faced by the hospitals. This demonstrates that knowing in CCUs extended beyond patient care to managing the units as well.

### **Professional knowing**

*Professional knowing* refers to the need for nurses to be committed to their job, to demonstrate a good attitude towards patients and guardians, and have good relationships with colleagues in CCUs. Nurses were expected to have learned ethics and professionalism during their basic nursing education. However, at the time the data were collected, there was public outcry about unprofessional behaviour of health professionals, including nurses, in the country’s public hospitals. This might have contributed to the prominence of the theme in the findings. The nurse leaders observed that there were some nurses who did not perform some nursing activities out of negligence. Therefore, they felt it was important to constantly remind the nurses about professionalism as expressed by one of the nurse leaders, “*I think we need to keep on talking about our responsibilities, our values and professionalism*” (CB).

Similarly, anaesthetists observed that professional knowing was important for the nurses. They had observed that the attitude of some nurses towards patients, guardians and colleagues, was not good. In particular, the anaesthetists cited examples where nurses demonstrated unfriendly attitudes towards patients, guardians and even colleagues. This worsened the stress experienced by patients and guardians, and contributed to lack of teamwork among health professionals. One of the anaesthetists illustrated this as follows, *“there are also some nurses whereby the attitude is not good to the patient, even to the guardians. The way they talk to the patient as well as the guardians...there is also some attitude problem”* (KM).

On their part, the nurses observed that professional knowing was important for the purpose of teamwork among health professionals. The complaints about the behaviour of their colleagues were common throughout the nurses’ reports. For instance, some complained that some of them were embarrassed by colleagues in the presence of patients. This demonstrated lack of respect for each other as expressed by one of the nurses, *“sometimes, other people’s behaviour in the presence of patients is irritating. We just need to remind each other that we are not supposed to say bad things about colleagues in the presence of patients”* (M).

The data demonstrates that knowing in CCU was not just about theoretical, practical, technical and managerial knowing. In this study, nurses were expected to be professional to achieve a state of knowing in these units.

### **Knowing is about interpretation and taking action**

The subtheme, *knowing is about interpretation and taking action* refers to the ability to recognise changes in the patient’s condition and take appropriate action based on the assessment findings. Knowing in CCU is not just about having knowledge and skills but being able to act, especially in emergency situations where nurses were expected to resuscitate the patient. However, most of the nurses in CCUs previously worked in general wards where some investigations were rarely done due to lack of resources. As such, investigations like ABGs were reserved for critically ill patients in CCUs. Although some nurses, especially registered nurses, learnt ECG interpretation during basic nursing education, they lost the skill with time as they worked in the general wards where there were no cardiac monitors.

In particular, nurse leaders reported that nurses in CCUs need to know interpretation of vital signs, ECG, ABGs, laboratory investigations, alarms from different equipment and x-rays. The nurse leaders noted that it was important for nurses who worked in CCU to know how to interpret different parameters so that they are able to recognise abnormalities. With regard to taking actions, the nurses were expected to either notify their seniors or take action especially in emergencies like performing CPR. This was summed up by one of the nurse leaders as follows:

*We need to know because as it is being done now, we just receive the results and file them for the clinicians but if you can interpret, we can notify the clinicians earlier before it is too late. Even the interpretation of x-rays, we need to know.* (PK)

The anaesthetists also considered knowing important, but their focus was on equipment. This demonstrates that there were variations among the participants with respect to certain aspects of knowing because of lack of clarity on the scope of practice of critical care nursing for different cadres of nurses in the units. The anaesthetists noted that CCUs use specialised equipment to manage and monitor patient, therefore “*when the machine alarms the nurse should be able to identify the problem and make some necessary interventions*” (KM).

The nurses also identified interpretation of ECG and parameters of mechanical ventilation as important. Surprisingly, some of the nurses expressed the need to learn about interpretation of vital signs, one of the core skills in all the nursing education programmes in Malawi. However, it is possible the nurses were describing an understanding of the physiological changes in specific disease conditions as manifested by changes in the vital signs. In interpretive knowing, the nurses expected to be able to understand the patient’s condition and take appropriate action when necessary as reported by one of the nurse participants:

*In addition, we have to know interpretation of those waves that we see on the monitor. If the waves are not OK, we should know so that we are able to intervene or if required a doctor can be called.* (J)

The severity of illness in patients admitted to CCUs required close monitoring and different investigations to guide treatment and care. Therefore, interpretation of findings of the investigations and the ability to take appropriate action were perceived important dimensions of knowing in these units.

## Contextual knowing

The sub-theme, *contextual knowing*, reflects that knowing is related to context. In this study, the nurses who worked in CCUs had acquired some knowing while working in the units. The acquired competencies were related to amount of experience, the nature of patients that nurses were exposed to, and availability of resources in the unit. The nurse leaders observed that the nurses who had worked in the units for some time had gained basic skills on the care of critically ill patients. In other words, experience in the unit positively correlated with the perceived level of knowing. This was recounted by one of the nurse leaders, *“those nurses that have stayed at least longer in the ICU at least have some skills”* (W). However, the nurse leaders did not specify the skills gained by the experienced nurses. In addition, there were few nurses who had worked in these units for a long period because, as already described, some were transferred from one unit to another annually.

Furthermore, the nurse leaders observed that lack of resources negatively affected knowing. The lack of resources denied the nurses an opportunity to practice and perfect the required practical knowing. The demand for services at the two hospitals was high because the services were provided for free—the patients were not charged user fees. This meant that the hospitals required more resources to meet the demand for care. In addition, some of the units lacked equipment which was critical for the delivery of critical care as expressed by one of the nurse leaders:

*They have some skill but they don't have skills required in an ideal HDU because the equipment that we have is the basic equipment like the monitors...blood pressure machines and sometimes the oxygen saturation probes so they do have skills on how to use such equipment.* (Q)

Similarly, anaesthetists noted that nurses who had worked in the unit for a longer period had gained theoretical and practical knowing required for the care of critically ill patients. The knowing was gained on the job through peer teaching in units. For instance, the anaesthetists observed that some nurses demonstrated practical knowing on CPR and patient monitoring. However, the knowing was perceived inadequate, *“some nurses who have stayed for longer...they have been doing on the job training from the other nurses, those nurses they know some skills but some of the skills are still not adequate”* (KM).

On their part, the nurses appreciated that they had acquired knowing over the period they had spent in the unit. They learnt from their colleagues, doctors, consultants and expatriates. The nurses reported that they had acquired knowing on assessment of vital signs and management of some conditions. However, the knowing depended on their experience with disease conditions and skills that were common in the unit. For instance, nurses who worked in ICUs expressed confidence in performing CPR, while the nurses from HDUs expressed lack of confidence in the skill. Cardiac arrests were more common in ICU because the patients were more critically ill than those admitted to HDUs as expressed by one of the nurses from the HDU, *“the common skills are those that are basic but for CPR nooooo, it’s not common in my unit. Assessment of vital signs...that’s common but when they say give Adrenaline. (Laughs)”* (ZA).

It is evident that nurses who worked in HDUs did not acquire the same level of knowing as those in ICU because of the differences in the nature of patients and the resources in the units. Therefore, it can be concluded that the context contributed to the level of knowing in ICU and HDU.

## **5.5 Inferences drawn from qualitative findings**

The conclusions drawn from qualitative findings are summarised as follows:

- CCU nurses were unprepared to work in the units because of the lack of educational preparation in intensive and critical care nursing. None of the nurses who participated in the focus group discussions had received training in intensive and critical care nursing.
- The nurses managed unpreparedness through unstructured learning on the job. They learnt from colleagues, expatriates, and through self-directed learning.
- Participants reported that contextual and organisational factors negatively affected their practice and patient care. Examples include annual rotation of nurses, shortage of staff and material resources, among others.
- Participants identified learning needs related to theoretical knowing, practical knowing, technical knowing, managerial knowing, professional knowing and ability to interpret assessment findings and take action.

## **5.6 Chapter summary**

The qualitative strand was conducted to provide clarification of the quantitative study results in the same phase. Although the nurses had rated their competence on ICCN-CS-1 as good and excellent, the qualitative findings were similar to the nurses' scores on additional competencies that were identified by expert nurses. The qualitative findings showed that CCU nurses were unprepared to work in the units because of a lack of educational preparation and other factors within their institutions. The findings also helped to shed light on the context in which the nurses practised. While discussing their learning needs, the participants observed that contextual factors, such as lack of resources, negatively impacted the learning and practice in the CCUs. The participants noted that a nurse required different forms of knowing to effectively practice in these units. Different learning needs were identified in relation to the forms of knowing. The conclusions drawn from qualitative and quantitative findings are discussed in Chapter 7. The identified learning needs were used to develop an in-service training programme as presented in the next chapter.

## **Chapter 6 Development, Implementation, and Evaluation of the Training Programme**

### **6.1 Introduction**

The previous chapter presented findings of the quantitative and qualitative strands which assessed nurses' competence and further explored their learning needs in intensive and critical care nursing. The participants admitted that nurses in CCUs are not adequately prepared to meet the needs of the critically ill patients and their families in these units. For the purpose of this study, the identified learning needs informed the development of a training programme for the nurses which was then implemented and evaluated at the two hospitals. As previously discussed in the methodology chapter, development of the programme was guided by Caffarella's Interactive Model of Programme Planning for adult learners (Caffarella, 2002). This chapter will present details of the process that was followed to prioritise the identified learning needs, instructional plans, implementation and evaluation of the training programme.

### **6.2 Prioritisation of the learning needs**

The findings of Phase 2 showed that nurses self-rated their basic competence on ICCN-CS-1 as either good or excellent. However, the majority of the nurses self-rated their competence as poor on five additional competencies namely; ABG analysis, basic ECG interpretation, nursing care of an intubated patient, CPR, and recognition and management of electrolyte imbalance. The nurses who participated in the initial survey suggested 40 specific learning needs for inclusion in the training programme, with most of the needs relating to the knowledge domain of nursing competence. The quantitative findings were confirmed by the qualitative findings which showed that nurse leaders, anesthetists, and nurses in CCUs identified learning needs related to theoretical knowing, practical knowing, technical knowing, managerial knowing, professional knowing, interpretation of findings and taking action. The learning needs for their training were similar to those identified in the initial survey although there were differences in the terminology in some areas. However, the qualitative findings revealed 12 additional learning needs which were not mentioned in the initial survey bringing the total learning needs to 52. It is worth noting that further analysis of the qualitative data after the training showed that the nurses exhibited manifestations of moral distress, although this term was not used by the nurses. These findings suggest the need for

inclusion of moral distress in the training programme to increase nurses' awareness of, and ability to address, the causes of moral distress.

The preliminary findings were presented to the advisory team comprising local experts in intensive and critical care nursing and anesthesia at two separate meetings held at the hospitals. It was difficult to convene a meeting for all experts in one place because of the geographical location of the two hospitals which are 241 km apart. The first meeting was attended by three experts at Hospital A and two attended the second meeting at Hospital B. The aim of the meetings, which were facilitated by the principal investigator, was to identify priority learning needs from the suggested list to be included in the training programme. Members observed the amount of content to be covered during the training would be guided by the duration of the training. In order to avoid disruption of services in the units, due to a shortage of staff, members agreed that a 3-day duration would be practical with each topic being covered over 45 minutes. The suggested 3-day duration was similar to the duration of other in-service training programmes previously conducted at other hospitals (Schnittger, Downie, & Pollach, 2011). The selection of the priority learning needs to be included in the training was guided by the following criteria: relevance of the topics to the CCU context in Malawi, additional competencies where nurses self-rated their competence as poor, and topics suggested by the majority of the participants. Details and the outcome of this process is presented in Figure 7 (p. 104).



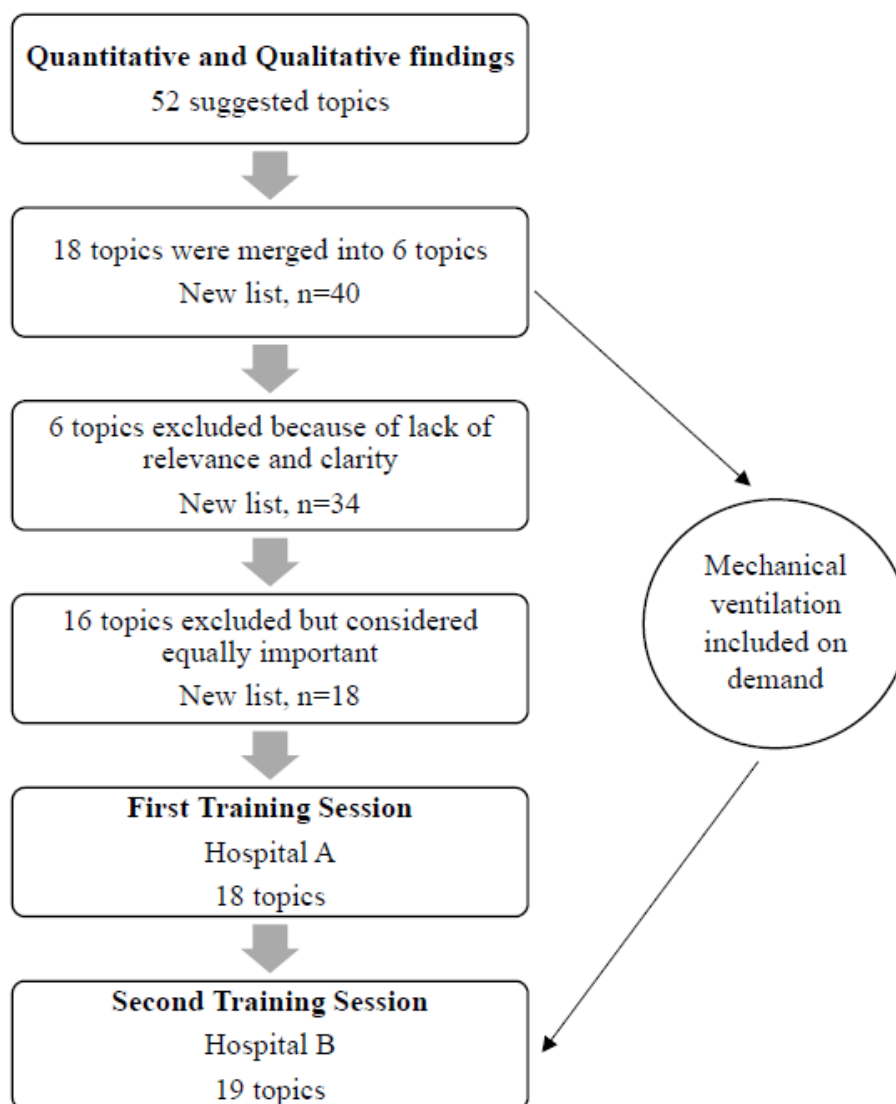


Figure 7: Prioritization of the learning needs

The first step was to scrutinise the list of identified learning needs. Members observed that some topics were either similar or related; therefore, a decision was made to combine some of the topics. As a result of this decision, 18 topics were combined into six topics as presented in Table 17 (p. 105). The members also excluded six topics which were either not relevant to the context, too broad or the suggested skill was basic and expected to be acquired during pre-service nursing education. These topics were organ transplantation law, infection prevention, healthcare legislation, up-to-date skills, healthcare legislation law, and peripheral cannulation. Members noted that there was no organ transplantation law in the country. Patients who require organ transplantation are referred to other countries. Infection prevention was excluded because there is an existing infection control programme which offers refresher activities for staff in the

hospitals (Nyaka, 2018). Healthcare legislation law was considered broad and peripheral cannulation is a basic skill that every nurse is expected to master during basic nursing training. The nurses and midwives in Malawi have a wider scope of practice which includes activities that are performed by physicians in developed countries. Some of the activities are the commencement of intravenous infusions and care of mothers with complicated pregnancies (Malata, 2013). These findings demonstrate that some of the suggested learning required further clarification from the participants.

Table 17. List of topics which were merged

<b>Suggested learning need</b>	<b>New topics</b>
Assessment of Glasgow Coma Scale	Patient assessment
Hemodynamic monitoring	
Interpretation of laboratory results	
Interpretation of assessment findings	
Pain management	Pain management and sedation
Use of sedatives	
Sepsis	Sepsis
Multiple organ failure	
Protocols for management of sepsis	
CPR	CPR
Defibrillation	
How to use perfusers, monitors, oxygen concentrators and ventilators	Technological support
Care of equipment	
Nursing care of a critically ill patient	Nursing care of a critically ill and ventilated patient
Nursing care of a ventilated patient	
Nursing care of an intubated patient	
Psychological care	
Ventilator-Associated Pneumonia	

Out of the remaining 34 topics, members identified 10 topics which were suggested by the majority of the participants. It was also noted that the additional competencies on which nurses self-rated their competence as poor in the initial survey were among the topics suggested by the majority of participants and included: ECG interpretation, CPR, ABG analysis, fluid and electrolyte balance, care of patient with endotracheal tube,

mechanical ventilation, tracheostomy care, management of drugs, meeting nutritional needs of patients and technological support in critical care. Although mechanical ventilation was among the common topics, members initially agreed that the focus during the training should be nursing care of a critically ill and ventilated patient as a combination of the following topics: nursing care of an intubated patient, prevention of ventilator-associated pneumonia, nursing care of a critically ill patient and psychological support. However, participants in the second session of the training requested a session on the basics of mechanical ventilation in the programme as discussed in the subsequent section.

Members also agreed to include common conditions and nursing activities in the units although they were not suggested by the majority of participants. These topics are head injury, sepsis, nutritional support, suctioning, tracheostomy care and family support. This decision was consistent with the findings of three separate audits in ICUs at the two hospitals where the present study was conducted, reporting common admissions were surgical patients (Gundo et al., 2014b; Prin et al., 2016; Tomlison et al., 2013). Overall ICU mortality rate in the three audits ranged from 23.6-60.9%. The highest mortality was recorded in patients with head injury (Tomlison et al., 2013) and sepsis (Gundo et al., 2014b; Prin et al., 2016). Furthermore, a study by Mula et al. (2014) on nurses' level of knowledge and practice on enteral feeding in CCUs in Malawi reported knowledge and performance gaps on the procedure which is one of the critical care interventions. Similarly, studies by Gondwe et al. (2011) on family needs in ICUs and HDUs revealed that nurses underestimated the needs of patients' guardians (Gundo et al., 2014a). The inclusion of common conditions and interventions in the training programme supports the findings of a study by DeGrande, Liu, Greene, and Stankus (2018) who reported that the ability to manage a patient in particular situations is one of the domains of professional competence of critical care nursing.

Furthermore, members considered it important for the nurses to learn about technical support with a specific focus on how to use and care for the equipment in CCU. Literature shows that the equipment which is used in these units facilitates nursing care and creates safety for the patient and staff (Tunlind et al., 2015). The lack of knowledge of the equipment increases anxiety, fear, and frustration among the nurses (Gohery & Meaney, 2013; Tunlind et al., 2015). In this study, the members noted that it is also important for the nurses and other staff to know how to care for the equipment. This is

not surprising in view of reports by the Government of the Republic of Malawi (2017a) that there is a shortage of technical staff in the country to service the equipment hence the need for health professionals to take good care of the equipment. With regard to documentation, a previously cited study by Mula et al. (2014) reported that nurses documentation in ICU and HDUs was not adequate. It was therefore important for the nurses to learn about principles of documentation.

The members further noted that 16 topics were considered relevant but could not be included because the duration was not sufficient to cover all the topics. For example, participants suggested obstetric and medical conditions (Table 18). Two of the previously cited audits by Prin et al. (2016) and Tomlison et al. (2013) reported that obstetric and medical diagnoses were associated with high mortality. The outcome of this prioritisation process resulted in the 18 topics for inclusion in the training programme (refer to the programme for the training for details of the topics). These findings indicate that more time was required for the training to cover all the learning needs which were considered relevant to nursing practice in the ICU/ HDUs.

Table 18. Topics considered important but excluded from the training

<b>Common conditions</b>	<b>Other topics</b>
Renal Failure	Colostomy care
Polytrauma	Professionalism/Nursing ethics
Stroke	Nurses' role during intubation
Diabetic Ketoacidosis	Counseling/Breaking bad news
Pre-eclampsia	Ward management
Pulmonary Oedema	Interpretation of x-rays
Severe Malaria	Patient involvement in care planning
	Insertion of the gastric tube in a critically ill adult
	Wound management

### 6.3 Designing instructional plans

The programme objective was to provide an in-service training on intensive and critical care nursing to CCU nurses. Development of course content was led by the researcher whose background is in intensive and critical care nursing. The content was developed through a review of the literature and was guided by the learning outcomes for each

topic. However, some of the learning outcomes were revised in the course of the literature review. Details of the sources of information for each topic are included in the resources for the training programme (Appendix V, p. 218). According to Harris et al. (2016), it is important that course content matches the needs and suits the culture of the context in which the programme will be implemented. In the present study, the proposed content was circulated to the advisory team and later to prospective facilitators at the two hospitals for their input. This was done to ensure that the content was context appropriate and relevant. In addition, members of the advisory team agreed with the suggested facilitation techniques which included lectures, practical experience and group discussion. These techniques are common and similar to approaches used in other training in Malawi (Barnes & Paterson-Brown, 2017; Harris et al., 2016).

After developing the content, the researcher requested the advisory team to suggest names of health professionals who could help with the facilitation of the training at each hospital. Four members of the advisory team and the researcher expressed interest to be part of the facilitation team. As previously indicated, members of the advisory team and the researcher had critical care qualification and experience. The members suggested additional members of staff to help with facilitation at each hospital. The identification of additional members was based on expertise and an interest in teaching staff in the units. The researcher contacted the proposed facilitators and they agreed to be part of the team. Ultimately, the facilitation team comprised senior nurses, one clinical officer, and anesthetists who either supervised the nurses in CCUs or worked with the nurses in these units. It was imperative to involve local facilitators to ensure the acceptability of the programme and the continuity of learning of the nurses after the training. The demographic profile of the facilitators is presented in Table 19 (p. 109). As presented in Tables 20-22 (p. 111-113), the learning outcomes guided the selection of appropriate techniques to be used.

Table 19. The demographic profile of the facilitators of the training

<b>Facility</b>	<b>Facilitator</b>	<b>Qualification</b>	<b>Critical care experience (years)</b>
Hospital A Session 1	1	MSc – Intensive and critical care nursing	4
	2	MSc – Intensive and critical care nursing	4
	3	MSc – Intensive and critical care nursing	6
	4	Diploma - Clinical Medicine	10
	5	Diploma – Anaesthesia	13
	6	Diploma – Anaesthesia Short course – Pain management	15
Hospital B Session 2	1	MSc – Intensive and critical care nursing	4
	2	MSc – Intensive and critical care nursing	6
	3	BSc – Nursing	4
	4	Diploma – Anaesthesia	10
	5	Diploma – Anaesthesia BSc - Health Service Management	16

As suggested by participants in Phase 1 of the study, a conference room for the training was identified at each hospital. There are conference rooms at each hospital which are used for meetings and training of staff at the hospital. Permission to use the rooms was sought from the management team at each hospital. The resources for the training included LCD projector, Resusci-Annie and Laerdal manikins for CPR, Ambu bags, intravenous fluids, monitors, perfusers, syringes, bandages. The resources were sourced from within the hospital with permission from management authorities and heads of department. Most departments at each hospital have an LCD projector which is used for training and meetings. Additional manikins for the first session were sourced from a nursing college where the researcher previously worked.

A week before the training at Hospital A, the researcher convened a meeting of facilitators to agree on a tentative programme for the training. The facilitators were requested to select topics of their choice and familiarise themselves with the content. The facilitators were allowed to make suggestions on the content and the approach for the training. The PowerPoint slides and tentative programme for the training were also

sent to a member of the advisory team and a facilitator at Hospital A through email one week before the second session. A similar preparatory meeting for facilitators at Hospital B was convened by the researcher three days before the training. Where possible, communication with facilitators and authorities at the two hospitals was made through phone calls and email.

#### **6.4 Implementation of the training**

A biostatistician was consulted on sample size required to power the study in view of the limited contextual research available from which to derive values for sample size calculations. Details of the process have been presented in the methodology chapter. The authorities at the two hospitals were requested to identify participants for the training. According to the Malawi context, participants for any training of nurses are selected by the nurse leaders. The selected participants were given information sheet (Appendix P, p. 201) and were requested to provide written consent (Appendix Q, p. 205). The participants (n=41) who received the training were nurses who worked in ICU and adult HDUs at the two hospitals. There were 18 nurses (44%) in the first session at Hospital A and 23 nurses (56%) in the second session at Hospital B. The participants comprised nurse-midwife technicians, 59% (n=24) and registered nurses, 41% (n=17). Majority of the nurses worked in HDU, 76% (n=31) while 24% (n=10) worked in ICUs. The mean age was 33 years (SD=9.5). The second session was conducted one week after the first session.

As per common practice during training in Malawi, the researcher formally requested for a member of the management team at each hospital to officially open and close the training. The management team at each hospital delegated a senior nurse to do the task. The involvement of the management team was important to ensure the acceptability of the training programme at the hospital. Each participant was provided with a writing pad, a pen and a copy of the programme with a list of topics and time schedule. At the beginning of each day, one participant was requested to take notes for the day's session to report back to the group the following day, which helped participants recap what had been learned the previous day. During the practice sessions, participants were divided into groups which were supervised and guided by the facilitators. Details of the programme for the training are presented in Table 20.

Table 20. Programme for Day 1 of the training

8:00 am	Registration Opening prayer		
8:30 am	Pre-training assessment		
9:15 am	Official Opening Remarks by Guest of Honour		
9:30 am	Background information Objectives of the training		
10:00 am	Tea Break		
Instructional plan			
	Content	Learning objectives The participants will be able to...	Instructional techniques
10:30 am	Nursing care of a critically ill and ventilated patient	Explain nursing management priorities to ensure patient safety and comfort	Lecture Question-and-answer
11:15 am	Patient assessment	Describe the parameters and techniques for performing a primary and secondary survey	Lecture Question-and-answer
12:00 Noon	Lunch Break		
1:00 pm	ECG interpretation (3 Lead)	Explain the steps of ECG interpretation	Lecture Question-and-answer
1:45 pm	Shock	Explain the pathophysiology and management of shock	Lecture Question-and-answer
2:30 pm	Fluid management	Explain the manifestation and management of fluid and electrolyte imbalance	Lecture Question-and-answer
3:15 pm	Tea Break		
3:30 pm	Practical session Patient Assessment ECG interpretation	Demonstrate the techniques for performing a primary and secondary survey	Demonstration Return demonstration Discussion
4:30 pm	Closing remarks		



Table 21. Programme for Day 2 of the training

8:00 am	Opening prayer and Rapporteur’s Report		
Instructional plan			
	Content	Learning objectives The participants will be able to...	Instructional techniques
8:30 am	Selected drugs used in critical care	Explain indications, mechanism of action and adverse effects of the selected drugs used in a critical care setting	Lecture Question-and-answer
9:15 am	Pain and sedation management	Explain pain and sedation management in the critically ill adult	Lecture Question-and-answer
10:00 am	Tea Break		
10:30 am	Meeting patients’ nutritional needs	Discuss nutritional requirements in the critically ill adult	Lecture Question-and-answer
11:15 am	Nursing care of a patient with chest drains	Describe the types of chest drainage system Discuss the nurse’s role in chest drainage insertion and management	Lecture Question-and-answer
12:00 Noon	Lunch Break		
1:00 pm	Documentation	Discuss the principles of and best practice on documentation	Lecture Question-and-answer
1:45 pm	CPR	Discuss the techniques required for CPR	Lecture Question-and-answer
2:30 pm	Practical Session CPR	Assess a collapsed victim Perform chest compression and rescue breathing Assist an unconscious breathing victim in the recovery position	Demonstration Return demonstration Discussion
3.00 pm	Tea Break		
3:30 pm	Practical session CPR	Assess a collapsed victim Perform chest compression and rescue breathing Assist an unconscious breathing victim in the recovery position.	Demonstration Return demonstration Discussion
4:30 pm	Closing remarks Closing prayer		

Table 22. Programme for Day 3 of the training

8:00 am	Opening prayer Rapporteur's Report		
Instructional plan			
	Content	Learning objectives The participants will be able to...	Instructional techniques
8:30 am	Suctioning and tracheostomy care	Explain the procedure for suctioning Explain tracheostomy care	Lecture Question-and-answer
9:15 am	ABG analysis	Explain the steps of ABG analysis	Lecture Question-and-answer
10:00 am	Tea Break		
10:30 am	Care of family members of patients admitted to CCU	Discuss family experience and needs during the critical illness of a family member	Lecture Question-and-answer
11:15 am	Sepsis	Explain the pathophysiology and management of sepsis	
12:00 Noon	Lunch break		
1:00 pm	Use and care of equipment	Discuss the parameters of selected equipment Discuss the nurse's role in the care of selected equipment	
1:45 pm	Head Injury		
2:30 pm	Practical Session Suctioning Use and care of equipment	Demonstrate suctioning procedure Demonstrate the use and care of equipment	Demonstration Return demonstration Discussion
3:30 pm	Tea Break		
3:45 pm	Post-training assessment Post-training evaluation		
4:30 pm	Closing remarks Closing prayer		

At the beginning of the second session, participants requested inclusion of basics of mechanical ventilation in the programme with a focus on modes of ventilation. Members of the advisory team and the facilitators considered the request as valid and

changes were made to the programme to accommodate the new topic. The researcher and the facilitators agreed to combine sepsis and shock to save 45 minutes for the new topic on the third day of the training. The researcher took the lead in preparing the content. One of the facilitators expressed interest in teaching the topic and provided feedback on the content. The content was also included in the practical session and a portable Newport ventilator was sourced from the ICU for the purpose of demonstration. It is also worth noting that the issue of nurses' attitude, one of the key findings in this study was addressed when discussing nursing care of a critically ill and ventilated patient, and the care of family members of patients admitted to the CCU.

## **6.5 Evaluation of the training programme**

Participants were requested to perform self -assessment of competence on ICCN-CS-1 and 10 additional competencies before and after the training. The ICCN-CS-1 has 144 items related to knowledge, skill, attitude and value, and experience domains. As earlier discussed, the local nursing experts (n=4) assessed the content validity of the questionnaire and identified the additional competencies not included in the questionnaire but relevant to the context in Malawi (Table 10, p. 47). The additional competencies were assessed separately on a 4-point Likert scale as follows: 1- poor competence, 2- moderate competence, 3- good competence and 4- excellent competence. In addition, participants completed the training evaluation form (Appendix R, p. 206) and qualitative data were gathered through interviews with participants (n=8) after the training. Participants were given information sheet (Appendix S, p. 207). A semi structured interview guide (Appendix T, p. 211) was used during the interviews.

### **6.5.1 Quantitative results**

SPSS version 23 was used to analyse the quantitative data. A paired-samples t-test was conducted to evaluate the impact of the training on nurses' competence. There was statistically significant increase in the competence score on ICCN-CS-1 from Time 1, pretraining ( $M = 608.2$ ,  $SD = 59.6$ ) to Time 2, posttraining ( $M = 684.7$ ,  $SD = 29.7$ ),  $t(40) = 8.8$ ,  $p < .001$  (two-tailed). The mean increase in the competence score was 76.9, 95% CI [59.3, 94.5]. The eta squared statistic (.66) indicated a large effect size.

Similarly, there was statistically significant increase in the overall score on additional competencies from Time 1, pretraining ( $M = 25.4$ ,  $SD = 6.2$ ) to Time 2, posttraining ( $M = 37.3$ ,  $SD = 2.8$ ),  $t(40) = 13.3$ ,  $p < .001$  (two-tailed). The mean increase in the

competence score was 11.9, 95% CI [10.1, 13.8]. The eta squared statistic (.81) also indicated a large effect size. See Table 23 (p. 116) for scores on specific domains of ICC-CS-1 and the additional competencies. This indicates that the training programme resulted in a large improvement in participants' competence in critical care.

The overall programme was rated very relevant by 85.4% (n=35). The majority, 97.6% (n=40) of the participants indicated that the objectives were clear and realistic and that they would be able to apply what they had learned in nursing practice.

Table 23. Summary of participants' scores on ICCN-CS-1 and additional competencies

<b>Assessment Tool</b>	<b>Time 1 Pre-training <i>M (SD), N=41</i></b>	<b>Time 2 Post-training <i>M (SD), N=41</i></b>	<b><i>p</i>-value (two-tailed)</b>
<b>ICCN-CS-1 Domain</b>			
1. Knowledge	145.5 (15.7)	170.9 (8.7)	<.001*
2. Skill	146.8 (21)	168.6 (14.2)	<.001*
3. Attitude and value	173.5 (10.9)	175.6 (6.5)	.147
4. Experience	142.5 (21.0)	170.0 (10.0)	<.001*
Total competence score on ICCN-CS-1	608.2 (59.6)	684.7 (29.7)	<.001*
<b>Additional competencies</b>			
1. Meeting nutritional needs of patients	2.9 (0.9)	3.7 (0.4)	<.001*
2. Recognition and management of electrolyte imbalance	2.7 (0.8)	3.6 (0.6)	<.001*
3. Performing Cardiopulmonary Resuscitation (CPR)	2.3 (1.0)	3.7 (0.5)	<.001*
4. Caring for a patient with endotracheal tube	2.4 (1.1)	3.8 (0.5)	<.001*
5. Caring for a patient with tracheostomy	2.7 (1.15)	3.9 (0.3)	<.001*
6. Basic interpretation of electrocardiogram (ECG)	1.6 (0.8)	3.6 (0.6)	<.001*
7. Preparation and management of emergency drugs	2.8 (0.8)	3.8 (0.5)	<.001*
8. Documentation of patient care	3.3 (0.6)	3.9 (0.3)	<.001*
9. Interpretation of arterial blood gases	1.8 (0.8)	3.5 (0.6)	<.001*
10. Implementation of discharge plan	2.9 (0.9)	3.8 (0.4)	<.001*
Total score on additional competencies	25.4 (6.2)	37.3 (2.8)	<.001*

### 6.5.2 Qualitative findings

At the end of the training, participants (n=8) granted permission for post-training interview. There were six nurse-midwife technicians, (n=6, 75%) and two registered nurses (n=2, 25%). One participant was from ICU; the remaining (n=7) worked in HDUs. Their work experience ranged from 7-48 months (*Mean* = 22.13, *SD* = 14.97).

The participants were requested to provide feedback on the training in relation to expectations, the process, challenges, and how the programme could be improved.

The training was well received. All participants reported that the training met their expectations as the topics discussed were relevant to nursing practice in CCUs. They felt empowered with the required basic theoretical knowledge and skills which would transform their attitude. The training improved their confidence in providing nursing care and the ability to teach and correct colleagues in the unit. They expected the training to improve the quality of patient care in their respective units. However, participants noted that the three days were not sufficient to cover the content and some facilitators rushed through the presentation. They also observed that some facilitators had challenges in facilitating topics although they had sufficient knowledge. The participants expressed the need for continued learning and made suggestions for future improvement of the training.

The participants admitted that they could not effectively provide care to the critically ill patients and guardians prior to the training. One participant acknowledged that the training empowered them with appropriate knowledge which would help them understand and meet the needs of critically ill patients: *“previously, we were able to manage patients but honestly, I was not knowing what exactly I was doing. After attending the training, I am now able to give rationale to every care that I provide to my patients”* (XC) and further noted the impact of the training on attitude towards patients and guardians, *“it will have an impact on my attitude because now I understand the psychological effect of critical illness on the patients and their guardians. I will be able to identify patient’s needs at a particular time”* (XC).

The participants specifically mentioned topics which they considered interesting during the training. The topics were: interpretation of 3-Lead ECG, CPR, ABG analysis, nutritional needs, family support, tracheostomy care, suctioning, care of a patient with chest drains, pain management, and management of fluid and electrolyte imbalance. In addition, five participants singled out the lecture and demonstration on technological support in CCU. The participants acknowledged that prior to the training they could not understand the readings and operations of the machines, as recounted by one of the participants:

*Apart from the CPR, I think the interpretation of the machine because we were just looking at the machines, we were just copying what's on the machine but now we are able to interpret. For example, when the reading is like this, what's the tone of the machine, now we know what that means and what we are supposed to do. (FJ)*

The participants reported that the facilitators were knowledgeable and used appropriate strategies for the training. However, six of the eight participants reported that the duration of the training was not adequate and suggested that more time is required:

*The first challenge was on time...time was not enough. The next session should be allocated more time. I noted that some facilitators run out of time and yet we still had a lot of questions to ask. So, there is a need to adjust the time. (ZC)*

One participant observed that most facilitators were knowledgeable, but few had challenges in discussing some topics:

*Yes, they did, most of them. Of course, there were some areas, we could see that there were challenges. There were some whom we could see that they were not good, maybe in certain aspects but most of them, almost 98% were good. (BT)*

Furthermore, participants expressed the need for resources which could be used for continued learning in the units. One of the participants observed that such resources as handouts and a procedure manual could be used as reference points while during practice, “*maybe on top of that you have to produce a manual, something that we can be using in our hospitals*” (VM).

Furthermore, the participants suggested the need for more CCU staff to be trained including clinicians, the inclusion of medical doctors in the facilitation team and the need for mechanisms to assess the long-term impact of the training.

## **6.6 Chapter summary**

This chapter presented the process that was followed to develop an in-service training programme which was implemented and evaluated at two hospitals. The training was facilitated by local facilitators using resources within the hospitals. There was a significant increase in the participants' scores on ICCN-CS-1 additional competencies at the end of the training. Participants' reports at the end of the training indicated that the training was well received. However, some of the learning needs considered relevant to the Malawi content were not included in the programme because the 3-days duration was not adequate. For future improvement, there is a need to increase the duration of the

training and provide resources for nurses continued learning in their units. The training programme could be adapted and used in other hospitals with similar context.



## **Chapter 7 Discussion**

### **7.1 Introduction**

The purpose of this multiphase mixed methods study was to explore the learning needs of critical care nurses which informed development, implementation, and evaluation of an in-service training programme for the nurses at two tertiary hospitals in Malawi. This was a large study which was implemented in three phases. The objective of the first phase was to explore learning needs of the nurses at two tertiary hospitals in Malawi. As mentioned in the methodology and results chapters, the ICCN-CS-1 and a list of additional areas of competence were administered to 79 nurses in CCUs to assess their basic nursing competence and elicit their learning needs in the quantitative strand. In the subsequent qualitative strand, data were gathered through two focus group discussions with registered nurses (n=6) and nurse midwife technicians (n=7) who took part in the initial survey. In addition, 10 key informant interviews were conducted with nurse leaders (n=8) and anaesthetists (n=2). In the second phase of the study, the identified learning needs guided development of a training programme, elaborated on with a review of literature and consultation with experts. In the final stage, the developed training programme was administered to CCU nurses (n=41) at the two hospitals in alignment with suggested training approaches. The training was evaluated through assessment of nursing competence of the participants before and after the training, and interviews with selected participants of the training. This chapter will discuss the findings of the different phases of the study in relation to previous research and the context as follows: nurses' competence in intensive and critical care nursing; learning needs; contextual issues; consequences of unpreparedness and contextual issues; development of training programme; implementation and evaluation of the programme.

### **7.2 Nurses' competence in intensive and critical care nursing**

With respect to the first objective of the study, quantitative data analysis revealed unexpected results with the ICCN-CS-1 questionnaire and 10 additional areas of competence. As previously discussed, in the methodology chapter, ICCN-CS-1 has 144 items which relate to knowledge base, skill base, attitude and value base, and experience base of nursing competence (Lakanmaa et al., 2013a). In the present study, the overall scores on the ICCN-CS-1 showed that all nurses self-rated their basic competence in intensive and critical nursing as good and excellent. The items with the highest score

were related to attitude and value domain which explored the nurses' perception of and desire to master, certain skills. On the other hand, items with low mean scores were related to adherence to economic efficiency and organ transplantation. Work experience was a significant predictor of competence when adjusted for site and professional qualification. There were differences in the mean scores of nurses in relation to hospital and professional qualification. However, the differences were not statistically significant at 0.05 level of significance.

Although the nurses self-rated their competence on ICCN-CS-1 as good and excellent, analysis of the nurses' responses to additional areas of competence showed that majority of the nurses rated their competence as poor on 5 of the 10 additional areas of competence. The five areas of competence were basic interpretation of ECG, interpretation of ABGs, caring for a patient with endotracheal tube, performing CPR, and recognition and management of electrolyte imbalance. The proportion of nurses with poor competence on caring for a patient with tracheostomy at Hospital B was significantly higher than the proportion of nurses with poor competence at Hospital A. In addition, the proportion of HDU nurses who rated their competence as poor was significantly higher than the proportion of nurses in ICU on two competencies namely; care of patient with tracheostomy and care of patients with endotracheal tube. While all nurses demonstrated poor competence on certain areas, the difference in the proportion of nurses with poor competence between the two hospitals and units suggests that hospital and unit influenced the level of nursing competence.

The subsequent qualitative strand provided a deeper understanding of the survey results and contextual issues that affected nursing practice in these units. Participants reported that nurses in CCUs lacked knowledge and skills on a wide range of areas related to the care of critically ill patients. This was attributed to lack of educational preparation on critical care nursing, factors related to management of the two hospitals and workforce issues. The lack of appropriate knowledge and skills on the care of critically ill patients had negative consequences on the nurses and patients. The nurses lacked confidence to work in the units and sometimes portrayed uncaring attitudes to both patients and their guardians. In addition, participants feared that patients were at risk of developing complications resulting from the nurses' lack of preparedness. However, the participants acknowledged that some nurses had acquired some knowledge and skills on the job though not sufficient for their practice in these units. The acquired knowledge and skills

were related to amount of experience of the nurse, the nature of patients, and availability of resources in the unit. Nurses who had worked in the units for some time had gained basic knowledge and skills on the care of critically ill patients because of continued exposure.

The quantitative and qualitative findings demonstrated that nurses in CCUs had basic competence but evidently lacked some critical knowledge and skills required for the care of critically ill patients at the two hospitals. This finding is consistent with that of (Lakanmaa et al., 2015) who reported that most participants self-rated their competence on ICCN-CS-1 as good and excellent. However, in the present study, nurses' responses to additional areas of competence and their accounts during interviews were in contrast to the results from the ICCN-CS-1. As earlier mentioned, in the methodology chapter, the additional areas of competence were identified by a team of Malawian experts who assessed the content validity of the ICCN-CS-1. The experts considered nurses' competence on the identified additional areas of competence as critical in CCU in Malawi. A possible explanation of these results is that the ICCN-CS-1 was developed and previously used in a context that is different from the context of the present study. The tool was developed through literature review and Delphi study, then pilot tested on a small sample of graduating nursing students and intensive care nurses in a developed country (Lakanmaa et al., 2013a). On the other hand, the present study was conducted in a developing country in Africa with a high burden of illness and shortage of well-trained staff and resources in the CCUs. Prior studies have noted that nurses are pillars of critical care in developing countries such that they assume extended roles in the absence of well trained professionals like physicians (Carter & Snell, 2016; Jochberger et al., 2010). For example, nurses intubate patients because of lack of trained anaesthetists in some critical care units in Zambia, a developing African country (Carter & Snell, 2016). Similarly, nurses and midwives in Malawi have a wider scope of practice, sometimes undertaking activities that are performed by physicians in developed countries, such as commencement of intravenous infusions and care of mothers with complicated pregnancies (Malata, 2013). The inconsistency of the findings from ICCN-CS-1 questionnaire and additional areas of competence confirms the observation by Garside and Nhemachena (2013) that competence in nursing is elusive and should be interpreted in relation to context and time. Most studies that explored the concept of competence in critical care nursing were conducted in developed countries (Aari et al., 2008; Lakanmaa et al., 2012). It can, therefore, be

assumed that the extended parameters of nursing professional practice in developing countries are not incorporated in the dimensions of the international tools that are used to assess nursing competence. Further research could explore the concept of competence in developing countries like Malawi to guide development of competence assessment tool appropriate for such countries.

It is interesting to note that out of the four main domains of the ICCN-CS-1, the attitude and value domain had the highest score. The domain comprised 36 items which assessed the nurses' perception of the importance of specific skills in managing critically ill patients and their desire to master different skills. The high score in this domain suggests that the nurses appreciated the importance of certain skills and expressed the desire to master certain skills. A possible explanation for this result is that none of the nurses who completed the questionnaire had undergone any critical care nursing course. Therefore, the nurses had gaps in their competence; although the overall score on the questionnaire demonstrated good or excellent competence. The findings of the present study corroborate results of earlier studies which reported that CCU nurses in Malawi lack knowledge and skills in certain aspects of intensive and critical care nursing practice (Gondwe et al., 2011; Gundo et al., 2014a; Mula et al., 2014). As an illustration, the study by Mula et al. (2014) assessed nurses' level of knowledge and practice on enteral feeding in CCUs at one of the tertiary hospitals where the present study was conducted. Similar to the present study, there were few registered nurses trained at degree level in the sample. The majority of the participants were nurses with nursing diploma and certificate qualification. The authors observed that while majority of participants demonstrated knowledge in some aspects of enteral feeding, an equal majority lacked knowledge in other aspects. The majority demonstrated poor practice in checking gastric residual volume, daily inspection of nostrils and documentation. Furthermore, the study reported that nurses do not use evidence-based information, which can be accessed from unit guidelines, journals and in-service education. The other studies by Gondwe et al. (2011) and (Gundo et al., 2014a) assessed nurses' perception of family needs and the challenges encountered by nurses in meeting patients' guardians' needs in ICU respectively. Nurse midwife technicians accounted for the majority in both studies and the authors concluded that nurses underestimated the needs of patients' family members.

On the other hand, items with low mean scores on the ICCN-CS-1 were related to adherence to economic efficiency and organ transplantation. The low score on economic efficiency may be explained by the fact that the nurses who completed the questionnaire were bedside nurses who are not involved in the management of finances at the two hospitals. It is also not surprising that the scores on organ transplantation were low. Organ transplantation is defined as a surgical intervention which is performed to replace a diseased organ in the body with a new one (Kumar & Mattoo, 2015). As earlier mentioned, the experts who assessed the content validity of the ICCN-CS-1 observed that the items related to organ transplantation were not relevant because the procedure is not performed in Malawi. Unfortunately, permission sought from the copyright author did not allow exclusion of items or alteration of the instrument. In the sub-Saharan Africa, it is only in South Africa where organ transplantation is performed. There are numerous challenges that limit the diffusion of organ transplantation to other African countries, which include lack of expertise, the cost of the transplant procedure and long-term immunosuppression, and the absence of a legal framework on organ transplantation (Muller, White, & Delmonico, 2014). These findings raise concerns regarding the care of patients who return to Malawi after organ transplantation in other countries.

Although some studies have been conducted on nurses' practice on specific nursing interventions, no single study exists which assessed nurses' competence on the additional areas of competence which were identified by experts in the present study. There are, however, possible explanations for the poor competence on the five additional areas of competence. In the absence of a critical care nursing course in Malawi, as discussed in the review of literature, it can be assumed that basic interpretation of ECG, interpretation of ABGs and care of a patient with endotracheal tube are either not included in the curriculum for basic nursing education or they are not sufficiently discussed during the training. In addition, the majority of participants were drawn from HDUs where ABG analysis and invasive procedures like intubation are rarely done because of shortage of resources and lack of expertise. However, the poor competence on CPR and management of electrolyte balance raises intriguing questions because these areas are included in the curriculum for basic nursing education. This result may be explained by the fact that there is no mandatory retesting of nurse competence Malawi. The requirement for annual renewal of registration with Nurses and Midwives Council of Malawi is that a nurse should earn 30 points on CPD (Nurses

and Midwives Council of Malawi, n.d.). However, the topics for the CPD sessions are left at the discretion of the CPD coordinator. In addition, participants in the present study observed that there is discrepancy between what nurses learn during undergraduate training and the actual nursing practice in CCUs. Furthermore, there is no policy for mandatory first aid training which includes CPR regardless of the profession as is the case in some developed countries.

Contrary to expectations, the present study found a significant difference between the two hospitals in the proportion of nurses with poor competence in caring for a patient with tracheostomy. As earlier mentioned, the two hospitals where the study was conducted are tertiary hospitals which offer specialised care and serve as teaching hospitals for medical doctors, nurses, clinical officers, anaesthetic clinical officers and other cadres. At the time of data collection, each of the two hospitals had one general ICU. The ICUs were attached to main operating theatres and away from other wards. According to earlier research carried out in ICUs at the two hospitals in 2010, 2012 and 2013-2014, the profile of patients in the units was similar. Majority of the admissions were surgical patients, accounting for 33.6-81% of total admissions (Gundo et al., 2014b; Prin et al., 2016; Tomlison et al., 2013). Surgical cases were easily admitted to ICUs because of the unit's proximity to the main operating theatres, while medical or obstetric cases waited for triaging and availability of space in the unit (Prin et al., 2016). Therefore, it is difficult to explain the significant difference in the proportion of nurses with poor competence on caring for a patient with tracheostomy. However, it is important to bear in mind the possible bias because most of the participants were drawn from one hospital. Furthermore, the proportion of HDU nurses who rated their competence in tracheostomy and endotracheal care as poor was significantly higher than the proportion of nurses in ICU. This difference can be explained in part by the difference in the level of care rendered in the units. For example, invasive procedures and interventions like mechanical ventilation are only performed in ICUs. Further research should be undertaken to investigate the factors contributing to the differences in the level of nurses' competence.

In the present study, participants attributed the lack of appropriate knowledge and skills among the nurses to lack of educational preparation in critical care nursing. There is paucity of published literature on critical care practice in most developing countries (Murthy et al., 2015). However, the limited literature indicates that there is no formal

critical care nursing programme in some developing countries like Cameroon and Malawi (Barnes & Paterson-Brown, 2017; Ntogwiachu et al., 2014). This is in contrast to high-income countries where post-registration critical care nursing programmes exist (Labeau et al., 2012). Consequently, majority of the nurses working in critical care settings in Malawi rely on basic nursing education to care for critically ill patients (Mula et al., 2014). However, literature indicates that undergraduate training in nursing does not equip nurses with the required knowledge and skills for critical care practice because CCUs are specialised units (Labeau et al., 2012; Skees, 2010). At the time of data collection, there were less than 10 nurses who had been formally trained in critical care nursing outside the country. Unfortunately, some of these nurses had joined training institutions while others held management positions at the two hospitals. It was learned that students for Bachelor of Science and only two of the Diploma programmes are allocated to CCUs for a 2-3-week orientation in their third or final year of study (W. Mwafulirwa, personal communication, June 30, 2016). This period is not enough for them to master the knowledge, skills and attributes required for practice in critical care settings. Consistent with literature, none of the nurses who completed the questionnaires had attended any critical care nursing course. This result means that qualified nurses who work in CCUs have very little or no knowledge at all about critical care nursing at the time of their allocation to the unit.

One interesting finding is that there was no significant difference in the competence scores between registered nurses and nurse midwife technicians. There are no previous studies to support this finding. However, nurse leaders in the present study observed that majority of nurses in CCUs were nurse midwife technicians and were considered not well trained for practice in critical care settings. Similar to previous studies in CCUs (Gundo et al., 2014a; Mula et al., 2014), the majority of participants in the present study were nurse midwife technicians. This is in contrast to developed countries, like Australia, where majority of nurses who work in these units are registered nurses trained at degree level (Hegney et al., 2010). In addition, workforce standards in Australia and New Zealand recommend that at least 50%, preferably 75%, of nurses working in ICU should hold post-registration qualification (Gill et al., 2012). The proportion of the different cadres of nurses in the present study and previously cited studies in Malawi reflects the proportion of nurses in most health facilities in the country. Initially, nurse midwife technicians were trained at certificate level for 3-years and, upon qualifying, worked under the supervision of nurses with Diploma or Degree

qualifications. However, the certificate programme was phased out and the nurses who had the certificate qualification were upgraded to diploma level (Jacob, Holan, Msolomba, Wasili, Langdon, Levine, Mondywa, Bateganya, et al., 2015). As mentioned in the literature review, nurse midwife technicians are the largest nursing cadre in Malawi (Holman, 2012). After a 3-year Diploma training, nurse midwife technicians are expected to provide general patient care and conduct uncomplicated deliveries in areas where senior nurses and midwives are limited in numbers (Government of the Republic of Malawi, 2011b). However, in most instances, nurse midwife technicians work outside their scope of practice because of a shortage of registered nurses. The nurse midwife technicians perform duties which are supposed to be done by registered nurses, a process called task shifting (Holman, 2012; Jacob, Holan, Msolomba, Wasili, Langdon, Levine, Mondywa, Batenganya, et al., 2015). This could be the reason why differences in the competence scores on ICCN-CS-1 between registered nurses and nurse midwife technicians were not statistically significant. It is also possible that the small number of registered nurses was not enough to detect statistical significance in the difference between the scores. In the present study, participants identified several learning needs, which informed development of the training programme as discussed in the subsequent sections.

### **7.3 Learning needs**

In the quantitative strand of the study, participants suggested a wide range of topics considered necessary for effective nursing practice in CCUs. The topics that were identified by majority of the nurses included interpretation of ECG, CPR, interpretation of ABGs, fluid and electrolyte balance, care of a patient with endotracheal tube, management of drugs that are used in critical care setting, mechanical ventilation, tracheostomy care, meeting nutritional needs of patients, technological support in critical care and pain management. In addition, the participants identified lectures, practical experience and group discussion as their preferred strategies of learning.

In the follow up qualitative strand, participants observed that nurses in CCUs are required to possess theoretical, practical, professional knowing and then to be able to interpret and take action. Theoretical knowing comprised knowledge on disease conditions which were common in ICUs and different HDUs, fluid calculation and monitoring, and management issues. CPR, suctioning, patient assessment and how to use equipment constituted practical knowing. The participants also identified ethics and



professionalism as another important dimension. In addition, the need to learn how to recognise changes in the patient's condition and take appropriate action based on the assessment findings was considered important. In particular, participants identified interpretation of vital signs, ECG, ABGs, laboratory investigations and alarms from different equipment as critical. Similar to the quantitative strand, participants suggested a blend of lectures and practical sessions as strategies that suit their learning needs.

The quantitative and qualitative findings showed that most of the suggested learning needs were related to knowledge and practical skills, including those that help to save lives in times of emergency. Similar to these findings, Labeau et al. (2012) recommended that ICU nurses should be adequately prepared both theoretically and practically to cope with challenges of critical illness in an environment that is fast evolving in terms of science and technology. In addition, a review of literature (Liaw, Scherpbier, Yobas, & Rethans, 2011) identified the need for the nurses to acquire appropriate knowledge and skills on how to recognise changes in patients' condition, report to seniors for appropriate course of action, and implement life-saving interventions while waiting for help. The review focused on literature which was published over a period of 10 years (2000-2010) in relation to educational strategies to improve nurses' roles in recognising and responding to deteriorating patients. The training of nurses in recognising deterioration in patients' condition, reporting, and responding appropriately was recommended in a separate literature review on critical care resources in resource-poor settings by Riviello et al. (2011). It is also interesting to note that most of the identified learning needs in the present study relate to patient care. This finding is in agreement with Abbey, Chaboyer, and Michell (2012) findings which reported that the major activity for nurses in ICU relate to direct and indirect care.

Furthermore, the findings of the present study are consistent with patterns of knowing which ground the doing of a person in nursing (Chinn & Kramer, 2018). According to Carper's pattern of knowing, there are four patterns namely; empirical, aesthetic, personal, ethical and socio-political knowing. The theoretical, practical and taking action domains, as identified in the present study, relate to Carper's empirical pattern of knowing. Empirical knowing is grounded in science and may be used to describe, explain, and predict a phenomenon in nursing (Chinn & Kramer, 2018). The participants in this study reported that they acquired knowledge and skills informally through observing and learning from colleagues. Although they had learnt some basics,

the participants felt the acquired knowledge and skills were inadequate and, in some cases, not correct. Therefore, they expressed desire to learn the ‘what’, ‘why’ and ‘how’ from experts in the critical care nursing. This would build sound analytical skills, which are required for appropriate care of the critically ill patients in a complex environment. The specific learning needs identified in the present study are also consistent with findings of similar studies which were conducted in Sri Lanka and Kenya (MacLeod et al., 2011; Pubudu et al., 2015). In the study by Pubudu et al. (2015), the assessment of learning needs showed that participants preferred practical skills to theoretical knowledge. The sample included 117 nurses from ICU who suggested different topics as follows: identifying critical conditions/situations, leadership skills, nursing roles during intubation, nursing care of ventilated patients, ventilator manipulation, understanding complications of the respiratory system, ABG analysis, acid-base balance, ECG interpretation, recognising and managing shock and infection control practices. The need for theoretical knowledge and practical skills was also identified by MacLeod et al. (2011) but the sample included doctors, clinical officers, and nurses in ICUs.

Additionally, participants in the present study identified ethics and professionalism as a learning need. This theme was infused with stories about ethical dilemmas and unfriendly attitudes of the nurses. Participants shared stories about ethical dilemmas in allocating limited resources to equally deserving patients. These findings support a previous study by Manda-Taylor, Mndolo, and Baker (2017) which reported that beneficence and justice are the primary ethical considerations in the provision of critical care in Malawi. The problem of resources in a low-resource setting like Malawi creates extreme healthcare rationing which may cause ethical, practical, and emotional challenges to the healthcare provider. This confirms the need for nurses to develop sound ethical knowing which refers to making judgement about what is right or wrong and taking appropriate action (Chinn & Kramer, 2018). On the other hand, learning needs regarding professionalism were related to therapeutic use of the self in the provision of care to patients and their family members. The World Federation of Critical Care Nurses (2007) stated that the aim of critical care nursing is to build a therapeutic relationship with patients and their relatives, and to implement interventions that empower the individual’s physical, psychological, sociological, and spiritual capabilities. Interestingly, the need for professional behaviour was emphasised by nurse leaders and anaesthetists, while nurses considered their attitude and professional

behaviour as good. This finding is not surprising because of the public image of the nursing profession in Malawi. At the time of data collection, there was public outcry about the uncaring attitude of nurses in public hospitals in Malawi. These issues on professionalism relate to Carper's aesthetic and personal pattern of knowing. Aesthetic knowing allows the nurse to interpret the patient's experience and connect with human experience which is unique to each person while envisioning the desired outcomes. Personal knowing is about knowing one's own self. It involves the perception and management of the self's feelings, prejudices and anxiety (Chinn & Kramer, 2018). Although there was a discrepancy between nurses, nurse leaders and anaesthetists on professionalism, it is important for the nurses to discuss professional issues which relate to their practice.

Participants suggested a blend of strategies comprising lectures, group discussion and practical sessions for their in-service training. The suggested strategies have been reported as ideal in a prior study that implemented a training programme in Malawi (Schnittger et al., 2011) and other studies in developing countries (MacLeod et al., 2011; Pubudu et al., 2015). The suggested strategies are consistent with Polanyi's theory of knowledge which proposed that the art of knowing involves explicit and tacit knowledge. Explicit knowledge constitutes formal knowledge which can be acquired through lectures and discussion. Tacit knowledge is gained through experience to acquire skill (Halter, 2001). Similarly, Liaw et al. (2011) observed that experiential learning is important but requires a lot of resources. Related literature shows that other modes of continuing education or continuing professional development in developing countries include on-the-job training, workshops, seminars, spontaneous interactions with colleagues, clinical hand-over meetings and professional reading (Giri et al., 2012; Muula et al., 2004). Interestingly, the study by Muula et al. (2004) observed that although workshops and seminars were the most common modes of training for health professionals in Malawi, attendance to such meetings is influenced by the provision of allowances to participants. The culture of course participants expecting to receive financial payment for attendance and meals at lunchtime was also identified as a barrier in the evaluation of burns education training programmes for doctors, nurses and physiotherapists in Malawi (Harris et al., 2016). This is in contrast to middle or high-income countries where participants are expected to pay for such courses (Chong et al., 2011; Ni et al., 2014). In view of economic challenges in most developing countries,

like Malawi, there is need to identify cost effective CPD strategies which are tailored to the context.

#### **7.4 Contextual issues**

The qualitative findings helped to explain the quantitative results; and findings provided a deeper understanding of the context in which the study was conducted. While discussing competencies and learning needs, participants raised numerous issues which need to be considered when designing programmes for upskilling of the nurses. Participants acknowledged that ICUs and HDUs are specialised units which were expected to provide high level of care to critically ill patients. However, the expected level of care could not be achieved because of shortage of nurses and lack of material resources. The findings support prior reports on staffing levels in the country's hospitals. Malawi is one of the developing countries experiencing critical shortage of health professionals. The vacancy rate for all health workers is reported to be 45%. The vacancy rate of nursing officers and nurse midwife technicians is 66% and 60% respectively. The shortage is attributed to inadequate intakes in training institutions due to diminishing government for preservice training (Government of the Republic of Malawi, 2017a); international migration and in-country migration between public and private health sectors in search for better pay, between urban and rural areas and between tertiary and primary health care delivery (Government of the Republic of Malawi, 2011b; Manafa et al., 2009). In addition, different studies reported lack of motivation among health workers due to low salaries, lack of job description for some cadres, lack of promotions and opportunities for career progression, unfair treatment by managers, lack of resources and lack of team work among staff (Bradley & McAuliffe, 2009; Manafa et al., 2009). The shortage of staff leads to high workload, especially for nurses who are at the frontline of health service delivery. At the time of data collection, the average nurse-patient ratio was not consistent, ranging from 1:2 and 1:4 (W. Mwafulirwa, June 30, 2016). Another important finding in this study is that work experience in a specific unit was critical for the acquisition of nursing competence in CCUs. The nurses who had worked in a particular unit for extended time had gained knowledge and skills required for the care of critically ill patients and their family members. This finding is consistent with Benner's taxonomy of nursing competence which states that nurses achieve competence through progressive experience (Benner et al., 2009). Surprisingly, the two hospitals have a policy on annual rotation of nurses from one department to another every year. Participants observed that the practice leads

to loss of nurses who had gained experience in these units. This finding was also reported by (Harris et al., 2016) who observed that competency gaps are aggravated by annual rotation of nurses. The present study adds voice to the calls for authorities to revisit the annual rotation system and identify other strategies for retaining nurses in these units to ensure optimal care provision.

Apart from the shortage of staff, participants reported a lack of material resources in CCUs. This finding is consistent with several studies which reported that provision of critical care in developing countries is compromised by numerous challenges including lack of prehospital care, delayed access to critical care because of long distances, inadequate infrastructure for critical care and lack of material resources (Carter & Snell, 2016; Ntogwiachu et al., 2014; Stafford et al., 2014). Furthermore, Carter and Snell (2016) reported inappropriate use of antibiotics which leads to antimicrobial resistance. Ironically, there is high burden of diseases, which culminate in critical illness and require critical care in developing countries (Murthy et al., 2015). The explanation for the reports about lack of resources in the present study is inadequate health financing. Although Malawi is a signatory to The Abuja Declaration which calls on African Governments to increase their budgetary allocation to health to at least 15% of the national budget, health financing is always unstable and below the stipulated 15% (Government of the Republic of Malawi, 2011a). For instance, the allocation to the health sector increased from 11.1% in 2005 to 13.6% in 2008/9 and later decreased to 12.4% in 2009/10 (Government of the Republic of Malawi, 2011a). The budget plummeted to 8.8% in the 2014/2015 budget because of the plunder of public resources commonly referred to as ‘cashgate’ which was prevalent in the Government department. Currently, there is increased dependency on donors who provide over 65% of the total health expenditure. The major donors (development partners) include World Bank, the African Development Bank, German, Norway, USAID, UNICEF, DFID, and UNFPA among others (Manda-Taylor et al., 2017; United States Agency for International Development, n.d; Zere et al., 2010). The shortage of resources in health facilities is a major challenge (Government of the Republic of Malawi, 2011a; Wild & Cammack, 2013) and has been reported as having an impact on the delivery of care in the country’s CCUs (Gundo et al., 2014b; Henry et al., 2014; Mula et al., 2014).

## **7.5 Consequences of unpreparedness and contextual resources**

In the present study, participants expressed frustration, fear, and lack of confidence as consequences of lack of proper educational preparation, shortage of resources in the units and organisational factors. This finding is similar to several studies which reported that nurses experience emotional turmoil because of the challenges in critical care (Cishahayo, Nankundwa, Sego, & Bhengu, 2017; Klopper, Coetzee, Pretorius, & Bester, 2012). As previously indicated, the shortage of staff in Malawi affects all hospital departments including critical care settings. A study by Bradley et al. (2015) on the impact of shortage of staff on obstetric care providers and quality of care in Malawi reported that the available staff considered leaving their post because of high workload. In addition, the participants experienced stress and frustration, and were unable to rest. In a review of the available literature, the concerns expressed by the nurses in the present study are manifestations of moral distress although the term was not used in any of the nurses' reports. The failure by participants in the present study to identify moral distress is not surprising because an earlier study (Maluwa, Andre, Ndebele, & Chilemba, 2012) reported that nurses in Malawi experience moral distress but some of the nurses do not understand what constitutes moral distress. Moral distress is defined as a feeling experienced in situations in which one is unable to implement the ethically appropriate actions (Choe, Kang, & Park, 2015; Hamric, Borchers, & Epstein, 2012). According to Hamric et al. (2012) moral distress is caused by internal and external constraints that prevent one from taking actions that one perceives to be morally right. The internal factors include lack of assertiveness, self-doubt, socialisation to follow orders, perceived powerlessness and lack of understanding of the full situation. The external factors are inadequate staffing, hierarchies within the healthcare system, lack of collegial relationships, lack of administrative support, policies, and priorities that conflict with care needs, compromised care due to pressure to reduce costs, and fear of litigation.

Previous studies suggest that moral distress is high in direct care providers, female nurses, and health professionals in ICU (O'Connell, 2015; Whitehead, Herbertson, Hamric, Epstein, & Fisher, 2015). Moral distress is high in critical care settings due to the complexity of technology and because sudden changes in a patient's condition require nurses to react quickly and make rapid decisions, which may conflict with other health professionals' perspectives (Hamric et al., 2012). The factors that contribute to moral distress in ICU include futile care which occurs in situations where health care

providers fail to withdraw support from a patient who is hopelessly ill (Whitehead et al., 2015; Wiegand & Funk, 2012; Wilson, Goettemoeller, Bevan, & McCord, 2013), organ donation, over and under administration of analgesic medications and other end of life issues (Wiegand & Funk, 2012). In addition, assisting a physician who performs a test or treatment without informed consent and assisting a physician who is incompetent are other causes of moral distress among nurses (Wilson et al., 2013). The majority of participants in the present study were female nurses who are involved in direct patient care in CCUs. Like most ICUs in sub-Saharan African countries, the ICUs and HDUs are manned by either nurses or anaesthesiologists who are not necessarily graduated physicians but just specially trained nurses and medical assistants (Carter & Snell, 2016; Jochberger et al., 2010).

There is limited literature on moral distress and its causes in Malawi. The previously cited study by Maluwa et al. (2012) reported that the causes of stress in Malawi include: shortage of staff; situations in which they violate regulations in order to protect the patients (e.g. when junior doctors prescribed wrong medication); being forced to accept disrespect in situations where the nurses felt ill-treated by patients, colleagues and supervisors; lack of resources, unprofessional behaviour of colleagues; and mismanagement by superiors evidenced by favouritism, fault finding and lack of appreciation when nurses do something good. Participants were registered nurses, enrolled nurses and nurse technicians from different health care settings which were not specified in the report. Similarly, findings of the present study showed that shortage of staff, lack of resources and unprofessional colleagues were dominant in the participants' reports. However, the present study focussed on nurses, nurse leaders, and anaesthetists from CCUs.

According to Wiegand and Funk (2012), the consequences of situations that cause moral distress affect patients, family members, future patients, and nurses. The negative effect on patients includes suffering, prolonged dying, undignified dying, quantity versus quality of life, inappropriate care, delayed treatment, prolonged hospitalisation, disrespect, inability to be with family and false hope. The consequences to family members were suffering, not being prepared, being overwhelmed, grief, guilt, financial burden, fatigue, stress, anger, being unable to spend time at the patient's bedside and organ donation. On the other hand, nurses experienced decreased job satisfaction and increased turnover, withdraw from patients, physical and psychological symptoms and

intent to leave the current position or the profession (O'Connell, 2015; Wiegand & Funk, 2012; Wilson et al., 2013). The physical and psychological symptoms of moral distress include lack of sleep, physical pain (headache), lack of appetite, sadness, irritation, powerlessness, an inability to fix a wrong, frustration, and anger (Hamric et al., 2012; Maluwa et al., 2012). Furthermore, Hamric et al. (2012) observed that these feelings are not completely eliminated at the end of a distressing situation. Rather, they remain as moral residue which acts as base line for subsequent moral distress. With continuous exposure to the causes of moral distress the moral residue increases steadily and invokes stronger feelings.

The findings of the present study emphasise the need for strategies by nurses and other health professionals to identify moral distress, manage, and minimise the consequences of moral distress in CCUs. Previous studies have suggested educational activities on moral distress and ethics (Hamric et al., 2012; O'Connell, 2015), ethics committee and debriefing (Wiegand & Funk, 2012; Wilson et al., 2013), addressing root causes of moral distress, developing policies for ethics consultation, family support, being assertive, and strategies that would enhance team work (Hamric et al., 2012; Wiegand & Funk, 2012). In addition, there is need for nurses in Malawi to acquire emancipatory knowing. According to Chinn and Kramer (2018), emancipatory knowing involves reflecting on the challenges, identifying contributing factors and taking action to create equitable and just conditions for all humans. Nurses need to be empowered so that they are able to analyse complex situations and take appropriate action. According to Metheson and Bobay (2007), information and education are some of the important tools for empowerment to overcome oppression. This could be achieved through development of critical care training programmes for the nurses and formation of a critical care nursing association. The association would give the nurses an opportunity to share best practice and discuss ideas for improvement of critical care nursing in the country.

Furthermore, the challenges in Malawi demand that CCU nurses gain appropriate competencies to optimise their role in such resource poor settings. Despite disparities in critical care resources between low and high-income countries, the expectation is that the quality of critical care services should be the same because access to critical care is a basic human right for all people (Lumb, 2013). In this study, findings of the first phase of the study uncovered nurses' learning needs and the context of critical care nursing



practice in Malawi. This was important because a previous study by Harris et al. (2016), on capacity building for health professionals in Malawi, suggested that training programmes should be tailored to the need and culture in which the programme will be implemented. The identified learning needs informed development of an in-service training programme for the nurses which was implemented and evaluated at the two hospitals, as discussed in the subsequent section.

## **7.6 Development of the training programme**

For the purpose of this study, Caffarella's Interactive Model of Programme Planning for adult learners was used. Although there is no evidence of its use in an African context, the model was used in other studies to develop in-service training programmes in nursing and other health related areas (Cavanaugh & Huse, 2004). The model was chosen because it is flexible and encourages programme planners to use components that are relevant to meet the needs of the people and the context. Furthermore, the model acknowledges that programme planning is a negotiated activity between and among educators, learners and other stakeholders who contribute their own beliefs to the planning process (Caffarella, 2002). Given that there are no intensive and critical care nursing programmes in Malawi, it was necessary to seek input from the recipients of the training, nurse leaders, anaesthetists and nurse experts in the field. A training programme for CCU nurses was developed in consultation with an advisory team comprising four Malawian nurse experts in intensive and critical care nursing and four anaesthetists. In keeping with the Interactive Model of Programme Planning, the subsequent phases of the development process involved prioritising learning needs, developing programme objectives, designing instructional plans, devising transfer-of-learning plans, formulating evaluation plans and coordinating facilities and on-site events (Caffarella, 2002).

At the end of the needs assessment stage, the participants had suggested several topics related to intensive and critical care nursing practice. The findings were presented to the advisory team and the members were requested to identify and prioritise learning needs. The importance of understanding the context in developing training programmes was emphasised in a previous study which evaluated barriers and facilitators faced by staff involved in burns education training programmes in Malawi (Harris et al., 2016). In the current study, the advisory team identified priority areas to be covered in three days. The number of days was based on previous studies (Schnittger et al., 2011) and was

considered appropriate to avoid disruption of nursing care in the units. Members of the advisory team agreed on the following topics: nursing care of a critically ill patient, patient assessment, basic ECG interpretation (3-Lead), shock, fluid management, selected drugs used in critical care, pain and sedation management, meeting patients nutritional needs, care of a patient with chest drains, documentation, CPR, suctioning and tracheostomy care, interpretation of ABGs, care of family members of patients, sepsis, use and care of equipment and head injury. Most of these topics were also considered important in similar trainings conducted in other developing countries (MacLeod et al., 2011; Pubudu et al., 2015; Stephens et al., 2017). Therefore, the findings of this study extend and reinforce knowledge on the areas to be considered for the training of nurses in developing countries.

According to the Interactive Model of Programme Planning, designing instructional plans involves developing learning objectives for each topic, organising the content, choice of instructional techniques, instructional resources and selecting competent instructors (Caffarella, 2002). The overall objective of the programme was to equip the nurses with appropriate knowledge and skills for practice in CCUs. The aim of critical care nursing is to build a therapeutic relationship with patients and their relatives and to implement interventions that empower the individual's physical, psychological, sociological, and spiritual capabilities (World Federation of Critical Care Nurses, 2007). The delivery of nursing care in critical care settings is complicated by the need to manage equipment, which is used to treat, support and monitor vital signs (Tunlind et al., 2015). This demands that nurses are competent in their skills as they make complex decisions that impact on patients' lives (Skees, 2010). Development of course content was led by the author whose background is intensive and critical care nursing. The content was generated from a review of the literature and existing frameworks such as Oh's framework for critical care nurses education (Bersten & Soni, 2014). The proposed content was then presented to the advisory team for input from the members. The team suggested that local facilitators should be identified within the hospitals and be given an opportunity to contribute to the content of the programme. The identified facilitators comprised nurse experts in intensive care nursing, a clinical officer and anaesthetists who worked with the nurses in ICUs/HDUs. This finding echoes recommendations from previous studies which reported that involvement of local facilitators would help to minimise challenges, and ensure acceptability and sustainability of the programmes (Barnes & Paterson-Brown, 2017; Harris et al., 2016).

The plan for evaluation of the training programme was based on Kirkpatrick's four levels of evaluating training programmes. According to the model, Level 1 assesses the degree of participants' favourable reaction to the learning event. Level 2 assesses the degree of participants' acquisition of the intended knowledge, skills and attitude based on their participation in the learning event. Level 3 assesses the degree of participants' application of what they learned during training when they are back on the job. Level 4 assesses the degree to which targeted outcomes occur as a result of the learning event(s) and subsequent reinforcement (Kirkpatrick & Kirkpatrick, 2015). In this study, evaluation of the programme focussed on Levels 1 and 2 because they measured the outcomes of the research. The participants' reactions were assessed through a programme evaluation questionnaire and in-depth individual interviews after the training. The acquisition of the intended knowledge, skills and attitude in Level 2 was assessed by comparing competence scores on ICCN-CS-1 (Q1) and additional areas of competence (Q3) before and after the training. Levels 3 and 4 of Kirkpatrick's hierarchy were beyond the scope of this study.

## **7.7 Implementation and evaluation of the programme**

The programme was implemented at the two hospitals, A and B. A total of 41 nurses (n=41) who work in CCUs were invited to take part in the training. Nurse leaders at the two hospitals were requested to identify participants for the training, and an appropriate venue. According to the context in Malawi, participants for any training of nurses are selected by the nurse leaders. The participants were nurses from CCUs. The trainings were held at the conferences at each of the two hospitals. As suggested by the participants, techniques involved lectures, group discussions, skill sessions and return demonstrations. These techniques are similar to the techniques used in previous studies. For instance, burns education training programmes for health professionals in Blantyre, one of the country's districts used didactic lecturing, ward-based teaching, small group discussion and hands-on practical sessions (Harris et al., 2016). Another study by Barnes and Paterson-Brown (2017), on improving care of critically unwell patients through development of a simulation programme at a Fistula Care Centre in Malawian Hospital, used lectures supplemented by a half day simulation course.

At the end of the training in the current study, there was an increase in the participants' scores in all domains of the ICCN-CS-1 and the total competence scores as presented in Table 23 (p. 116). These findings are similar to the outcome of similar training

programmes in critical care settings in developing countries (MacLeod et al., 2011; Mpambara et al., 2015; Pubudu et al., 2015; Stephens et al., 2017). As an illustration, the study by Pubudu et al. (2015), which was conducted in Sri Lanka, reported that post-test scores of participants were significantly higher than pre-test scores. There is lack of published literature on evaluation of training programmes or continuing education in critical care settings in Malawi. However, the study by Barnes and Paterson-Brown (2017) conducted in Malawi reported that participants' confidence improved significantly after attending the training. Their training focussed on management of critical illness at a Fistula Care Centre at one of the district hospitals which is a different context from that in which the present study was conducted. The levels of health services in Malawi were discussed in the literature review. Furthermore, participants in the present study expressed satisfaction with the content and techniques used in the training in the follow up qualitative strand. These findings indicate that the training met the expectations of nurses from continuing education programmes. Literature indicates that nurses attend continuing education to update their knowledge, to improve their skills in clinical practice, to improve the quality of their comprehension, to obtain the knowledge necessary to achieve professional status and to raise their level of scholarship (Chong et al., 2011; Ni et al., 2014). Therefore, the findings of the present study contributed a resource which can be used for orientation of new nurses, continuing education, and preceptorship programmes in CCUs in Malawi.

The participants, however, observed that there were challenges. The majority of participants reported that the time was not adequate. In addition, some facilitators lacked appropriate knowledge and skill in certain areas and some topics were not sufficiently discussed. These findings are consistent with those of a previous study by Harris et al. (2016) which evaluated training programmes. Participants identified limited time and lack of hands on experience as challenges for the training. The short period for the training resulted in loading the participants with information. In addition, Ni et al. (2014), reported that negative experiences with programmes, such as outdated content and inexperienced teachers, hinder nurses from attending continuing education. The participants in the present study also expressed the need for more staff to be trained including clinicians. This finding supports Firth and Ttendo (2012) recommendation that capacity building should not be limited to special units because the treatment of critically ill patients requires early detection and prompt intervention before the patient is transferred to a specialised unit. Based on these findings, future training should

consider increasing the duration of the training and conducting a training of trainers to ensure uniformity among the facilitators. In addition, provision of handbooks would be beneficial to the participants because of limited access to internet and books in Malawi.

## **7.8 Chapter summary**

Critical care is a specialty that can save lives and help persons with one or more failing organs or systems to return to their preceding quality of life. Well trained health care providers are fundamental to the delivery of critical care services. Despite disparities in critical care resources between low and high-income countries, the expectation is that the quality of critical care services should be the same because access to critical care is a basic human right for all people (Lumb, 2013). The findings of the study addressed the need for a training programme for CCU nurses which can be implemented using existing structures in Malawi. However, the generalisability of these results is subject to certain limitations. The study was conducted at two public hospitals in Malawi. Therefore, the findings may not be applicable to other hospitals, including private hospitals. Evaluation of the training programme was based on subjective information. It is possible that participants overrated their level of competence. Given that the evaluation of the training was based on Kirkpatrick's Level 1 and Level 2, it is not clear whether the positive feedback and change in competence score would translate to application of what the nurses had learned (Level 3) and change in the quality of patient care (Level 4). As suggested by Barnes and Paterson-Brown (2017), objective data collected through different assessment methods would be more appropriate in assessing the impact of such trainings. However, it is expected that the use of local facilitators who work with the nurses in the units would help to reinforce the knowledge and skills inculcated during the training. It is also anticipated that the resource developed in this study could be used in these units as reference points. Future work could develop post training strategies to facilitate the application of what nurses learn during trainings to improve the quality of care. As previously observed, further research could be conducted to develop tools that can be used to assess nurses' competence in developing countries like Malawi. Lastly, it is important to extend the training to nurses in other departments because the management of critically ill patients begins with the correct diagnosis and initiation of appropriate treatment before the patient is transferred to CCU. Despite its limitations, the study contributes to the development of a specialist body of knowledge related to critical care nursing education and practice development within developing countries.

## **Chapter 8 Conclusion and Recommendations**

### **8.1 Introduction**

Critical care is a basic human right for all people. Despite disparities in critical care resources between low and high-income countries, the quality of critical care services is expected to be the same (Lumb, 2013). The absence of well-trained staff is a major challenge in developing countries, including Malawi. This study aimed to explore learning needs of critical care nurses to inform development and evaluation of an in-service training programme for the nurses in Malawi. This chapter presents a summary of the key quantitative and quantitative findings at different phases. Furthermore, the original contribution of the study, recommendations, strengths and limitations of the study, and a reflective account of the research process will be discussed.

### **8.2 Key quantitative and qualitative findings**

This study found out that nurses' competence on ICCN-CS-1 ranged from good to excellent based on competence score classification as presented by the copyright author (Lakanmaa et al., 2013a). The items with high mean scores were related to attitude and value domain which explored the participants' interest in professional growth. Items with low mean scores were related to organ transplantation. Although the overall competence was good and excellent, majority of the nurses rated their competence as poor on 50% (n=5) of additional competencies which were suggested by a team of local nursing experts. The additional competencies were basic interpretation of ECG, interpretation of ABGs, care of a patient with endotracheal tube, performing CPR, and recognition and management of electrolyte imbalance. These findings appear to suggest that the ICCN-CS-1 was developed and previously used in a context that is different from that of the present study.

The qualitative findings in Phase 1 of the study showed that nurses in CCUs lacked knowledge and skills required for effective nursing practice in these units. This was attributed to the lack of educational preparation, organisational factors and lack of resources. The study found out that there were no postgraduate critical care nursing programmes and on-the-job training for the nurses was scanty. Majority of nurses in ICUs and HDUs were nurse midwife technicians. These nurses were considered by nurse leaders as not well trained for practice in critical care settings. Nurse midwife technicians are trained at Diploma level and are expected to provide general patient care

and conduct uncomplicated deliveries in areas where senior nurses and midwives are limited in numbers (Government of the Republic of Malawi, 2011a). However, in most instances, nurse midwife technicians work outside their scope of practice, a process called task shifting because of shortage of senior nurses trained at degree or higher level. Unfortunately, their training does not cover the content which is expected to be covered by higher cadres (Holman, 2012; Jacob, Holan, Msolomba, Wasili, Langdon, Levine, Mondiwa, Bateganya, et al., 2015).

Furthermore, this study noted that nursing was negatively affected by shortage of staff and material resources in CCUs. The critical shortage of nurses at the two hospitals led to deployment of newly qualified nurses to the highly specialised units like ICU and HDU in large numbers. The new graduate nurses worked without support from experienced nurses because they were not available in most units. One of the striking findings is the effect of organisational factors like the policy on annual rotation of nurses. As previously discussed, the policy gives nurse leaders mandate to transfer some nurses from one hospital department, including CCUs, to another department. This system leads to loss of experienced nurses and aggravates competency gaps among the nurses. The study further noted that lack of educational preparation and shortage of staff and material resources led to frustration, fear, lack of confidence and bad attitude among the nurses. Although not a term used by participants in this study, the findings suggest that nurses in CCUs in Malawi are exhibiting manifestations of moral distress.

For the purpose of this study, participants were requested to identify their learning needs. Findings showed that effective nursing practice in ICUs and HDUs required different forms of knowing namely, theoretical, practical, professional knowing, and ability to interpret and take action. In this regard, learning needs were identified in relation to the forms of knowing. Chapter 5 examined these findings in more detail. The findings informed development and implementation of a training programme for the nurses. Evaluation of the training utilised both quantitative and qualitative methods. Participants' scores on the ICCN-CS-1 and additional competencies after the training were significantly higher than the scores before the training. The participants who were interviewed after the training expressed satisfaction with the programme content and techniques used in the transfer of the knowledge and skills. However, the participants reported challenges in relation to duration of the training and facilitation. Findings of this phase are discussed in the preceding Chapter 7. In view of the paucity of published

literature on critical care practice in most developing countries (Murthy et al., 2015), the findings contribute to the body of knowledge on critical care nursing in Malawi and other developing countries are discussed in the subsequent section.

### **8.3 Contribution to knowledge**

The contribution of this PhD study relates to the body of knowledge on critical care competence, critical care nursing practice and critical care nursing education as follows:

#### **8.3.1 Contribution to knowledge on competence in critical care nursing**

Findings of this study challenged the application of quantitative nursing competence assessment tools developed in high income countries to developing countries, such as Malawi. At the time of data collection, there was no published literature on the use of ICCN-CS-1 in developing countries. For the purpose of this study, content validity of the ICCN-CS-1 was assessed by a team of local experts in intensive and critical care nursing who further suggested 10 additional competencies considered relevant to local context. These findings support Garside and Nhemachena (2013) who observed that competence in nursing is elusive and should be interpreted in relation to context and time. The findings appear to suggest that assessment tools that are developed in developed countries may not adequately assess nursing competence in developing countries like Malawi because of the difference in context.

#### **8.3.2 Contribution to critical care nursing education in developing countries**

The findings on lack of educational preparation for the nurses extend the knowledge on competency gaps among the nurses in CCUs in Malawi. The findings are consistent with previously cited studies by Gondwe et al. (2011); Gundo et al. (2014a) and Mula et al. (2014) which reported competency gaps among CCU nurses in Malawi. The present study highlights that the lack of educational preparation is the source of competency gaps among the nurses. The study was conducted in a country where majority of nurses who practise in critical care settings do not possess a post registration qualification in critical care nursing. As earlier indicated, there is lack of such programmes, short courses are scanty and there are no well-defined orientation programmes for new nurses in critical care settings. The findings indicate that there is need for educational initiatives to upskill the nurses who work in CCUs in Malawi.



To the researcher's knowledge, this is the first study to explore learning needs of nurses in ICUs and HDUs as a way of informing development of a training programme for the nurses in Malawi. The findings on learning needs extend the knowledge on areas to be considered for training of nurses in developing countries. Most of the topics which were identified in the present study were also considered important in other developing countries where similar projects were conducted (MacLeod et al., 2011; Pubudu et al., 2015; Stephens et al., 2017). In the present study, the identified learning needs informed development of a 3-day training for nurses. Development of the content was led by the primary researcher, a trained critical care nurse, in consultation with local nursing experts and facilitators of the training. This process was discussed in Chapter 7. The training was implemented in two separate sessions, one at each hospital. There were 18 nurses (44%) in the first session at Hospital A and 23 nurses (56%) in the second session at Hospital B. The three days were based on previous programmes and were considered practical to avoid disrupting patient care in the units. The involvement of local nursing experts and facilitators was critical in developing a resource which suits the Malawi context and supports recommendations from previous studies on the use of local facilitators to minimise challenges, and ensure acceptability and sustainability of the programmes (Barnes & Paterson-Brown, 2017; Harris et al., 2016). Based on participants' feedback, the training programme, as developed in this study, could be used for orientation of new nurses, continuing education and preceptorship programmes in ICUs and HDUs in Malawi. It is also envisaged that the findings could guide training institutions, policy makers and donors on the development of critical care nursing programmes.

### **8.3.3 Contribution to critical care nursing practice in developing countries**

This PhD study extends the knowledge on the impact of shortage of well-trained nurses and material resources in developing countries like Malawi. Despite the high burden of diseases which culminate to critical illness in developing countries (Murthy et al., 2015), the delivery of critical care is hampered by numerous challenges, such as lack of prehospital care, delayed access to critical care because of long distances, inadequate infrastructure for critical care and lack of material resources (Carter & Snell, 2016; Ntogiwiachu et al., 2014; Stafford et al., 2014). One interesting finding in the present study was the practice of annual rotation of nurses. Although this finding has been reported in previous studies, and conducted in other hospital departments in Malawi (Harris et al., 2016), this study is the first to highlight the negative effect of the policy

on the care of critically ill patients in ICUs and HDUs. Findings of the present study echo calls for authorities to revisit the annual rotation system to ensure optimal care provision. There is also urgent need to address the challenges that affect critical care delivery in the developing countries.

The study is the first to report the existence of moral distress among nurses in ICU and HDUs in Malawi. Previous research reported that nurses in Malawi experience moral distress but some of the nurses do not understand what constitutes moral distress (Maluwa et al., 2012). Moral distress is defined as a feeling experienced in situations in which one is unable to implement the ethically appropriate actions (Choe et al., 2015; Epstein & Hamric, 2009). The consequences of situations that cause moral distress may also affect patients, family members and future patients (Wiegand & Funk, 2012). The findings of this study support the need for organisational support to minimise consequences of moral distress in CCUs.

#### **8.4 Recommendations for critical care nursing education**

*Introduction of post registration critical care nurse training programme* – There is urgent need for post registration critical care nurse training programmes in Malawi to train critical care nurses locally. The Government, through the Ministry of Health, has tried to send nurses overseas for postgraduate training in critical care nursing. For the past 5-10 years, the Ministry of Health has sent fewer than 10 nurses to South Africa and Kenya for the training. Unfortunately, some of these nurses were no longer working in the clinical areas having joined training institutions or moved into management positions at the two hospitals. It is unlikely that the Ministry of Health will be able to sponsor nurses for specialised training outside the country because of financial constraints. Given that it may take long for the country to start benefiting from such programmes, interim measures could be considered to address the competency gaps as discussed in the subsequent section.

*On-going on-the-job training of nurses in ICUs and HDUs* – There is a need to formalise on-going training of nurses on the management of critically ill patients in CCUs and other wards. This could be achieved through introducing clinical educators who should be responsible for planning and delivering orientation, continuing education and mentorship programmes in ICUs and HDUs. This study has contributed a training resource which could be used for such educational activities. The educators could be

nurses trained in intensive and critical care if available, or nurses with significant experience in critical care settings.

In addition, the training programme implemented in the present study could be replicated. As suggested by participants who received the training, such trainings could be extended to nurses in other departments because the management of critically ill patients begins with the correct diagnosis and initiation of appropriate treatment before the patient is transferred to ICU or HDU. Based on feedback from participants in the present study, the duration could be increased to avoid overloading participants with information. Providing pamphlets could help participants prepare for the training because of limited access to internet and books in Malawi. A training of trainers' workshop for the facilitators before the training could help to ensure uniformity in facilitation.

## **8.5 Recommendations for critical care nursing practice**

*Retention of staff in ICUs and HDUs* – While the Ministry of Health is responsible for recruitment and posting of staff to different hospitals, nurse leaders have the mandate to allocate nurses to different hospital departments. There is need for nurse leaders to consider allocating more nurses to critical care settings because of high workload. In addition, findings of this study suggest that authorities should consider revising the policy annual rotation of nurses. This has the potential to minimise the loss of experienced nurses and optimise patient care in these units.

*Sensitisation and management of moral distress in ICUs and HDUs* – This study found that moral distress is a big challenge in ICUs and HDUs at the two hospitals where the study was conducted. Greater efforts are required to increase nurses' awareness and ability to address root causes of moral distress. This could be achieved through inclusion of topics related to moral distress in educational programmes for the nurses. There is need for hospital authorities and health professionals, including nurses, to introduce interventions which could enable the nurses and other health professionals to manage and minimise the consequences of moral distress. As discussed, other strategies which could be considered include instituting ethics committees, debriefing sessions, developing policies for ethics consultation, family support; and enhancing team work among staff (Epstein & Hamric, 2009; O'Connell, 2015; Wilson et al., 2013).

*Formation of a critical care nurses association* – Findings of this study suggest that nurses in CCUs are not empowered. Apart from providing the nurses with appropriate educational preparation, the nurses could benefit from formation of a critical care nursing association. The association would give the nurses an opportunity to share best practice and discuss ideas for improvement of critical care nursing in the country.

## **8.6 Recommendations for health policy**

*Recruitment of nurses and allocation of material resources* - The findings will be disseminated to authorities in the Ministry of Health and at the hospitals where the study was conducted. It is important for the authorities to be aware of the contextual issues that influence critical care nursing practice in Malawi. There is need for the Ministry of Health to recruit more nurses and identify strategies for retention of staff in public hospitals. The Ministry plays an oversight role and manages staffing in all public hospitals, including the sites where the present study was conducted. It is imperative that the Ministry lobby for sufficient health financing to ensure that hospitals are provided with adequate material resources, which would trickle down to the care of critically ill patients. Currently, there is debate on introduction of health insurance to improve health financing. Given that health financing is never sufficient, the Government, through the Ministry of Health, should support the suggestion.

## **8.7 Recommendations for regulatory body**

*Alignment of preservice nursing education to current critical care practice* – There is need for Nurses and Midwives Council of Malawi and training institutions to align the preservice training programmes with current nursing practice in CCUs. The findings of this study showed that there is discrepancy between undergraduate nursing education and the actual nursing practice in CCUs. In addition, nurse midwife technicians are the largest nursing cadres in Malawi and constitute the majority of staff in CCUs. This is in contrast to developed countries like Australia where majority of nurses who work in these units are registered nurses trained at degree level (Hegney et al., 2010). Currently, there are initiatives by Nurses and Midwives Council of Malawi to revise training curriculum for nurse midwife technicians because of their extended roles in practice (Jacob, Holan, Msolomba, Wasili, Langdon, Levine, Mondiswa, Batenganya, et al., 2015). Such initiatives should consider inclusion of the areas identified in the present study as critical for effective nursing practice in CCUs.

## **8.8 Recommendations for critical care nursing research**

A further study could explore the concept of critical care nursing competence in developing countries like Malawi to guide development of competence assessment tool appropriate for such countries. In the present study, the additional competencies were identified by a team of Malawian experts who assessed the content validity of the ICCN-CS-1. It can, therefore, be assumed that the extended parameters of nursing professional practice in developing countries are not incorporated in the dimensions of the international tools that are used to assess nursing competence. In addition, the findings of the present study provide insights for future research on retention of nurses and strategies to facilitate application of what nurses learn during trainings to actual practice using the available resources.

## **8.9 Strengths and limitations of the study**

The major strength of this study is the use of mixed methods research design. Although there were challenges in identifying an appropriate tool for assessing critical care nursing competence in a developing country, the quantitative strand provided some understanding of nurses' basic competence. The subsequent qualitative strand helped to elaborate the quantitative results and the critical care context of the study. In addition, the inclusion of an advisory team helped to align the process and the developed training programme within the Malawi context. The findings are generalisable to other hospitals and developing countries with similar context.

However, generalisability of these findings is subject to certain limitations. The sample size was small, and the study was conducted at two public tertiary hospitals. In addition, evaluation of the training programme was based on subjective information. It is possible that participants overrated their level of competence. It is not clear whether the positive feedback and change in competence score would translate to change in the quality of patient care. In spite of these limitations, the findings have significant implications for critical care education, practice, research and health policy in Malawi and other developing countries.

## **8.10 Reflective account of the research process**

This reflective account focuses on the research process that culminated in development of a training programme for nurses who work in ICU and HDUs in Malawi, a developing country in sub-Saharan Africa. The account is guided by the steps of Gibb's

reflective cycle (McMillan & Weyers, 2013) as follows: the situation, feelings, experience evaluated, reflection (learning opportunities), conclusion and the future.

*The situation* – The motivation for this study originated from my experience as a bed side nurse in ICU and lecturer at a nursing college in Malawi. During the period that I worked in ICU, at one of the referral hospitals, I was the only nurse with post registration qualification in critical care nursing. I observed that the other nurses lacked confidence and struggled in caring for the critically ill patients as they relied on only basic nursing education. While I helped the nurses with some instructions, the sessions were not formal and mostly depended on the initiative of the learner.

The situation in HDUs was even worse because there was no nurse with critical care qualification to guide them. Just like the majority of nurses in ICU, the nurses in HDUs blindly provided care to the critically ill patients. Having studied a Master of Science in Nursing (Intensive and Critical Care) in South Africa, I noted that the situation in Malawi is different from countries like South Africa and other developed countries in terms of critical care education. Unlike developed countries where post registration critical care nursing courses do exist, and clinical educators facilitate the training of new nurses without post registration critical care qualification in critical care settings, no such courses or arrangement existed in Malawi. Therefore, I decided to explore the learning needs of the nurses in ICU and HDUs to inform development of a training resource which could be used in these units.

The identified research area received support from the Malawi Government because of its relevance to the country. My scholarship application was further assessed by the New Zealand Government before I received the competitive New Zealand Commonwealth Scholarship for PhD study in New Zealand. During development of the proposal, I had the opportunity to visit Auckland Hospital to learn how they implement in-service training for nurses in the Department of Critical Care Medicine. Throughout development of the full proposal, data collection in Malawi and thesis writing, I was in touch (through emails and phone calls) with local experts and colleagues in Malawi. The local experts helped with selection of the appropriate tools for data collection, assessment of content validity, development and implementation of the training programme. Participants in this study freely discussed their experiences and learning needs in a critical care setting. Despite the lack of postgraduate training and numerous challenges, nurses were expected to practice to the level of a trained critical care nurse.

The nurses who received the training in the present study expressed satisfaction and wished the training could be extended to other nurses in other departments.

*Feelings* – The process of developing the proposal, data collection and development of the training programme brought mixed feelings of fear, sadness, motivation and joy. I was gripped with fear from the onset when I realised that the task that I had set out was huge and required more time. According to regulations of the scholarship, I was initially required to spend a maximum of six months out of New Zealand for the data collection and complete the PhD within a maximum of 42 months. It was almost impossible to complete the three phases of the study, which involved both quantitative and qualitative methods within 6 months. Fortunately, I managed to negotiate for an extension of the data collection period and the scholarship which was granted with support from the supervisors.

The stories that participants shared about critical care practice in Malawi were shocking, though familiar. I felt sad for the nurses who sacrificed a lot for the sake of critically ill patients and their families. In the absence of proper preparation for critical care practice, it was almost impossible for the nurses to find their feet in a highly specialist area. The shortage of staff and material resources worsened the situation as the nurses were expected to be creative and improvise when necessary. The nurses wished nurse leaders could help in allocating more staff and resources. On their part, the nurse leaders appeared helpless as their roles were limited by the bureaucracy of the organisations. Ultimately, the nurses experienced moral distress of which none of the participants seemed to be aware.

Throughout the data collection period, I felt motivated by the enormous support that I received from supervisors, hospital authorities, advisory team and participants. The participants admitted that ICU and HDU nurses lacked competencies required for the care of critically ill patients. This project was considered a great opportunity to equip the nurses and develop a resource which could be used for on-going training of the nurses in the units. The hospital authorities granted permission for the study and provided space for the training. Each session of the training was officially opened and graced by a senior nurse leader at the hospital. The nurses' enthusiasm and desire to learn the basics of critical care nursing was amazing. Although, we could not train all the nurses in ICUs and HDUs at the two hospitals, I was happy that the task that had been set out was accomplished.

*Experience evaluated* – The experience challenged my theoretical assumptions of competence in critical care nursing. It appeared that nurses in Malawi performed extended roles because of shortage of staff and resources. The required knowledge and skills for their effective practice in critical care settings may not follow templates from developed countries because the context and disease burden are different. Through interaction with the advisory team and participants, I came to understand the numerous challenges that negatively impacted critical care nursing practice and which required other interventions, apart from offering a training programme.

In the course of data collection and analysis, I realised that understanding the nursing education curriculum content would have provided additional information to triangulate some of the nurses' reports. This would have provided an opportunity to identify areas that need to be included in the curriculum as a temporary measure to address the critical shortage of critical care trained nurses. However, this was not part of the study.

*Reflection (Learning Opportunities)* – Through interaction with nurses, anaesthetists, and nurse leaders I learned that the process of developing training programmes should not be theoretical. Training programmes that are used in developed countries may not apply to developing countries like Malawi because of the differences in context. Therefore, the experience highlighted the importance of understanding the context when developing training programmes or introducing initiatives that are aimed to improve the competence of nurses in critical care settings.

In this study, the advisory team helped me to understand what would work for Malawi. I wondered if interaction of medical doctors and assessment of what is taught during undergraduate training would have helped to gain in-depth understanding of the context and additional information which could be included in the training programme.

*Conclusion* – Based on the following experience, I have drawn the following conclusions:

Nurses in developing countries, like Malawi, perform extended roles in critical care settings. In the absence of critical care nursing education, their job description in these units is not clear. It is important to understand their roles before developing training programmes that would help them to provide effective care in the critical care settings. Mentorship programmes should be based on their learning needs.



Critical care nursing practice in developing countries is negatively affected by numerous challenges. The introduction of a training programme may not be enough to improve the competence of the nurses. There are challenges that require the attention of different authorities to achieve effective nursing practice and optimal care in these units. Lastly, involvement of local leaders and other cadres in the development of the training programme is important to facilitate acceptability of the programme.

*Future* – There is a need to extend the study to other referral hospitals to gain in-depth understanding of experiences and the learning needs of the nurses. This would also help to understand critical care nursing practice in the whole country. It would be important to assess the content that relates to critical care in the current undergraduate training programmes.

### **8.11 Conclusion of the thesis**

Critical care nursing involves delivery of care to patients with actual or potential life-threatening illnesses. These patients are treated with specialised equipment in special units. It demands that people who work in these units are well trained and competent to provide care to these patients and their families. This PhD study addressed the need for a training programme for ICU and HDU nurses which can be implemented using existing structures Malawi. In spite of its limitations, the study contributes to the development of a specialist body of knowledge related to critical care in Malawi and other developing countries. Recommendations have been made in relation to critical care nursing education, practice, health policy, regulatory body and nursing research.

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## **Glossary**

Intensive care unit – a unit which provides monitoring and support to critically ill patients with two or more failing organs from which recovery is possible

High dependency unit – a unit which provides intermediary care between what is offered in general wards and the care in ICU. It is also called stepdown unit

Critical care unit – an umbrella term for intensive care unit and high dependency unit

Critical care nursing - a specialty which responds to the challenging demands of critically ill patients

Guardian – In Malawi, this term refers to a patient's family member

Competence – involves knowledge, skill, attitude and value, and experience

Competency – performance of a skill

Nurse Midwife Technician – nurses/midwives who are trained in nursing and midwifery at diploma level

Koha – a gift

## Appendix A: Ethics approval by AUTECH in New Zealand



### AUTECH Secretariat

Auckland University of Technology  
D-88, WU406 Level 4 WU Building City Campus  
T: +64 9 921 9999 ext. 8316  
E: [ethics@aut.ac.nz](mailto:ethics@aut.ac.nz)  
[www.aut.ac.nz/researchethics](http://www.aut.ac.nz/researchethics)

10 December 2015

Gael Mearns  
Faculty of Health and Environmental Sciences

Dear Gael

Ethics Application: **15/439 Development of an in-service training programme for critical care nurses in Malawi.**

Thank you for submitting your application for ethical review. I am pleased to confirm that the Auckland University of Technology Ethics Committee (AUTECH) has approved your ethics application for three years until 7 December 2018.

AUTECH wishes to commend the researchers on the thoroughness of their application and noted that the scope of the project was vast.

AUTECH suggests that the Malawi advisor contact details are added to the Information Sheet and reminds the researchers that all documents require the AUT logo

As part of the ethics approval process, you are required to submit the following to AUTECH:

- A brief annual progress report using form EA2, which is available online through <http://www.aut.ac.nz/researchethics>. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 7 December 2018;
- A brief report on the status of the project using form EA3, which is available online through <http://www.aut.ac.nz/researchethics>. This report is to be submitted either when the approval expires on 7 December 2018 or on completion of the project;

It is a condition of approval that AUTECH is notified of any adverse events or if the research does not commence. AUTECH approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

AUTECH grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to obtain this. If your research is undertaken within a jurisdiction outside New Zealand, you will need to make the arrangements necessary to meet the legal and ethical requirements that apply there.

To enable us to provide you with efficient service, we ask that you use the application number and study title in all correspondence with us. If you have any enquiries about this application, or anything else, please do contact us at [ethics@aut.ac.nz](mailto:ethics@aut.ac.nz).

All the very best with your research,

A handwritten signature in black ink, appearing to read 'K O'Connor', written in a cursive style.

Kate O'Connor  
Executive Secretary  
**Auckland University of Technology Ethics Committee**

Cc: Rodwell Gundo [rogundo@yahoo.co.uk](mailto:rogundo@yahoo.co.uk); Annette Dickinson



Telephone: + 265 789 400  
Facsimile: + 265 789 431  
e-mail: mohdoccentre@gmail.com  
**All Communications should be addressed to:  
The Secretary for Health**



MINISTRY OF HEALTH  
P.O. BOX 30377  
LILONGWE 3  
MALAWI

21<sup>st</sup> January 2016

Rodwell Gundo  
Auckland University

Dear Sir/Madam,

RE: Protocol #16/1/1533: Development of an in-service training program for critical care nurses in Malawi

Thank you for the above titled proposal that you submitted to the National Health Sciences Research Committee (NHSRC) for review. Please be advised that the NHSRC has **reviewed** and **approved** your application to conduct the above titled study.

- **APPROVAL NUMBER** : NHSRC #1533  
The above details should be used on all correspondence, consent forms and documents as appropriate.
- **APPROVAL DATE** : 21/01/2016
- **EXPIRATION DATE** : This approval expires on 21/01/2017  
After this date, this project may only continue upon renewal. For purposes of renewal, a progress report on a standard form obtainable from the NHSRC secretariat should be submitted one month before the expiration date for continuing review.
- **SERIOUS ADVERSE EVENT REPORTING** : All serious problems having to do with subject safety must be reported to the National Health Sciences Research Committee within 10 working days using standard forms obtainable from the NHSRC Secretariat.
- **MODIFICATIONS**: Prior NHSRC approval using standard forms obtainable from the NHSRC Secretariat is required before implementing any changes in the Protocol (including changes in the consent documents). You may not use any other consent documents besides those approved by the NHSRC.
- **TERMINATION OF STUDY**: On termination of a study, a report has to be submitted to the NHSRC using standard forms obtainable from the NHSRC Secretariat.
- **QUESTIONS**: Please contact the NHSRC on Telephone No. (01) 789314, 0888344443 or by e-mail on mohdoccentre@gmail.com
- **Other:**  
Please be reminded to send in copies of your final research results for our records as well as for the Health Research Database.

Kind regards from the NHSRC Secretariat.

~~AS~~ Kan

FOR CHAIRMAN, NATIONAL HEALTH SCIENCES RESEARCH COMMITTEE

**PROMOTING THE ETHICAL CONDUCT OF RESEARCH**  
Executive Committee: Dr. B. Chilima (Chairman), Dr. B. Ngwira (Vice Chairperson)  
Registered with the USA Office for Human Research Protections (OHRP) as an International IRB  
(IRB Number: 1986-007005, CHL-00000001)

## Appendix C: Amendment approval by AUTECH in New Zealand



### AUTECH Secretariat

Auckland University of Technology  
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[www.aut.ac.nz/researchethics](http://www.aut.ac.nz/researchethics)

3 March 2016

Gael Mearns  
Faculty of Health and Environmental Sciences

Dear Gael

Re: Ethics Application: **15/439 Development of an in-service training programme for critical care nurses in Malawi.**

Thank you for your request for approval of amendments to your ethics application.

I have approved minor amendments to your ethics application allowing changes to the survey instrument, research & advisory team, inclusion criteria and koha.

I remind you that as part of the ethics approval process, you are required to submit the following to the Auckland University of Technology Ethics Committee (AUTECH):

- A brief annual progress report using form EA2, which is available online through <http://www.aut.ac.nz/researchethics>. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 7 December 2018;
- A brief report on the status of the project using form EA3, which is available online through <http://www.aut.ac.nz/researchethics>. This report is to be submitted either when the approval expires on 7 December 2018 or on completion of the project.

It is a condition of approval that AUTECH is notified of any adverse events or if the research does not commence. AUTECH approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

AUTECH grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to obtain this. If your research is undertaken within a jurisdiction outside New Zealand, you will need to make the arrangements necessary to meet the legal and ethical requirements that apply there.

To enable us to provide you with efficient service, please use the application number and study title in all correspondence with us. If you have any enquiries about this application, or anything else, please do contact us at [ethics@aut.ac.nz](mailto:ethics@aut.ac.nz).

All the very best with your research,

A handwritten signature in black ink, appearing to read 'K O'Connor', written in a cursive style.

Kate O'Connor  
Executive Secretary  
**Auckland University of Technology Ethics Committee**

Cc: Rodwell Gundo [rogundo@yahoo.co.uk](mailto:rogundo@yahoo.co.uk), Annette Dickinson

## Appendix D: Poster

**AUT**

TE WĀNANGA ARONUI  
O TĀMAKI MAKAU RAU

### DEVELOPMENT OF AN IN-SERVICE TRAINING PROGRAMME FOR CRITICAL CARE NURSES IN MALAWI

Research participants are required.

#### What is this research all about?

This a PhD study which is exploring learning needs of critical care nurses. The information gathered will guide development of an in-service training programme which will be implemented and evaluated at Hospital A and B.

#### Who can participate?

You need to be:

- A nurse working in Intensive Care Unit (ICU) or adult High Dependency Unit (HDU) on full time or locum basis, at least for the past 3 months
- 18 years of age or older
- Willing to talk about your competences and learning needs

#### How?

The study will be conducted in different phases. You will be asked to complete a questionnaire or attend focus group discussion or key informant interviews or attend an in-service training programme depending on the phase of the study. During the focus

group discussions, you will be asked questions on the topic in a confidential group of 6-10 nurses (these will be your colleagues in ICU or adult HDU).

Please contact the researcher for further details:

**Researcher contact details:**

Rodwell Gundo, Auckland University of Technology, [rogundo@yahoo.co.uk](mailto:rogundo@yahoo.co.uk), Malawi (+265) 883529492, New Zealand (+64)226716322.

**Research Assistant (details included once person identified)**

Research Assistant at Hospital A: Chifundo Thamala, 0995682873/0881596283

Research Assistant at Hospital B: Maness Mlaviwa, 0999764020/0884266642

**Approved by the Auckland University of Technology Ethics Committee on 10<sup>th</sup> December, 2015, AUTECH Reference number 15/439 and National Health Sciences Research Committee in Malawi, Reference Number #1533**

## Appendix E: Survey participant information sheet

The logo for the Auckland University of Technology (AUT) is displayed in white text on a black rectangular background.

TE WĀNANGA ARONUI  
O TĀMAKI MAKAU RAU

### Survey Participant

#### Date Information Sheet Produced:

22th November 2015

#### Project Title

Development of an in-service training programme for critical care nurses in Malawi.

#### An Invitation

Hello, my name is Rodwell Gundo, a Malawian nurse employed by Ministry of Health. Currently, I am pursuing Doctor of Philosophy (PhD) studies in Nursing at Auckland University of Technology in New Zealand. I intend to conduct a study in Intensive Care Unit (ICU) and adult High Dependency Unit (HDU) as a requirement for the PhD programme. I would like to invite you to participate in the study to explore learning needs of nurses who work in ICU and adult HDU which will guide development of an in-service training programme which suits the Malawi context.

I previously worked in Intensive Care Unit (ICU) at Hospital A before being seconded by Ministry of Health to teach at Kamuzu College of Nursing. You will not be advantaged or disadvantaged in any way if you decide to participate or not. Your participation is voluntary and you will be allowed to withdraw at any time prior to completion of the data collection in June, 2016.

#### What is the purpose of this research?

The purpose of the study is to explore learning needs of nurses who work in ICU and adult HDU. The identified learning needs will guide development and implementation of an in-service training programme. The research outputs expected from the findings of the study will include thesis, journal article, conference papers and other academic publications or presentations.

#### How was I identified and why am I being invited to participate in this research?

All nurses who work in ICU and adult HDUs at Hospitals A and B have been invited to participate in the study. This invitation has been sent to you as a nurse who works in one of these critical care units. This criteria excludes nurses who are on orientation.

A presentation was done by the primary researcher at a departmental meeting to create awareness about the study. In addition, posters with details of the study, contact details of the researcher and research assistant were posted in each of the critical care units,

inviting nurses who would be willing to participate in the study. The nurses who work are willing to participate in the study are requested to contact the research assistant.

### **What will happen in this research?**

The study aims to identify learning needs of critical care nurses which will guide development of an in-service training programme. The training programme will be implemented at two hospitals. This will be followed by an evaluation of the training programme.

If you decide to take part in this research, a research assistant will pass on an envelope with a consent form to sign. The signed consent form will be collected by the same individual at your convenient time. As soon as I receive the consent form, I will invite you to complete two questionnaires. The first questionnaire is Intensive and Critical Care Nursing Competence Scale (Q1). Using this questionnaire you will be required to assess your competences in intensive and critical care nursing. Completion of the questionnaire takes 20 to 30 minutes. The second questionnaire (Q2) will explore your ideas on the approach to be used for the in-service training. Completion of this questionnaire takes 5 to 10 minutes.

### **What are the discomforts and risks?**

You may feel embarrassed in the process of self-assessment on competences in managing critically ill patients.

### **How will these discomforts and risks be alleviated?**

I would like to assure you that the findings will only be used to identify learning needs which will guide development of an in-service training programme.

### **What are the benefits?**

The study aims to develop an in-service training programme for nurses who work in ICU and adult HDUs in Malawi. Currently, there is no training institution which offers critical care nursing course in the country. You may not directly benefit from the study but your views will contribute to a programme which suits the context in Malawi.

It is expected that the nurses who will undergo training in this study will gain competences required for the care of critically ill patients. The in-service training programme will be used for orientation and continuing education activities for critical care nurses in the country. This will improve the quality of critical care and patient outcomes. It is also envisaged that the findings will inform nurse educators on what could be included in training curriculum for nurses. In the absence of post-registration programme in critical care nursing, the findings will guide training institutions, policy makers and donors in the development of such programmes for the country. Furthermore, the findings will contribute to a body of knowledge on critical care nursing which does not exist in most developing countries including Malawi. Finally, the potential benefit to the researcher is that the study will lead to the award of PhD qualification.

### **How will my privacy be protected?**

Code numbers instead of personal names will be used during data collection, analyses and reporting to protect your confidentiality. The research assistant will sign confidentiality agreements protecting your identity. In addition, names of the two hospitals where the study will be conducted will not be reported anywhere after the study.

In Malawi, the data will securely kept in locked filing cabinets in the office of my third supervisor, Professor Ellen Chirwa at Kamuzu College of Nursing, Blantyre campus. In New Zealand, all the data will be securely kept in locked filing cabinets for up to 6 years in the offices of my primary and secondary research supervisors, Dr. Gael Mearns and Dr. Annette Dickinson. Their offices are located in the School of Clinical Sciences, Auckland University of Technology, Auckland, New Zealand. The three supervisors and I will have access to the information. After 6 years all the study material, transcripts and audio tapes will be destroyed.

**What are the costs of participating in this research?**

It is expected that you will not incur any costs.

**What opportunity do I have to consider this invitation?**

Participation is voluntary. You have 2 weeks to consider this invitation. You can get in touch with me if you have questions or require clarification.

**How do I agree to participate in this research?**

Should you agree to participate, you will be required to sign a consent. The signed consent should be submitted to the research assistant

**Will I receive feedback on the results of this research?**

Yes. Upon completion of Phase 2 of the study – identification of programme ideas/needs assessment, the findings will be presented to the participants, health professionals and hospital authorities. Similarly, the findings will be shared with participants, other health professionals and authorities at the two hospitals at the end of the study. You can also request for a summary of the findings by indicating on the consent form.

**What do I do if I have concerns about this research?**

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Gael Mearns, email address: gael.mearns@aut.ac.nz or (+64) 99219999 extension 7108

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTECH, Kate O'Connor, ethics@aut.ac.nz , (+64) 921 9999 ext 6038.

**Whom do I contact for further information about this research?**

*Researcher Contact Details:*

Rodwell Gundo, Kamuzu College of Nursing, rogundo@yahoo.co.uk, Malawi (+265) 888366130, New Zealand (+64)226716322.



Research Assistant at Hospital A: Chifundo Thamala, 0995682873/0881596283

Research Assistant at Hospital B: Maness Mlaviwa, 0999764020/0884266642

*Project Supervisor Contact Details:*

Dr Gael Mearns, Auckland University of Technology, email address:  
gael.mearns@aut.ac.nz or (+64) 99219999 extension 7108

Dr. Annette Dickinson, Auckland University of Technology, email address:  
Annette.dickinson@aut.ac.nz or (+64)99219999 extension 7337

Professor Ellen Chirwa, email address: embweza@kcn.unima.mw or (+265) 1874898

Approved by the Auckland University of Technology Ethics Committee on 10th  
December 2015, AUTECH Reference number 15/439 and National Health Sciences  
Research Committee in Malawi, Reference Number NHSRC#1533

## Appendix F: Consent forms - Survey and Key Informant Interview Participant

**AUT**

TE WĀNANGA ARONUI  
O TĀMAKI MAKĀU RAU

*Project title: Development of an in-service training programme for critical care nurses in Malawi.*

*Project Supervisor: Dr. Gael Mearns (Primary Supervisor), Dr. Annette Dickinson (Secondary Supervisor), Professor Ellen Chirwa (Local Supervisor)*

*Primary Researcher: Rodwell Gundo*

- 
- ☐ I have read and understood the information provided about this research project in the Information Sheet dated 22<sup>nd</sup> November, 2015.
  - ☐ I have had an opportunity to ask questions and to have them answered.
  - ☐ I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
  - ☐ If I withdraw, I understand that all relevant information will be destroyed.
  - ☐ I agree to take part in this research.
  - ☐ I wish to receive a copy of the report from the research (please tick one): Yes ☐ No ☐

Participant's signature:.....

Participant's name: .....

Participant's Contact Details (if appropriate):

.....

Date:

**Approved by the Auckland University of Technology Ethics Committee on 10<sup>th</sup> December, 2015, AUTECH Reference number 15/439 and National Health Sciences Research Committee in Malawi, Reference Number #1533**

*Note: The Participant should retain a copy of this form*

## Appendix G: Survey questionnaire (Q1)

**AUT**

TE WĀNANGA ARONUI  
O TĀMAKI MAKAU RAU

### Intensive and critical care nursing competence scale version 1 (ICCN-CS-1)

**Study Site:**..... **Code Number:**.....

**Study Title:** Development of an in-service training programme for critical care nurses in Malawi

The questionnaire has five sections, A to E. Please respond to all questions with honesty, completeness and accuracy. Please use a pencil to complete the questionnaire. The questionnaire will take 20 to 30 minutes to complete.

### **SECTION A: DEMOGRAPHIC DATA**

**Instruction:** Fill in the blank spaces or tick the option that corresponds with you.

What is your age?

.....

What is your gender?

- ☐ Male
- ☐ Female

What is your professional qualification?

- ☐ Nurse Midwife Technician
- ☐ Registered Nurse/Midwife

In which Critical Care Unit do you work?

- ☐ Intensive Care Unit
- ☐ High Dependency Unit

For how long have you worked in the Critical Care Unit? .....

**Instruction:** The following items relate to competence in intensive and critical care nursing. Assess your competence on the scale provided by ticking the number which corresponds with your perceived competence. There are no correct or error options.

## **SECTION B: KNOWLEDGE BASE**

**Instruction:** Assess your competence from the "I KNOW" point of view.

- 1 = very poorly
- 2 = poorly
- 3 = neither poorly nor well
- 4 = well
- 5 = very well

### ***I know how I care for an intensive and critical care patient***

1	safely	1	2	3	4	5
2	justly	1	2	3	4	5
3	patient centredly	1	2	3	4	5
4	equally	1	2	3	4	5

### ***While caring for an intensive and critical care patient I know how I adhere to***

5	aseptic rules	1	2	3	4	5
6	physician`s orders	1	2	3	4	5
7	evidence-based clinical guidelines	1	2	3	4	5
8	instructions for the use of technical equipment	1	2	3	4	5

### ***I know how I recognise an intensive and critical care patient`s***

9	abnormal vital signs	1	2	3	4	5
10	need of pain care	1	2	3	4	5
11	changes in skin condition	1	2	3	4	5
12	need of fluid therapy	1	2	3	4	5
13	need of patient education	1	2	3	4	5
14	need of mental support	1	2	3	4	5

### ***I know how I care for an intensive and critical care patient`s***

15	support of vital functions	1	2	3	4	5
16	pain care	1	2	3	4	5
17	skin care	1	2	3	4	5
18	fluid therapy	1	2	3	4	5
19	patient education	1	2	3	4	5
20	mental support	1	2	3	4	5

***I know how I adhere to***

21	nurses` ethical code	1	2	3	4	5
22	general health care legislation	1	2	3	4	5
23	organ transplantation law	1	2	3	4	5
24	economic efficiency	1	2	3	4	5

***I know how I***

25	make work-related decisions	1	2	3	4	5
26	solve work-related problems	1	2	3	4	5
27	think critically	1	2	3	4	5
28	prioritise my work	1	2	3	4	5

***I know how I develop***

29	my team	1	2	3	4	5
30	myself in work	1	2	3	4	5
31	Nursing	1	2	3	4	5
32	my subordinate skills	1	2	3	4	5

***I know how I collaborate***

33	within my own profession	1	2	3	4	5
34	Multiprofessionally	1	2	3	4	5
35	with other health care units	1	2	3	4	5
36	with a patient`s significant others	1	2	3	4	5

**SECTION C: SKILL BASE**

Assess your competence from the "I AM ABLE TO" point of view

1 = very poorly

2 = poorly

3 = neither poor nor well

4 = well

5 = very well

***I am able to care for an intensive and critical care patient***

37	safely	1	2	3	4	5
38	justly	1	2	3	4	5
39	patient centredly	1	2	3	4	5
40	equally	1	2	3	4	5

***When caring for an intensive and critical care patient I am able to adhere to***

41	aseptic rules	1	2	3	4	5
42	physician`s orders	1	2	3	4	5
43	evidence-based clinical guidelines	1	2	3	4	5
44	instructions for the use of technical equipment	1	2	3	4	5

***I am able to recognise an intensive and critical care patient`s***

45	abnormal vital signs	1	2	3	4	5
46	need of pain care	1	2	3	4	5
47	changes in skin condition	1	2	3	4	5
48	need of fluid therapy	1	2	3	4	5
49	need of patient education	1	2	3	4	5
50	need of mental support	1	2	3	4	5

***I am able to care for an intensive and critical care patient`s***

51	support of vital functions	1	2	3	4	5
52	pain care	1	2	3	4	5
53	skin care	1	2	3	4	5
54	fluid therapy	1	2	3	4	5
55	patient education	1	2	3	4	5
56	mental support	1	2	3	4	5

***I am able to adhere to***

57	nurses` ethical code	1	2	3	4	5
58	general health care legislation	1	2	3	4	5
59	organ transplantation law	1	2	3	4	5
60	economic efficiency	1	2	3	4	5

***I am able to***

61	make work-related decisions	1	2	3	4	5
62	solve work-related problems	1	2	3	4	5
63	think critically	1	2	3	4	5
64	prioritise my work	1	2	3	4	5

***I am able to develop***

65	my team	1	2	3	4	5
66	myself in work	1	2	3	4	5
67	Nursing	1	2	3	4	5
68	my subordinate skills	1	2	3	4	5

***I am able to collaborate***

69	within my own profession	1	2	3	4	5
70	Multiprofessionally	1	2	3	4	5
71	with other health care units	1	2	3	4	5
72	with a patient's significant others	1	2	3	4	5

#### **SECTION D: ATTITUDE AND VALUE BASE**

Assess your own attitudes and values

1 = fully disagree

2 = disagree

3 = neither disagree nor agree

4 = agree

5 = fully agree

***I think it is important that I care for an intensive and critical care patient***

73	safely	1	2	3	4	5
74	justly	1	2	3	4	5
75	patient centredly	1	2	3	4	5
76	equally	1	2	3	4	5

***While caring for an intensive and critical care patient I think it is important that I adhere to***

77	aseptic rules	1	2	3	4	5
78	physician's orders	1	2	3	4	5
79	evidence-based clinical guidelines	1	2	3	4	5
80	instructions for the use of technical equipment	1	2	3	4	5

***I think it is important that I master the recognition of an intensive and critical care patient's***

81	signs of abnormal vital signs	1	2	3	4	5
82	need of pain care	1	2	3	4	5
83	changes in skin condition	1	2	3	4	5
84	need of fluid therapy	1	2	3	4	5
85	need of patient education	1	2	3	4	5
86	need of mental support	1	2	3	4	5

***I think it is important that I master an intensive and critical care patient's***

87	support of vital functions	1	2	3	4	5
88	pain care	1	2	3	4	5
89	skin care	1	2	3	4	5
90	fluid therapy	1	2	3	4	5
91	patient education	1	2	3	4	5
92	mental support	1	2	3	4	5

***I think it is important that I adhere to***

93	nurses` ethical code	1	2	3	4	5
94	general health care legislation	1	2	3	4	5
95	organ transplantation law	1	2	3	4	5
96	economic efficiency	1	2	3	4	5

***I think it is important that***

97	I make work-related decisions	1	2	3	4	5
98	I solve work-related problems	1	2	3	4	5
99	I think critically	1	2	3	4	5
100	I prioritise my work	1	2	3	4	5

***I think it is important that I develop***

101	my team	1	2	3	4	5
102	myself in work	1	2	3	4	5
103	Nursing	1	2	3	4	5
104	my subordinate skills	1	2	3	4	5

***I think it is important that I collaborate***

105	within my own profession	1	2	3	4	5
106	Multiprofessionally	1	2	3	4	5
107	with other health care units	1	2	3	4	5
108	with a patient`s significant others	1	2	3	4	5

**SECTION E: EXPERIENCE BASE**

Assess the quality of your experience

1 = fully insufficiently

2 = insufficiently

3 = neither insufficiently nor sufficiently

4 = sufficiently

5 = fully sufficiently

***I have experience in caring for an intensive and critical care patient***

109	safely	1	2	3	4	5
110	justly	1	2	3	4	5
111	patient centrednessly	1	2	3	4	5
112	equally	1	2	3	4	5

***When caring for an intensive and critical care patient I have experience in adhering to***



113	aseptic rules	1	2	3	4	5
114	physician`s orders	1	2	3	4	5
115	evidence-based clinical guidelines	1	2	3	4	5
116	instructions for the use of technical equipment	1	2	3	4	5

***I have experience of recognition of an intensive and critical care patient`s***

117	signs of abnormal vital signs	1	2	3	4	5
118	need of pain care	1	2	3	4	5
119	changes in skin condition	1	2	3	4	5
120	need of fluid therapy	1	2	3	4	5
121	need of patient education	1	2	3	4	5
122	need of mental support	1	2	3	4	5

***I have experience of an intensive and critical care patient`s***

123	support of vital functions	1	2	3	4	5
124	pain care	1	2	3	4	5
125	skin care	1	2	3	4	5
126	fluid therapy	1	2	3	4	5
127	patient education	1	2	3	4	5
128	mental support	1	2	3	4	5

***I have experience of adhering to***

129	nurses` ethical code	1	2	3	4	5
130	general health care legislation	1	2	3	4	5
131	organ transplantation law	1	2	3	4	5
132	economic efficiency	1	2	3	4	5

***I have experience of***

133	making work-related decisions	1	2	3	4	5
134	solving work-related problems	1	2	3	4	5
135	thinking critically	1	2	3	4	5
136	prioritising my own work	1	2	3	4	5

***I have experience of developing***

137	my team	1	2	3	4	5
138	myself in work	1	2	3	4	5
139	Nursing	1	2	3	4	5
140	my subordinate skills	1	2	3	4	5

***I have experience of collaboration***

141	within my own profession	1	2	3	4	5
142	Multiprofessionally	1	2	3	4	5
143	with other health care units	1	2	3	4	5
144	with a patient`s significant others	1	2	3	4	5

## Appendix H: Survey questionnaire (Q2)

The logo for AUT (Auckland University of Technology) is displayed in white text on a black background.

TE WĀNANGA ARONUI  
O TĀMAKI MAKAU RAU

Study Site:.....

Code Number:.....

**Study Title:** Development of an in-service training programme for critical care nurses in Malawi

The questionnaire has two sections, A and B. Please respond to all questions with honesty, completeness and accuracy. Please use a pencil to complete the questionnaire. The questionnaire will take 10 to 15 minutes to complete.

### **SECTION A: ADDITIONAL COMPETENCES**

**Instruction:** The following statements relate to competence in intensive and critical care nursing. Assess your competence by ticking the number which corresponds with your perceived competence on the following scale:

1= Poor competence

2= Moderate competence

3= Good competence

4= Excellent competence

**NOTE:** There are no correct or error options.

1	Meeting nutritional needs of patients	1	2	3	4
2	Recognition and management of electrolyte imbalance	1	2	3	4
3	Performing Cardiopulmonary Resuscitation (CPR)	1	2	3	4
4	Caring for a patient with endotracheal tube	1	2	3	4
5	Caring for a patient with tracheostomy	1	2	3	4
6	Basic interpretation of electrocardiogram (ECG)	1	2	3	4
7	Preparation and management of emergency drugs	1	2	3	4
8	Documentation of patient care	1	2	3	4
9	Interpretation of arterial blood gases	1	2	3	4
10	Implementation of discharge plan	1	2	3	4

## **SECTION B: TRAINING APPROACH**

**Instruction:** Please answer as many questions as possible. This will help us in planning and preparing for the in-service training.

1. List the topics that you would want to learn in an in-service training programme
  - i. ....
  - ii. ....
  - iii. ....
  - iv. ....
  - v. ....
2. Which of the following instructional techniques would be appropriate for an in-service training programme? (Please circle as many as apply)
  - i. Group discussion
  - ii. Lectures
  - iii. Practical exercises
  - iv. Other. Specify.....
3. Which of the following instructional materials and aids should be used during the in-service training programme?
  - i. Powerpoint presentation
  - ii. Video clips
  - iii. Presentation handouts
  - iv. Other. Specify.....
4. Who should be involved in the facilitation of the in-service training?
  - i. Fellow nurses
  - ii. Physicians
  - iii. Anaesthetists
  - iv. Other. Specify.....
5. How much time would you spare for an in-service training?
  - i. 1 hour/day
  - ii. 2 hours/day
  - iii. 1 day

Other. Specify.....

# Appendix I: Permission for ICCN-CS-1

PhD, RN Riitta-Liisa Lakanmaa  
Address: Betanankatu 12 B 26, 20810 Turku, Finland, EUROPE  
Email: [riitta-liisa.lakanmaa@turkuamk.fi](mailto:riitta-liisa.lakanmaa@turkuamk.fi)  
Phone: +358 50 3652885

## AGREEMENT FORM

### Intensive and Critical Care Nursing Competence Scale Version 1 / ICCN-CS-1 The permission to use the scale ICCN-CS-1

Free of charge with this form. Not for commercial purposes or for workforce agencies. When the signed agreement form is received, and the use of the scale is accepted, the ICCN-CS-1 will be sent to the applicant.

#### A What will be applied?

\_\_\_ Permission to translate the scale into another language / language \_\_\_\_\_  
☒ Permission to use the English version \_\_\_\_\_ Permission to use the Finnish version \_\_\_\_\_

#### B Background information of the applicant and the usage of the scale

1. Name: RODWELL GUNDO
2. Address: ROOM 26B, 42 AKORANGA DRIVE, AUCKLAND 0627, NEW ZEALAND
3. Email: rogundo@yahoo.co.uk
4. Phone: (+64) 022 671 6322
5. Education: MSc NURSING 6. Position in the organization: PhD student
7. The organization where the scale will be used: CRITICAL CARE UNITS (ICU & HDU) IN MALAWI
8. Purpose of using the scale: PhD study - ASSESSMENT OF CONTINUING EDUCATION NEEDS
9. Setting (where the scale will be used): ICUs AND HDUs IN MALAWI
10. Sample (how many nurses will reply the scale): 100 NURSES
11. The plan of the data gathering (how the data will be gathered; electronically \_\_\_ "paper and pencil" test) ☒

#### C Rules of the usage of the scale

1. The scale will be used as whole not parts of it.
2. The scale or part of it will not be published anywhere.
3. When using the translation the ICCN-CS-1, the permission to use the scale has to be applied also from the original developer PhD Riitta-Liisa Lakanmaa.
4. Copyright of the original ICCN-CS-1 should be presented in the copies of translation of ICCN-CS-1:  
Copyright Lakanmaa ICCN-CS-1 (original).
5. The translation of ICCN-CS-1 should be sent to original developer PhD Riitta-Liisa Lakanmaa (email/mail)
6. The results of the study, project or work where the scale has been used will be reported to PhD Riitta-Liisa Lakanmaa for the further development of the ICCN-CS-1 scale.
7. The results of the scale when published in the articles will be informed or sent to PhD Riitta-Liisa Lakanmaa for further development of the scale and for the accounting purposes of the ICCN-CS-1.
8. The ICCN-CS-1 will be used in a study process, which has an ethical approval. / The study fulfils the national standards for the study that kind.

I hereby agree and confirm all above mentioned issues. (Tick the box, please)



Date 12/06/2015 Place AUT UNIVERSITY, NEW ZEALAND

Signature TD 3 (Clarification of the name here) RODWELL GUNDO

## Appendix J: Focus group discussion participant information sheet

The logo for the Auckland University of Technology (AUT) is displayed in white text on a black rectangular background.

TE WĀNANGA ARONUI  
O TĀMAKI MAKAU RAU

### Date Information Sheet Produced

22th November 2015

### Project Title

Development of an in-service training programme for critical care nurses in Malawi.

### An Invitation

Hello, my name is Rodwell Gundo, a Malawian nurse employed by Ministry of Health. Currently, I am pursuing Doctor of Philosophy (PhD) studies in Nursing at Auckland University of Technology in New Zealand. I intend to conduct a study in Intensive Care Unit (ICU) and adult High Dependency Unit (HDU) as a requirement for the PhD programme. I would like to invite you to participate in the study to explore learning needs of nurses who work in ICU and adult HDU which will guide development of an in-service training programme which suits the Malawi context.

I previously worked in Intensive Care Unit (ICU) at Hospital A before being seconded by Ministry of Health to teach at Kamuzu College of Nursing. You will not be advantaged or disadvantaged in any way if you decide to participate or not. Your participation is voluntary and you will be allowed to withdraw at any time prior to completion of the data collection in June, 2016.

### What is the purpose of this research?

The purpose of the study is to explore learning needs of nurses who work in ICU and adult HDU. The identified learning needs will guide development and implementation of an in-service training programme. The research outputs expected from the findings of the study will include thesis, journal article, conference papers and other academic publications or presentations.

### How was I identified and why am I being invited to participate in this research?

All nurses who work in ICU and adult HDUs at Hospitals A and B have been invited to participate in the study. This invitation has been sent to you as a nurse who works in one of these critical care units. This criteria excludes nurses who are on orientation.

A presentation was done by the primary researcher at a departmental meeting to create awareness about the study. In addition, posters with details of the study, contact details of the researcher and research assistant were posted in each of the critical care units, inviting nurses who would be willing to participate in the study. The nurses who are willing to participate in the study are requested to contact the research assistant.

### **What will happen in this research?**

The study aims to identify learning needs of critical care nurses which will guide development of an in-service training programme. The training programme will be implemented at the two hospitals. This will be followed by an evaluation of the training programme.

If you decide to take part in this research, a research assistant will pass on an envelope with a consent form to sign. The signed consent form will be collected by the same individual at your convenient time.

As soon as I receive the consent form, I will invite you to take part in the focus group discussion. Details on the venue and time will be included in the invitation. The focus groups will be group discussions with fellow nurses who work in ICU or adult HDUs. The discussion is expected to take 2 to 3 hours and will focus on:

- Your competences in the management of critically ill patients
- Your learning needs for the management of critically ill patients
- Suggestions on the approach for the in-service training programme

The discussion will be conducted in English language. It is essential to make accurate representation of what is discussed. Based on your consent, the group discussions will be audio taped and handwritten notes will be taken during the discussion by a research assistant. Later, I will request a transcriptionist to write down what is said in the audio recording.

I will emphasize the need to maintain group confidentiality at each focus group discussion. It is important to note that you are not allowed to share 'who said what' with anyone outside the group. If you become tired or wish to attend to something urgent, you will be allowed to leave the discussion early. The findings from this study will be presented at the two hospitals and in my doctoral thesis, journal articles and conference presentations.

### **What are the discomforts and risks?**

You may feel embarrassed in discussing your competences and learning needs on management of critically ill patients.

### **How will these discomforts and risks be alleviated?**

I would like to assure you that the findings will only be used to identify learning needs which will guide development of an in-service training programme. I will also emphasize the need for group confidentiality at each focus group discussion. In addition, you will be allowed not to answer certain questions or ask the audio tape to be turned off or leave the group session without giving a reason.

### **What are the benefits?**

The study aims to develop an in-service training programme for nurses who work in ICU and adult HDUs in Malawi. Currently, there is no training institution which offers

critical care nursing course in the country. You may not directly benefit from the study but your views will contribute to a programme which suits the context in Malawi.

It is expected that the nurses who will undergo training in this study will gain competences required for the care of critically ill patients. The in-service training programme will be used for orientation and continuing education activities for critical care nurses in the country. This will improve the quality of critical care and patient outcomes. It is also envisaged that the findings will inform nurse educators on what could be included in training curriculum for nurses. In the absence of post-registration programme in critical care nursing, the findings will guide training institutions, policy makers and donors in the development of such programmes for the country. Furthermore, the findings will contribute to a body of knowledge on critical care nursing which does not exist in most developing countries including Malawi. Finally, the potential benefit to the researcher is that the study will lead to the award of PhD qualification.

### **How will my privacy be protected?**

A pseudonym of your choice will be used instead of personal names during the discussion, analyses and reporting to protect your confidentiality. Any identification details will be changed in the records/transcripts and resulting research publications. In addition, names of the two hospitals where the study will be conducted will not be reported anywhere after the study.

The research assistant and transcriptionist will sign confidentiality agreements protecting your identity. In Malawi, the data will securely kept in locked filing cabinets in the office of my third supervisor, Professor Ellen Chirwa at Kamuzu College of Nursing, Blantyre campus. In New Zealand, all the data will be securely kept in locked filing cabinets for up to 6 years in the offices of my primary and secondary research supervisors, Dr. Gael Mearns and Dr. Annette Dickinson. Their offices are located in the School of Clinical Sciences, Auckland University of Technology, Auckland, New Zealand. The three supervisors and I will have access to the information. After 6 years all the study material, transcripts and audio tapes will be destroyed.

### **What are the costs of participating in this research?**

You are not expected to incur any expenses. However, if you will travel from home to attend the focus group discussion, I will refund the cost. The focus group discussion is expected to take 2 to 3 hours but this may extend depending on contribution from group members.

### **What opportunity do I have to consider this invitation?**

Participation is voluntary. You have up to 2 weeks to consider this invitation. You can get in touch with me if you have questions or require clarification.

### **How do I agree to participate in this research?**

Should you agree to participate, you will be required to sign a consent form. The signed consent should be submitted to the research assistant (if you are based at Kamuzu Central Hospital) or to me if you are based at Queen Elizabeth Central Hospital.

### **Will I receive feedback on the results of this research?**



Yes. Upon completion of Phase 2 of the study – identification of programme ideas/needs assessment, the findings will be presented to the participants, health professionals and hospital authorities. Similarly, the findings will be shared with participants, other health professionals and authorities at the two hospitals at the end of the study. You can also request for a summary of the findings by indicating on the consent form.

### **What do I do if I have concerns about this research?**

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Gael Mearns, email address: gael.mearns@aut.ac.nz or (+64) 99219999 extension 7108

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTECH, Kate O'Connor, ethics@aut.ac.nz , (+64) 921 9999 ext 6038 or National Health Sciences Research Committee, Ministry of Health, P.O. Box 30377, Lilongwe 3. Tel: +265 1 726422/418, Email: mohdoccentre@gmail.com.

### **Whom do I contact for further information about this research?**

#### *Researcher Contact Details:*

Rodwell Gundo, Kamuzu College of Nursing, rogundo@yahoo.co.uk, Malawi (+265) 888366130, New Zealand (+64)226716322.

Research Assistant at Hospital A: Chifundo Thamala, 0995682873/0881596283

Research Assistant at Hospital B: Maness Mlaviwa, 0999764020/0884266642

#### *Project Supervisor Contact Details:*

Dr Gael Mearns, Auckland University of Technology, email address: gael.mearns@aut.ac.nz or (+64) 99219999 extension 7108

Dr. Annette Dickinson, Auckland University of Technology, email address: Annette.dickinson@aut.ac.nz or (+64)99219999 extension 7337

Professor Ellen Chirwa, email address: embweza@kcn.unima.mw or (+265) 1874898

Approved by the Auckland University of Technology Ethics Committee on 10th December, 2015, AUTECH Reference number 15/439 and National Health Sciences Research Committee in Malawi, Reference Number NHSRC#1533

## Appendix K: Key informant participant information sheet

The logo for the Auckland University of Technology (AUT) is displayed in white text on a black rectangular background.

TE WĀNANGA ARONUI  
O TĀMAKI MAKĀU RAU

### Date Information Sheet Produced:

22th November 2015

### Project Title

Development of an in-service training programme for critical care nurses in Malawi.

### An Invitation

Hello, my name is Rodwell Gundo, a Malawian nurse employed by Ministry of Health. Currently, I am pursuing Doctor of Philosophy (PhD) studies in Nursing at Auckland University of Technology in New Zealand. I intend to conduct a study in Intensive Care Unit (ICU) and adult High Dependency Unit (HDU) as a requirement for the PhD programme. I would like to invite you to participate in the study to explore learning needs of nurses who work in ICU and adult HDU which will guide development of an in-service training programme which suits the Malawi context.

I previously worked in Intensive Care Unit (ICU) at Hospital A before being seconded by Ministry of Health to teach at Kamuzu College of Nursing. You will not be advantaged or disadvantaged in any way if you decide to participate or not. Your participation is voluntary and you will be allowed to withdraw at any time prior to completion of the data collection in June, 2016.

### What is the purpose of this research?

The purpose of the study is to explore learning needs of nurses who work in ICU and adult HDU. The identified learning needs will guide development and implementation of an in-service training programme. The research outputs expected from the findings of the study will include thesis, journal article, conference papers and other academic publications or presentations.

### How was I identified and why am I being invited to participate in this research?

This invitation has been sent to you as a nurse leader who supervises nurses in one of these critical care units or an anaesthetist who works in CCU. This criteria excludes professionals who are on orientation.

A presentation was done by the primary researcher at a departmental meeting to create awareness about the study. In addition, posters with details of the study, contact details of the researcher and research assistant were posted in each of the critical care units, inviting nurses who would be willing to participate in the study. The nurses who are willing to participate in the study are requested to contact the research assistant.

### **What will happen in this research?**

The study aims to identify learning needs of critical care nurses which will guide development of an in-service training programme. The training programme will be implemented at two hospitals. This will be followed by an evaluation of the training programme.

If you decide to take part in this research, a research assistant will pass on an envelope with a consent form to sign. The signed consent form will be collected by the same individual at your convenient time. As soon as I receive the consent form, I will invite you for an interview. You will be requested to indicate the venue and time which is convenient to you. I will conduct the interview and will focus on the following areas:

- Competences and learning needs of the nurses who work in ICU or adult HDU
- Suggestions on topics that should be included in the in-service training programme
- Suggestions on the approach for the in-service training programme

The interview will be conducted in English language. However, you will also be allowed to use vernacular language, Chichewa where necessary. It is essential to make accurate representation of what is discussed. Based on your consent, the interview will be audio taped and handwritten notes will be taken during the interview. Later, I will request a transcriptionist to write down what is said in the audio recording and translating Chichewa words into English. The findings from this study will be presented at the two hospitals and in my doctoral thesis, journal articles and conference presentations.

### **What are the discomforts and risks?**

You may feel embarrassed in discussing competences of nurses who work under your supervision.

### **How will these discomforts and risks be alleviated?**

I would like to assure you that the findings will only be used to identify learning needs which will guide development of an in-service training programme. In addition, you will be allowed not to answer certain questions or ask the audio tape to be turned off when you want to talk about anything that is sensitive.

### **What are the benefits?**

You may not directly benefit from the study but your views will contribute to a programme which suits the context in Malawi. It is expected that the nurses who will undergo training in this study will gain competences required for the care of critically ill patients. The in-service training programme will be used for orientation and continuing education activities for critical care nurses in the country. This will improve the quality of critical care and patient outcomes.

It is also envisaged that the findings will inform nurse educators on what could be included in training curriculum for nurses. In the absence of post-registration programme in critical care nursing, the findings will guide training institutions, policy

makers and donors in the development of such programmes for the country. Furthermore, the findings will contribute to a body of knowledge on critical care nursing which does not exist in most developing countries including Malawi. Finally, the potential benefit to the researcher is that the study will lead to the award of PhD qualification.

### **How will my privacy be protected?**

A pseudonym of your choice will be used instead of personal names during the interview, analyses and reporting to protect your confidentiality. Any identification details will be changed in the records/transcripts and resulting research publications. In addition, names of the two hospitals where the study will be conducted will not be reported anywhere after the study.

The research assistant and transcriptionist will sign confidentiality agreements protecting your identity. In Malawi, the data will securely kept in locked filing cabinets in the office of my third supervisor, Professor Ellen Chirwa at Kamuzu College of Nursing, Blantyre campus. In New Zealand, all the data will be securely kept in locked filing cabinets for up to 6 years in the offices of my primary and secondary research supervisors, Dr. Gael Mearns and Dr. Annette Dickinson. Their offices are located in the School of Clinical Sciences, Auckland University of Technology, Auckland, New Zealand. The three supervisors and I will have access to the information. After 6 years all the study material, transcripts and audio tapes will be destroyed.

### **What are the costs of participating in this research?**

You are not expected to incur any expenses. However, if you will travel from home to attend the interview, I will refund the transport cost. The interview is expected to take 2 to 3 hours but this may extend depending on your contributions. Refreshments and snacks will be provided at the end of the interview.

### **What opportunity do I have to consider this invitation?**

Participation is voluntary. You have up to 2 weeks to consider this invitation. You can get in touch with me if you have questions or require clarification.

### **How do I agree to participate in this research?**

Should you agree to participate, you will be required to sign a consent form. The signed consent should be submitted to the research assistant

### **Will I receive feedback on the results of this research?**

Yes. Upon completion of Phase 2 of the study – identification of programme ideas/needs assessment, the findings will be presented to the participants, health professionals and hospital authorities. Similarly, the findings will be shared with participants, other health professionals and authorities at the two hospitals at the end of the study. You can also request for a summary of the findings by indicating on the consent form.

### **What do I do if I have concerns about this research?**

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Gael Mearns, email address: gael.mearns@aut.ac.nz or (+64) 99219999 extension 7108

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTECH, Kate O'Connor, ethics@aut.ac.nz , (+64) 921 9999 ext 6038.

**Whom do I contact for further information about this research?**

*Researcher Contact Details:*

Rodwell Gundo, Kamuzu College of Nursing, rogundo@yahoo.co.uk, Malawi (+265) 888366130, New Zealand (+64)226716322.

Research Assistant at Hospital A: Chifundo Thamala, 0995682873/0881596283

Research Assistant at Hospital B: Maness Mlaviwa, 0999764020/0884266642

*Project Supervisor Contact Details:*

Dr Gael Mearns, Auckland University of Technology, email address: gael.mearns@aut.ac.nz or (+64) 99219999 extension 7108

Dr. Annette Dickinson, Auckland University of Technology, email address: Annette.dickinson@aut.ac.nz or (+64)99219999 extension 7337

Professor Ellen Chirwa, email address: embweza@kcn.unima.mw or (+265) 1874898

Approved by the Auckland University of Technology Ethics Committee on 10th December, 2015, AUTECH Reference number 15/439 and National Health Sciences Research Committee in Malawi, Reference Number NHSRC#1533

## Appendix L: Confidentiality agreement – Research Assistant

AUT

TE WĀNANGA ARONUI  
O TĀMAKI MAKĀU RAU

*Project title: Development of an in-service training programme for critical care nurses in Malawi.*

*Project Supervisor: Dr. Gael Mearns (Primary Supervisor), Dr. Annette Dickinson (Secondary Supervisor), Professor Ellen Chirwa (Local Supervisor)*

*Researcher: Rodwell Gundo*

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- ☐ I understand that all the material I will be asked to record is confidential.
- ☐ I understand that the contents of the Consent Forms, tapes, or interview notes can only be discussed with the researchers.
- ☐ I will not keep any copies of the information nor allow third parties access to them.

Intermediary's signature:.....

Intermediary's name: .....

Intermediary's Contact Details (if appropriate):

.....  
.....

Date:

Project Supervisor's Contact Details (if appropriate):

.....  
.....  
.....

**Approved by the Auckland University of Technology Ethics Committee on 10<sup>th</sup> December, 2015, AUTEK Reference number 15/439 and National Health Sciences Research Committee in Malawi, Reference Number #1533**

*Note: The Intermediary should retain a copy of this form.*

## Appendix M: Interview guide for focus group discussions

The logo for AUT (Auckland University of Technology) is displayed in white text on a black rectangular background.

TE WĀNANGA ARONUI  
O TĀMAKI MAKAU RAU

**Study Title:** Development of an in-service training programme for critical care nurses in Malawi

1. How would you describe your experience in the critical care unit (CCU)?  
*Prompt: do you feel adequately prepared to work in ICU or HDU?*
2. How would you describe your competences in the management of critically ill patients?  
*Prompt: Your knowledge on management of critically ill patients?*  
*Prompt: Your skill on management of critically ill patients?*  
*Prompt: Your attitude and value when caring for critically ill patients?*  
*Prompt: Your experience in managing critically ill patients?*
3. What are your learning needs for critical care nursing practice?  
*Prompt: Knowledge on management of critically ill patients?*  
*Prompt: Skill on management of critically ill patients?*  
*Prompt: Attitude and value when caring for critically ill patients?*  
*Prompt: Experience in managing critically ill patients?*
4. We are intending to develop, implement and evaluate an in-service training programme for nurses working in ICU and adult HDU. What do you think about this idea?
5. What are your suggestions on the topics that should be included in the in-service training programme?
6. What are your suggestions on the approach for the in-service training programme?  
*Prompt: instructional techniques? E.g. lectures, group discussion.*  
*Prompt: instructional material? E.g. video clip*  
*Prompt: duration?*  
*Prompt: venue?*
7. Is there anything that you wish to add?

This marks the end of the focus group discussion. Thank you very much for your participation.

## Appendix N: Interview guide for key informant interviews

The logo for AUT (Auckland University of Technology) is displayed in white text on a black rectangular background.

TE WĀNANGA ARONUI  
O TĀMAKI MAKĀU RAU

**Study Title:** Development of an in-service training programme for critical care nurses in Malawi

1. How would you describe the experience of nurses in critical care unit (ICU/adult HDU)?  
*Prompt: do you feel adequately prepared to work in ICU or HDU?*
2. How would you describe the nurses' competences in the management of critically ill patients?  
*Prompt: Knowledge on management of critically ill patients?*  
*Prompt: Skill on management of critically ill patients?*  
*Prompt: Attitude and value when caring for critically ill patients?*  
*Prompt: Experience in managing critically ill patients?*
3. What do you think are the learning needs of the nurses in ICU or adult HDU?  
*Prompt: Knowledge on management of critically ill patients?*  
*Prompt: Skill on management of critically ill patients?*  
*Prompt: Attitude and value when caring for critically ill patients?*  
*Prompt: Experience in managing critically ill patients?*
4. We are intending to develop, implement and evaluate an in-service training programme for nurses working in ICU and adult HDU. What do you think about this idea?
5. What are your suggestions on the topics that should be included in the in-service training programme?
6. What are your suggestions on the approach for the in-service training programme?  
*Prompt: instructional techniques? E.g. lectures, group discussion.*  
*Prompt: instructional material? E.g. video clip*  
*Prompt: duration?*  
*Prompt: venue?*
7. Is there anything that you wish to add?

This marks the end of the interview. Thank you very much for your participation.



## Appendix O: Confidentiality agreement – Transcriptionist

AUT

TE WĀNANGA ARONUI  
O TĀMAKI MAKAU RAU

*Project title: Development of an in-service training programme for critical care nurses in Malawi.*

*Project Supervisor: Dr. Gael Mearns (Primary Supervisor), Dr. Annette Dickinson (Secondary Supervisor), Professor Ellen Chirwa (Local Supervisor)*

*Researcher: Rodwell Gundo*

---

- ☐ I understand that all the material I will be asked to transcribe is confidential.
- ☐ I understand that the contents of the tapes or recordings can only be discussed with the researchers.
- ☐ I will not keep any copies of the transcripts nor allow third parties access to them.

Transcriber's signature:.....

Transcriber's name:.....

Transcriber's Contact Details (if appropriate):

.....  
.....

Date:

Project Supervisor's Contact Details (if appropriate):

.....  
.....

**Approved by the Auckland University of Technology Ethics Committee on 10<sup>th</sup> December, 2015, AUTEK Reference number 15/439 and National Health Sciences Research Committee in Malawi, Reference Number #1533**

*Note: The Transcriber should retain a copy of this form.*

## Appendix P: Training participant information sheet

The logo for the Auckland University of Technology (AUT) is displayed in white text on a black rectangular background.

TE WĀNANGA ARONUI  
O TĀMAKI MAKĀU RAU

### **Date Information Sheet Produced:**

22th November, 2015

### **Project Title**

Development of an in-service training programme for critical care nurses in Malawi.

### **An Invitation**

Hello, my name is Rodwell Gundo, a Malawian nurse employed by Ministry of Health. Currently, I am pursuing Doctor of Philosophy (PhD) studies in Nursing at Auckland University of Technology in New Zealand. I intend to conduct a study in Intensive Care Unit (ICU) and adult High Dependency Unit (HDU) as a requirement for the PhD programme. I would like to invite you to participate in the study to explore learning needs of nurses who work in ICU and adult HDU which will guide development of an in-service training programme which suits the Malawi context.

I previously worked in Intensive Care Unit (ICU) at Hospital A before being seconded by Ministry of Health to teach at Kamuzu College of Nursing. You will not be advantaged or disadvantaged in any way if you decide to participate or not. Your participation is voluntary and you will be allowed to withdraw at any time prior to completion of the data collection in June, 2016.

### **What is the purpose of this research?**

The purpose of the study is to explore learning needs of nurses who work in ICU and adult HDU. The identified learning needs will guide development and implementation of an in-service training programme. The research outputs expected from the findings of the study will include thesis, journal article, conference papers and other academic publications or presentations.

### **How was I identified and why am I being invited to participate in this research?**

All nurses who work in ICU and adult HDUs at the two hospitals have been invited to participate in the study. This invitation has been sent to you as a nurse who works in one of these critical care units. This criteria excludes nurses who are on orientation.

A presentation was done by the primary researcher at a departmental meeting to create awareness about the study. In addition, posters with details of the study, contact details of the researcher and research assistant were posted in each of the critical care units, inviting nurses who would be willing to participate in the study. The nurses who are willing to participate in the study are requested to contact the research assistant.

### **What will happen in this research?**

The study aims to identify learning needs of critical care nurses which will guide development of an in-service training programme. The training programme will be implemented at two hospitals. This will be followed by an evaluation of the training programme.

If you decide to take part in the in-service training, a research assistant will pass on an envelope with a consent form to sign. The signed consent form will be collected by the same individual at your convenient time.

As soon as I receive the consent form, I will seek permission from the nurse leaders at the hospital for you to attend the training. I will then invite you to attend the in-service training. Details on the venue and time will be included in the invitation. The content will focus on the learning needs identified by nurses who work in ICU and HDUs. The in-service training will be conducted in English. At the beginning of the training, you will be requested to complete two questionnaires. The first questionnaire is Intensive and Critical Care Nursing Competence Scale (Q1). Using this questionnaire you will be required to assess your competences in intensive and critical care nursing. Completion of the questionnaire takes 20 to 30 minutes. The second questionnaire (Q2) will explore your ideas on the approach to be used for the in-service training. Completion of this questionnaire takes 5 to 10 minutes.

At the end of the training, you will also be requested to complete two questionnaires, Intensive and Critical Care Nursing Competence Scale (Q1) and Post-course evaluation questionnaire (Q3). Completion of the evaluation questionnaire takes 5 to 10 minutes.

I will emphasize the need to maintain group confidentiality at each training session. It is important to note that you are not allowed to share 'who said what' with anyone outside the group. If you become tired or wish to attend to something urgent, you will be allowed to leave the in-service training. The findings from this study will be presented at the two hospitals and in my doctoral thesis, journal articles and conference presentations.

### **What are the discomforts and risks?**

You may feel embarrassed in discussing your competences and learning needs on management of critically ill patients during the training.

### **How will these discomforts and risks be alleviated?**

I would like to assure you that the findings will only be used to identify learning needs which will guide development of an in-service training programme. I will also emphasize the need for group confidentiality at each training session.

### **What are the benefits?**

It is expected that you will gain intensive and critical care nursing competences during the training. You will also earn points for continuing professional development (CPD) after attending the training. The CPD points are required for annual renewal of registration with Nurses and Midwives Council of Malawi.

Your views during the training will contribute to improvement of the programme so that it suits the context in Malawi. The in-service training programme will be used for orientation and continuing education activities for critical care nurses in the country. This will improve the quality of critical care and patient outcomes. It is also envisaged that the findings will inform nurse educators on what could be included in training curriculum for nurses. In the absence of post-registration programme in critical care nursing, the findings will guide training institutions, policy makers and donors in the development of such programmes for the country. Furthermore, the findings will contribute to a body of knowledge on critical care nursing which does not exist in most developing countries including Malawi. Finally, the potential benefit to the researcher is that the study will lead to the award of PhD qualification.

### **How will my privacy be protected?**

Code numbers instead of personal names will be used during data collection, analyses and reporting to protect your confidentiality. Any identification details will be changed in the records and resulting research publications. In addition, names of the two hospitals where the study will be conducted will not be reported anywhere after the study.

The research assistant will sign confidentiality agreements protecting your identity. In Malawi, the data will be securely kept in locked filing cabinets in the office of my third supervisor, Professor Ellen Chirwa at Kamuzu College of Nursing, Blantyre campus. In New Zealand, all the data will be securely kept in locked filing cabinets for up to 6 years in the offices of my primary and secondary research supervisors, Dr. Gael Mearns and Dr. Annette Dickinson. Their offices are located in the School of Clinical Sciences, Auckland University of Technology, Auckland, New Zealand. The three supervisors and I will have access to the information. After 6 years all the study material, transcripts and audio tapes will be destroyed.

### **What are the costs of participating in this research?**

You are not expected to incur any expenses. However, if you will travel from home to the venue of the in-service training programme, I will refund the transport cost. Refreshments and snacks will be provided during the training. In cases where a session takes the whole day, lunch will be provided to the participants.

### **What opportunity do I have to consider this invitation?**

Participation is voluntary. You have up to 2 weeks to consider this invitation. You can get in touch with me if you have questions or require clarification.

### **How do I agree to participate in this research?**

Should you agree to participate, you will be required to sign a consent form. The signed consent should be submitted to the research assistant (if you are based at Kamuzu Central Hospital) or to me if you are based at Queen Elizabeth Central Hospital.

### **Will I receive feedback on the results of this research?**

Yes. The findings will be shared with participants, other health professionals and authorities at the two hospitals at the end of the study. You can also request for a summary of the findings by indicating on the consent form.

**What do I do if I have concerns about this research?**

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Gael Mearns, email address: gael.mearns@aut.ac.nz or (+64) 99219999 extension 7108

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTECH, Kate O'Connor, ethics@aut.ac.nz , (+64) 921 9999 ext 6038.

**Whom do I contact for further information about this research?**

*Researcher Contact Details:*

Rodwell Gundo, Kamuzu College of Nursing, rogundo@yahoo.co.uk, Malawi (+265) 888366130, New Zealand (+64)226716322.

Research Assistant at Hospital A: Chifundo Thamala, 0995682873/0881596283

Research Assistant at Hospital B: Maness Mlaviwa, 0999764020/0884266642

*Project Supervisor Contact Details:*

Dr Gael Mearns, Auckland University of Technology, email address: gael.mearns@aut.ac.nz or (+64) 99219999 extension 7108

Dr. Annette Dickinson, Auckland University of Technology, email address: Annette.dickinson@aut.ac.nz or (+64)99219999 extension 7337

Professor Ellen Chirwa, email address: embweza@kcn.unima.mw or (+265) 1874898

Approved by the Auckland University of Technology Ethics Committee on 10th December, 2015, AUTECH Reference number 15/439 and National Health Sciences Research Committee in Malawi, Reference Number NHSRC#1533

## Appendix Q: Consent form – In-service Training Participant

**AUT**

TE WĀNANGA ARONUI  
O TĀMAKI MAKĀU RAU

*Project title: Development of an in-service training programme for critical care nurses in Malawi.*

*Project Supervisor: Dr. Gael Mearns (Primary Supervisor), Dr. Annette Dickinson (Secondary Supervisor), Professor Ellen Chirwa (Local Supervisor)*

*Primary Researcher: Rodwell Gundo*

- 
- ☐ I have read and understood the information provided about this research project in the Information Sheet dated 22<sup>nd</sup> November 2015.
  - ☐ I have had an opportunity to ask questions and to have them answered.
  - ☐ I understand that identity of my fellow participants and our discussions in the in-service training is confidential to the group and I agree to keep this information confidential.
  - ☐ I understand that notes will be taken during the training
  - ☐ I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
  - ☐ If I withdraw, I understand that while it may not be possible to destroy all records of the training of which I was part, the relevant information about myself will not be used.
  - ☐ I agree to take part in this research.
  - ☐ I wish to receive a copy of the report from the research (please tick one): Yes ☐ No ☐

Participant's signature:.....

Participant's name:.....

Participant's Contact Details (if appropriate):

.....  
.....

Date:

**Approved by the Auckland University of Technology Ethics Committee on 10<sup>th</sup> December, 2015, AUTEK Reference number 15/439 and National Health Sciences Research Committee in Malawi, Reference Number #1533**

*Note: The Participant should retain a copy of this form.*

## Appendix R: Survey questionnaire (Q3)

**AUT**

TE WĀNANGA ARONUI  
O TĀMAKI MAKĀU RAU

Study Site:.....

Code Number:.....

**Study Title:** Development of an in-service training programme for critical care nurses in Malawi

**Instruction:** Please assist us in evaluating the quality of the programme by completing the questionnaire. For each question, circle the number that best represents your view: 1 – No, 2 – Somewhat, 3 – Yes, definitely

<b>PART 1: CONTENT AND PROCESS</b>				
1	Were the training objectives clear and realistic?	1	2	3
2	Did you learn what you expected to learn?	1	2	3
3	Was the material presented relevant and valuable to you?	1	2	3
4	Was the material presented at an appropriate rate?	1	2	3
5	Was there an adequate amount of time allocated to each topic?	1	2	3
6	Did the instructional and presentation techniques used adequately assist you in learning the material?	1	2	3
7	If there were opportunities for you to actively participate in the various sessions, was this participation beneficial to you?	1	2	3
8	Could you relate the material to your nursing practice in your particular units?	1	2	3
9	Did the instructional materials and aids used enhance the learning process?	1	2	3
10	Did the planned skill transfer activities assist you in applying what you have learned?	1	2	3

<b>PART 2: FACILITATOR'S SKILLS</b>				
1	Did the facilitators have expert knowledge of the content?	1	2	3
2	Did the facilitators provide you with adequate assistance in learning the material?	1	2	3
3	Did the facilitators cover the content adequately in the allocated time?	1	2	3

<b>PART 3: OVERALL PROGRAMME</b>				
1	Will you be able to apply what you have learned in nursing practice?	1	2	3
2	Were you challenged by the content and the way the material was taught?	1	2	3
3	Was the programme well organized and effectively conducted?	1	2	3
4	How do you rate the programme overall? 1- Not relevant , 2- Relevant, 3- Very relevant	1	2	3

## Appendix S: Post-training interview participant information sheet

The logo for the Auckland University of Technology (AUT) is displayed in white text on a black rectangular background.

TE WĀNANGA ARONUI  
O TĀMAKI MAKAU RAU

### Date Information Sheet Produced:

22th November 2015

### Project Title

Development of an in-service training programme for critical care nurses in Malawi.

### An Invitation

Hello, my name is Rodwell Gundo, a Malawian nurse employed by Ministry of Health. Currently, I am pursuing Doctor of Philosophy (PhD) studies in Nursing at Auckland University of Technology in New Zealand. I intend to conduct a study in Intensive Care Unit (ICU) and adult High Dependency Unit (HDU) as a requirement for the PhD programme. I would like to invite you to participate in the study to explore learning needs of nurses who work in ICU and adult HDU which will guide development of an in-service training programme which suits the Malawi context.

I previously worked in Intensive Care Unit (ICU) at hospital A before being seconded by Ministry of Health to teach at Kamuzu College of Nursing. You will not be advantaged or disadvantaged in any way if you decide to participate or not. Your participation is voluntary and you will be allowed to withdraw at any time prior to completion of the data collection in June, 2016.

### What is the purpose of this research?

The purpose of the study is to explore learning needs of nurses who work in ICU and adult HDU. The identified learning needs will guide development and implementation of an in-service training programme. The research outputs expected from the findings of the study will include thesis, journal article, conference papers and other academic publications or presentations.

### How was I identified and why am I being invited to participate in this research?

This invitation has been sent to you as a nurse who attended the in-service training which was developed based on identified learning needs. You are being invited to provide feedback on the in-service training programme.

### What will happen in this research?

If you decide to take part in this research, a research assistant will pass on an envelope with a consent form to sign. The signed consent form will be collected by the same individual at your convenient time.



As soon as I receive the consent form, I will invite you for an interview. You will be requested to indicate the venue and time which is convenient to you. I will conduct the interview and will focus on the following areas:

- Whether the training met your expectations or not
- Your suggestions on how to improve the training

The interview will be conducted in English language. However, you will also be allowed to use vernacular language, Chichewa where necessary. It is essential to make accurate representation of what is discussed. Based on your consent, the interview will be audio taped and handwritten notes will be taken during the interview. Later, I will request a transcriptionist to write down what is said in the audio recording and translating Chichewa words into English. The findings from this study will be presented at the two hospitals and in my doctoral thesis, journal articles and conference presentations.

### **What are the discomforts and risks?**

You may feel embarrassed in discussing your competences on management of critically ill patients after attending the in-service training.

### **How will these discomforts and risks be alleviated?**

I would like to assure you that the findings will only be used to improve the training programme. In addition, you will be allowed not to answer certain questions or ask the audio tape to be turned off during the training.

### **What are the benefits?**

You may not directly benefit anything after the interview but your views will help to improve the programme. It is expected that the programme will be used for orientation and continuing education activities for critical care nurses in the country. This will improve the quality of critical care and patient outcomes. It is also envisaged that the findings will inform nurse educators on what could be included in training curriculum for nurses. In the absence of post-registration programme in critical care nursing, the findings will guide training institutions, policy makers and donors in the development of such programmes for the country. Furthermore, the findings will contribute to a body of knowledge on critical care nursing which does not exist in most developing countries including Malawi. Finally, the potential benefit to the researcher is that the study will lead to the award of PhD qualification.

### **How will my privacy be protected?**

A pseudonym of your choice will be used instead of personal names during the interview, analyses and reporting to protect your confidentiality. Any identification details will be changed in the records/transcripts and resulting research publications. In addition, names of the two hospitals where the study will be conducted will not be reported anywhere after the study.

The research assistant and transcriptionist will sign confidentiality agreements protecting your identity. In Malawi, the data will securely kept in locked filing cabinets in the office of my third supervisor, Professor Ellen Chirwa at Kamuzu College of

Nursing, Blantyre campus. In New Zealand, all the data will be securely kept in locked filing cabinets for up to 6 years in the offices of my primary and secondary research supervisors, Dr. Gael Mearns and Dr. Annette Dickinson. Their offices are located in the School of Clinical Sciences, Auckland University of Technology, Auckland, New Zealand. The three supervisors and I will have access to the information. After 6 years all the study material, transcripts and audio tapes will be destroyed.

**What are the costs of participating in this research?**

You are not expected to incur any expenses. However, if you will travel from home to attend the interview, I will refund the transport cost. The interview is expected to take 1 to 2 hours but this may extend depending on your contributions. Refreshments and snacks will be provided at the end of the interview.

**What opportunity do I have to consider this invitation?**

Participation is voluntary. You have up to 2 weeks to consider this invitation. You can get in touch with me if you have questions or require clarification.

**How do I agree to participate in this research?**

Should you agree to participate, you will be required to sign a consent form. The signed consent should be submitted to the research assistant.

**Will I receive feedback on the results of this research?**

Yes. The findings will be shared with participants, other health professionals and authorities at the two hospitals at the end of the study. You can also request for a summary of the findings by indicating on the consent form.

**What do I do if I have concerns about this research?**

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Gael Mearns, email address: [gael.mearns@aut.ac.nz](mailto:gael.mearns@aut.ac.nz) or (+64) 99219999 extension 7108

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTECH, Kate O'Connor, [ethics@aut.ac.nz](mailto:ethics@aut.ac.nz) , (+64) 921 9999 ext 6038.

**Whom do I contact for further information about this research?**

*Researcher Contact Details:*

Rodwell Gundo, Kamuzu College of Nursing, [rogundo@yahoo.co.uk](mailto:rogundo@yahoo.co.uk), Malawi (+265) 888366130, New Zealand (+64)226716322.

Research Assistant at Hospital A: Chifundo Thamala, 0995682873/0881596283

Research Assistant at Hospital B: Maness Mlaviwa, 0999764020/0884266642

*Project Supervisor Contact Details:*

Dr Gael Mearns, Auckland University of Technology, email address: [gael.mearns@aut.ac.nz](mailto:gael.mearns@aut.ac.nz) or (+64) 99219999 extension 7108

Dr. Annette Dickinson, Auckland University of Technology, email address:  
Annette.dickinson@aut.ac.nz or (+64)99219999 extension 7337

Professor Ellen Chirwa, email address: embweza@kcn.unima.mw or (+265) 1874898

Approved by the Auckland University of Technology Ethics Committee on 10th  
December, 2015, AUTECH Reference number 15/439 and National Health Sciences  
Research Committee in Malawi, Reference Number NHSRC#1533

## Appendix T: Interview guide for training participants

AUT

TE WĀNANGA ARONUI  
O TĀMAKI MAKAU RAU

**Study Title:** Development of an in-service training programme for critical care nurses in Malawi

1. In general, did the training meet your expectations?  
*Prompt: Was the content presented relevant and valuable to you?*
2. What did you find interesting in relation to management of critically ill patients?  
*Prompt: Knowledge on management of critically ill patients?*  
*Prompt: Skill on management of critically ill patients?*  
*Prompt: Attitude and value when caring for critically ill patients?*  
*Prompt: Experience in managing critically ill patients?*
3. Was the process appropriate?  
*Prompt: Did the facilitators demonstrate expert knowledge?*  
*Prompt: Were techniques used appropriate?*
4. What would you suggest for the improvement of the training?  
*Prompt: In relation to content*  
*Prompt: Approach for knowledge and skill transfer*
5. Is there anything that you wish to add?

This marks the end of the interview. Thank you very much for your participation.

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### U1: Map of Malawi and its location on the African continent (page 9).

Reprinted from “A review of heavy metals in soil and aquatic systems of urban and semi-urban areas in Malawi with comparisons to other selected countries” (Kaonga, C. C., Kosamu, I. B. M., Lakudzala, D. D., Mbewe, R., Thole, B., Monjerezi, M. , ... Sajidu, S. M. I. (2017). *African Journal of Environmental Science and Technology*, 11(9), 450). Copyright 2019 by C.C. Kaonga. Reprinted with permission.

- Request for permission to reproduce image - Map of Malawi (3)

- **Rodwell Gundo** Dear Author, I am a Malawian studying at Auckland University of T

- **Chikumbusko Kaonga** <ckaonga07@gmail.com>

To Rodwell Gundo

Hello,  
Please go ahead that is fine.

Regards,

Kaonga

### U2: Conduction system of the heart (p. 230).


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### U3: Normal sinus rhythm (p. 230).

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#### U4: EKG paper (p. 231)

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#### U5: Heart rate (p. 231)

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### U6: Sinus bradycardia (p. 233)

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### U7: Sinus tachycardia (p. 233)

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## U8: Dysrhythmias (p. 233)

Atrial fibrillation, atrial flutter, and paroxysmal (i.e. sudden onset), supraventricular tachycardia, ventricular fibrillation, and asystole. Reprinted from "Using an algorithm to easily interpret basic cardiac rhythms", by D. Atwood, 2005, *AORN Journal*, 82(5), p.762. Copyright 2019 by John Wiley and Sons

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## U9: Pathophysiology of shock (p. 235)

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## **U11: BLS Healthcare Provider Adult Cardiac Arrest Algorithm—2015 Update (p. 267)**

Reprinted from “Part 5: Adult basic life support and cardiopulmonary resuscitation quality: 2015 American Heart Association guidelines update for cardiopulmonary resuscitation and emergency cardiovascular care”, by M.E. Kleinman, E.E., Brennan, Z.D. Goldberger, R.A. Swor, M. Terry, B.J. Bobrow,...T. Rea, 2015, *Circulation*, 132(suppl 2), p.S418. Copyright 2019 by Wolters Kluwer Health, Inc.

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# Appendix V: Resources for the in-service training programme

## V1 – Background information

<p><b>Background</b></p> <p>Training of critical care nurses in Malawi</p>	<p><b>Background</b></p> <ul style="list-style-type: none"><li>• A Critical Care Unit (CCU) refers to:<ul style="list-style-type: none"><li>• An Intensive Care Unit (ICU)</li><li>• High Dependency Unit (HDU) or</li><li>• A unit which combines the two</li></ul></li><li>• Patients have actual or potential life-threatening conditions</li></ul>
<p><b>Background</b></p> <ul style="list-style-type: none"><li>• Critical care nurses make complex decisions that impact on patients' lives</li><li>• Analogy of critical care nurses to the aeroplane pilots in whose hands people's lives are trusted</li></ul>	<p><b>Background</b></p> <ul style="list-style-type: none"><li>• Disparities exist between countries</li><li>• Lack of resources &amp; shortage of well trained staff</li><li>• No post-registration critical care courses in Malawi</li><li>• Lack of competences contributes to suboptimal care</li></ul>
<p><b>Learning Outcomes</b></p> <ul style="list-style-type: none"><li>• Understand parameters that are used for hemodynamic and respiratory monitoring in critical care units</li><li>• Conduct patient assessment and prioritise actions in managing critical situations</li><li>• Integrate knowledge from nursing science and other sciences in the care of critically ill patients and their families</li></ul>	<p><b>Learning Outcomes</b></p> <ul style="list-style-type: none"><li>• Demonstrate technical skills required for nursing practice critical care unit</li><li>• Understand the management of disease conditions that are common in critical care units</li><li>• Demonstrate appropriate attitude required for practice in critical care setting</li></ul>

## V2 - Nursing care of a critically ill and ventilated patient

### Nursing care of a critically ill and ventilated patient

Training of critical care nurses  
Malawi

#### Learning outcome

Participants will be able to:

- Explain nursing management priorities to ensure patient safety and comfort
- Explain nursing management priorities to ensure patient safety and comfort

#### Background

Nursing management priorities:

Patient safety

- Patient assessment
- Equipment assessment

Patient comfort

- Measures that promote patient's comfort

#### Background

Patient assessment will be covered later in a separate session

Equipment assessment – ensure emergency equipment is available

- Resuscitation bag
- Suction unit
- Oxygen source
- Intubation equipment
- Correct attachment of IVs & monitoring devices

#### Background

- This presentation focuses on patient comfort
- Patient comfort is important in the management of critically ill patients
- Patient comfort comprises positioning, hygiene, management of stressors, pain and sedation management

#### Patient positioning

- Proper positioning improves patient comfort and tissue oxygenation in ventilated patients
- Proper positioning reduces the work of breathing and myocardial workload
- Common positions include supine, semi-recumbent, prone and lateral positions
- Evidence recommends semi-recumbent position for ventilated patients with head of the bed elevated at 30-45°

### Patient positioning

- This reduces ventilator associated pneumonia (VAP)
- Elevation of head of the bed depends on the condition of the patient e.g. head injury and lung injury
- Supine and semi-recumbent positions is recommended for patient care
- Prone position and rotational therapy improve ventilation-perfusion mismatch

### Hygiene

- This comprises interventions that meet the patient's hygiene needs
- The activities include:
  - Eye care
  - Mouth care
  - Bed baths

### Eye care

- Patients who are sedated, unconscious and mechanically ventilated are at risk of corneal dehydration, abrasions and infection due to impaired eye protective measures e.g. blink reflex.
- Assessment and 2 hourly eye care are crucial to prevent dehydration, abrasion and infection
- Saline irrigation, eye drops, taping, ointment gels e.t.c.
- Eye care should be provided in all ICU patients

### Mouth care

- There are various forms of ensuring oral hygiene
- Swabs and soft toothbrushes are commonly used
- Solutions that are used include mouth washes, sodium bicarbonate, hydrogen peroxide, chlorhexidine and fluoride
- Chlorhexidine is recommended because it removes plaque and suppresses pathogens

### Mouth care

- Oral care done 2 to 4 hourly improves oral hygiene
- Ice cubes may be administered to avoid mouth dryness. This promotes patient comfort and assist in reducing bacterial growth
- Oral care in intubated ICU patients promotes physical comfort and prevent nosocomial infections

### Bed baths

- Provides an opportunity for the nurses to assess and communicate to the patient
- Daily bed baths, 'mini wash' and washing of the hair promote comfort and psychological wellbeing
- Urinary catheter is the source of nosocomial infections
- Cleaning of the perineum and meatus should be done twice daily with soap and water

### Management of stressors

- Critical because the CCU environment is stressful to patients
- Most ventilated patients experience:
  - Difficulties to communicate
  - Sleep deprivation
  - Night mares
  - Feelings of isolation and loneliness.

### Communication stressors

- Difficulties in communication is one of the greatest challenges in ventilated patients
- Nurses should use the following to facilitate communication:
  - Positive body language
  - Friendly facial expressions
  - Eye contact
  - Use of questions with a yes/no response

### Sleep disturbance

- Mechanically ventilated patients in ICU normally have sleep disturbances
- Common causes of sleep disturbances are environmental noise (alarms, equipment, telephones and talking, lighting, discomfort, stress and pain
- Inadequate sleep suppresses immunity as a result healing and weaning from ventilators is delayed.

### Sleep disturbance

- Hallucinations and delirium may occur
- Nurses should plan sleep promotion interventions
- Nurses and other caregivers should minimise environmental noise
- Silencing equipment alarms, dimmed light, minimising lights at nights, proper positioning etc. promote uninterrupted sleep

### Feeling of isolation

- Patients feel lonely and isolated in critical care environment
- Loneliness promotes fear and anxiety
- Some interventions that may be used to minimise patients isolation and loneliness include:
  - Orienting patient to day and night
  - Talking to the patients in a friendly manner
  - Inviting family members to chat with their patient may also promote comfort

### Pain management

- CCU patients experience pain
- Proper assessment and management of pain is required.
- Assessing pain in mechanically ventilated patients is difficult.
- Assessment tools include visual analogue scale and the numeric rating scale
- Procedures done and wounds may also indicate the pain experienced

### **Pain management**

- A plan for analgesia should be developed and communicated to all caregivers
- Proper documentation should be done to ensure effective management of pain

#### **Pharmacological pain management**

- Intravenous opioids are most preferred
- Morphine and Fentanyl are the best
- However, there is risk of withdraw syndrome

### **Pain management**

#### **Non-pharmacological pain management**

- Explain all procedures to the patients prior
- Heat and cold treatments
- Massage
- Relaxation techniques etc.

### **Sedation**

- Pain management and sedation work hand in hand
- Intravenous sedation prolongs mechanical ventilation
- Withdrawal of sedation on daily basis to reassess patients requirements reduces patient requirements, ventilation time, length of stay in the unit and complications like VAP
- The use of protocols/guidelines with clear goals reduces ventilation time, medication side effects, morbidity, length of ICU care and costs

### **Sedation**

- Pain need to be managed first
  - Various sedation scales have been developed to assess sedation management
- #### **Pharmacological sedation management**
- The combination of opioids and sedatives produces a synergistic effect hence lower doses are used
  - Commonly used are Midazolam and Diazepam
  - Propofol is used for patients easily aroused

### **Sedation**

#### **Non-pharmacological sedation management**

- Includes orientation to time and place
- Manipulation of the environment e.g. lighting, noise
- Seeking their input (family members) to provide care

### **Securing the tube – intubated patients**

- Movement of the endotracheal tube can result in:
  - Displacement of the tube
  - Loss of cuff seal
  - Traumatic extubation
  - Oesophageal intubation
  - Discomfort
  - Migration of the tracheostomy tube into the pre-tracheal tissue

### Securing the tube – intubated patients

- Secure the tube
- Check for loosening of the fixing device
- Use cotton tapes
- Check the tightness – should allow one between the and the patient's skin
- Pressure from constricting tape/knot can cause tissue ulceration
- Tapes should be changed regularly

### Securing the tube – intubated patients

- Tight tapes occlude venous blood flow and ultimately increase intracranial pressure
- Two people are required when changing the tapes
- Check cuff pressure regularly
- Pressure should be maintained at 20 -25 cmH<sub>2</sub>O

### Conclusion

- Critically ill and mechanically ventilated patients experience various stressors in their care
- To provide quality care, caregivers should consider various options of managing the critically ill patient.

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## V3 - Patient assessment

### Patient Assessment

Training for critical care nurses  
Malawi

#### Learning Outcome

Participants will be able to:

- Explain the parameters that are assessed during primary and secondary survey
- Conduct assessment of the critically ill patient

#### Background

Nursing management priorities:

Patient safety

- Patient assessment
- Equipment assessment

Patient comfort

- Measures that promote patient's comfort

#### Background

Equipment assessment – ensure emergency equipment is available

- Resuscitation bag
- Suction unit
- Oxygen source
- Intubation equipment
- Correct attachment of IVs & monitoring devices

#### Background

- Nurses are in constant contact with patients
- Through patient assessment, in-hospital cardiac arrests and patient deaths could be reduced
- Patient assessment divided into two parts:
  - Primary (initial) survey
  - Secondary survey

#### Primary/initial survey

- Aim: to identify immediate life threatening events
- Takes a few minutes
- Uses A-B-C-D-E framework
- Relies on answers to five questions
- A = Is the AIRWAY patent?
- B = Is the patient BREATHING?
- C = Is there a CIRCULATION?
- D = Is the patient's consciousness DECREASED?
- E = Is EVERYTHING ELSE acceptable?

#### Primary/initial survey

- **Airway**
  - *Is the airway patent and secure?*
  - Listen to air movement
  - Observe rise and fall of the chest
  - Check tube is safe and length is correct

#### Primary/initial survey

- Cause of obstruction in unconscious patients is the tongue
  - Basic resuscitation airway manoeuvres will minimise this
  - Head tilt/chin lift or jaw thrust
- A gurgling noise means fluid in the airway
  - Perform gentle suctioning
- If a solid object is seen, proceed with caution
  - An attempt to remove it should be made if there is no danger of pushing it further

#### Primary/initial survey

- |   |   |
|---|---|
| <ul style="list-style-type: none"><li>• <b>Breathing</b><ul style="list-style-type: none"><li>• <i>Is the patient breathing?</i></li><li>• Observe chest rise and fall – look, listen &amp; feel</li><li>• Observe patient colour</li></ul></li></ul> | <ul style="list-style-type: none"><li>• <b>Relevant numerical data</b><ul style="list-style-type: none"><li>• Oxygen saturation</li><li>• Tidal volume</li><li>• Respiratory rate</li></ul></li></ul> |
|---|---|

#### Primary/initial survey

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>• <b>Circulation</b><ul style="list-style-type: none"><li>• <i>Does the patient have adequate circulation?</i></li><li>• Check for pulse</li><li>• Assess strength of pulse</li><li>• Observe patient colour</li></ul></li></ul> | <ul style="list-style-type: none"><li>• <b>Relevant numerical data</b><ul style="list-style-type: none"><li>• Heart rate and rhythm</li><li>• Arterial blood pressure</li></ul></li></ul> |
|--|---|

#### Primary/initial survey

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li>• <b>Decreased consciousness</b><ul style="list-style-type: none"><li>• <i>What is the patient's level of consciousness?</i></li><li>• GCS</li><li>• Can be rapidly assessed using AVPU scale</li></ul></li></ul> | <ul style="list-style-type: none"><li>• <b>A</b> = The patient is fully alert and responds spontaneously</li><li>• <b>V</b> = The patient responds to voice</li><li>• <b>P</b> = The patient responds to pain</li><li>• <b>U</b> = The patient is unresponsive</li></ul> |
|---|--|

#### Primary/initial survey

- Level of sedation
- Hypoglycaemia can cause acute alteration of level consciousness
  - Should be excluded by testing blood glucose level

#### Primary/initial survey

- Everything else
  - Undertake a visual top-to-toe check of the patient
  - Look for abnormal findings such as:
    - Bleeding
    - Haematomas
    - Fractures
    - Rashes etc.

#### Primary/initial survey

- Initial survey takes a few minutes to complete
- Enables either recognition and management of life-threatening condition
- Or the conclusion that the patient's condition is not immediately life-threatening

#### Secondary survey

- Involves systemic assessment of body systems:
  - Neurological
  - Respiratory
  - Cardiovascular
  - GIT
  - Metabolic
  - Renal
  - Skin

#### Neurological

- Level of consciousness
- Pupil responses
- Blink or corneal response
- Presence of rhinorrhea, otorrhea
- Physical examination of skull - haematomas, lacerations, battle's sign, depressions

#### Respiratory

- Artificial airway (including cuff status) and airway patency
- Respiratory rate, quality and depth
- Oxygen administration (type, humidity and route)
- Capnometry
- Ventilator settings (oxygen, tidal volume, mode, PEEP, rate)
- Arterial blood gas and trends
- Pulse oximetry
- Chest tubes (placement, drainage, method and degree of suction)

#### Cardiovascular

- Pulses (pressure, quality, rate and rhythm)
- Blood pressure
- Pulse pressure
- ECG rhythm, rate and ectopics
- Central venous pressure
- Oedema
- Laboratory values (hemoglobin, electrolytes, clotting profile, platelets)
- Medication therapy (vasopressors, inotropic agents, anticoagulants)

### Gastrointestinal

- Inspection of abdomen (distension, condition of dressings, suture lines)
- Auscultation of bowel sounds (all four quadrants)
- Palpation (pain, rebound tenderness, masses)
- Presence of gastric tubes
- Appearance of gastric drainage (bilious, coffee ground)
- Amount and characteristics of gastric aspirates
- Frequency of bowel movements
- Physical strength and body weight

### Renal

- Amount and colour of urine
- Presence of catheter (type, size, patency)
- Urine specific gravity
- Hematuria
- Glucose/ketones
- Urine specimen collection - sodium/potassium/urea/creatinine
- Serum and urine osmolality
- Intake/output balance
- Medication therapy - diuretics

### Metabolic

- Temperature
- Serum glucose
- Urea and creatinine
- Enteral/parenteral feeding regimes (types and tolerance)

### Skin and extremities

- Pressure areas and mode of treatment
- Incisions/sutures
- Catheter insertions
- Range of movement (active, passive, note deformities/limitations)
- Circulation (capillary refill)
- Casts and traction (type, amount, weight)

### Psychosocial

- Sensorium (orientation, memory, intellectual function, judgement)
- Thought process (flow, form and content)
- Mood and affect
- Interaction with family and staff
- Facial expression and body language
- Physiological parameters (tachycardia, elevated blood pressure)

### Conclusion

- Nurses' contemporary roles include patient assessment and management
- Patient assessment must be timely, accurate and comprehensive
  - Appropriate treatment can be initiated quickly
  - Potentially saving the patient's life

### Practical session

- Participants will be divided into groups to practise patient assessment

### References

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## V4 - ECG interpretation (3 Lead)

### 3 Lead ECG Interpretation

Training of critical care nurses  
Malawi

#### Learning outcome

Participants will be able to:

- Explain the conduction system of the heart
- Explain the relationship between impulse transmission and ECG
- Interpret 3 Lead ECG by using the 5 steps on interpretation
- Identify common dysrhythmias

#### Introduction

- Electrocardiography – process of creating visual tracing of the electrical activity
- Electrocardiogram (ECG) – the visual tracing
- Critical care nurses should understand cardiac monitoring, lead selection and rhythm interpretation

#### Conduction system of the heart

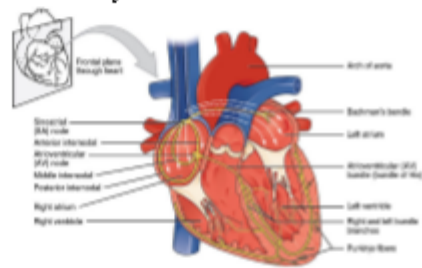


Figure 1. Conduction system of the heart. From Wikimedia commons. Retrieved from [https://commons.wikimedia.org/wiki/File:3D1818\\_Conduction\\_System\\_of\\_Heart.jpg](https://commons.wikimedia.org/wiki/File:3D1818_Conduction_System_of_Heart.jpg). Registered with permission.

#### PQRST complex

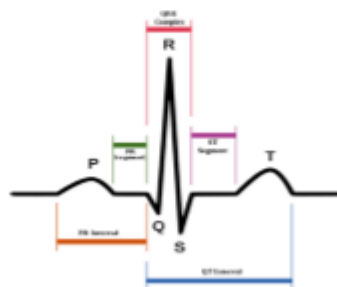


Figure 2. Normal sinus rhythm. From Wikimedia commons. Retrieved from [https://commons.wikimedia.org/wiki/File:Sinus\\_Rhythm\\_Labels.svg](https://commons.wikimedia.org/wiki/File:Sinus_Rhythm_Labels.svg). Registered with permission.

#### PQRST complex

- P wave – atrial depolarization
- QRS – ventricular depolarization
- T wave – ventricular repolarization
- PR interval – atrial depolarization and delay in AV junction (AV node and bundle of His)
- The delay in AV node allows the atria to contract before contraction of the ventricles

## Pacemakers of the heart

- SA node – Dominant pacemaker. Intrinsic rate is 60 – 100 beats per minute
- AV node – Backup pacemaker. Intrinsic rate is 40 – 60 beats per minute
- Ventricular cells – Back-up pacemaker. Intrinsic rate is 20 – 45 beats per minute

## ECG paper



Figure 3 EKG paper. From Practical Clinical Skills. Retrieved from <https://www.practicalclinicalskills.com/ebg-lesson?coursecaseorder=1&courseid=201>. Copyright 2019 by Medical Training and Simulation LLC

## ECG paper

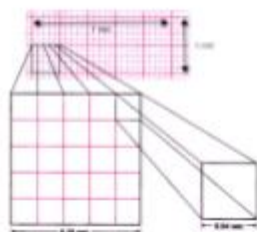


Figure 4 EKG paper. From Practical Clinical Skills. Retrieved from <https://www.practicalclinicalskills.com/ebg-lesson?coursecaseorder=1&courseid=201>. Copyright 2019 by Medical Training and Simulation LLC

## Rhythm analysis

- Step 1: Calculate rate
- Step 2: Determine regularity
- Step 3: Assess the P wave
- Step 4: Determine PR interval
- Step 5: Determine QRS duration

## Step 1: Calculate rate



- Option 1 - Count the number of R waves in a 6 second rhythm and then multiply by 10

Figure 5 Heart rate. From Practical Clinical Skills. Retrieved from <https://www.practicalclinicalskills.com/ebg-lesson?coursecaseorder=2&courseid=201>. Copyright 2019 by Medical Training and Simulation LLC

## Step 1: Calculate rate

- Option 2 - Count the number of boxes between two R waves



Figure 6 Heart rate. From Practical Clinical Skills. Retrieved from <https://www.practicalclinicalskills.com/ebg-lesson?coursecaseorder=3&courseid=201>. Copyright 2019 by Medical Training and Simulation LLC

### **Step 2: Determine regularity**

- Check the R-R distance - Use a pen or paper
  - Regular?
  - Irregular?
  - Regularly irregular?
  - Irregularly irregular?

### **Step 3: Assess the P waves**

- Morphology – do they look alike?
- Do they occur at a regular rate?
- One P wave before every QRS complex

### **Determine PR interval**

- Normal: 0.12 to 0.20 seconds
- Number of small boxes: 3 to 5 boxes
- Refer to Figure 2

### **Step 5: QRS duration**

- Normal: 0.04-0.12 seconds
- Number of small boxes: 1-3
- Refer to Figure 2

### **Rhythm summary**

- Rate
- Regularity
- P wave
- PR interval
- QRS duration
- Interpretation?

### **Arrhythmia formation**

- Arrhythmias arise from problems related to:
  - Sinus node
  - Atrial cells
  - AV junction
  - Ventricular cells

### Examples of dysrhythmias

- Sinus bradycardia – the SA node fires too slow. Heart rate less than 60 beats per minute



Figure 7 Sinus bradycardia. From Wikimedia commons. Retrieved from [https://commons.wikimedia.org/wiki/File:Sinus\\_bradycardia\\_leadII.png](https://commons.wikimedia.org/wiki/File:Sinus_bradycardia_leadII.png) Reprinted with permission

### Examples of dysrhythmias

- Sinus tachycardia – the SA node fires too fast. HR greater than 100 beats per minute

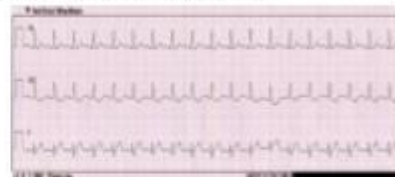


Figure 8 Sinus tachycardia. From Wikimedia commons. Retrieved from <https://commons.wikimedia.org/wiki/File:SinusTach.jpg> Reprinted with permission

### Examples of dysrhythmias

- Atrial fibrillation
- Atrial flutter
- Supraventricular tachycardia



Figure 9 Atrial fibrillation (a), atrial flutter (b), and paroxysmal (i.e. sudden onset), supraventricular tachycardia (c). Reprinted from "Using an algorithm to easily interpret basic cardiac rhythms", by D. Atwood, 2005, *ACRN Journal*, 32(5), p.762. Copyright 2019 by John Wiley and Sons

### Examples of dysrhythmias

- Ventricular fibrillation
- Asystole



Figure 10 Ventricular fibrillation (a), asystole (b). Reprinted from "Using an algorithm to easily interpret basic cardiac rhythms", by D. Atwood, 2005, *ACRN Journal*, 32(5), p.761. Copyright 2019 by John Wiley and Sons

### References

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## V5 – Shock

### SHOCK

Training for critical care nurses in  
Malawi

#### Learning outcomes

Participants will be able to:

- Explain the pathophysiology of shock
- Explain the management of shock

#### Definition

- A clinical syndrome characterized by inadequate tissue perfusion
- Results in cellular, metabolic and hemodynamic derangements
- Results from ineffective, inadequate blood volume or inadequate vascular tone
- Frequently results in systemic inflammatory response syndrome (SIRS) and multiple organ dysfunction syndrome (MODS)

#### Pathophysiology

- Begins when cardiovascular system fails to function properly
- Alterations in one of the four components – blood volume, myocardial contractility, blood flow or vascular resistance
- Note: Normally, the components maintain circulatory homeostasis. When one fails, the others compensate
- A state of shock occurs when compensatory mechanism fails or if more than one component is affected

#### Pathophysiology

- Alteration in circulation results in impaired tissue perfusion
- Delivery of adequate and nutrients decreases
- Cells convert from aerobic to anaerobic metabolism. Less energy is produced
- Lactic acid – a by-product of anaerobic metabolism causes tissue acidosis

#### Pathophysiology

- Tissue acidosis impairs cellular metabolism
- Cells, tissues and organ systems suffer
- Organ dysfunction occurs due to decreased oxygen and nutrient supply

### Stages of shock

#### Stage 1: Initiation

- Subclinical hypoperfusion
- No obvious clinical indications of hypoperfusion

### Stages of shock

#### Stage 2: Compensatory

- Reduced tissue perfusion initiates compensatory mechanism
  - Neural compensation – Stimulated by baroreceptors
  - Endocrine compensation – Renin-angiotensin system/ADH/ACTH
  - Chemical compensation – Stimulation of chemoreceptors by low oxygen tension

### Stages of shock

#### Stage 3: Progressive

- Profound hypoperfusion
- Vasoconstriction – shunting of blood to vital organs
- Decreased capillary flow and cellular hypoxia
- Cells convert to anaerobic metabolism, produce lactic acid which leads to metabolic acidosis

### Stages of shock

#### Stage 3: Progressive

- Reduced energy for cellular metabolism
- Failure of sodium-potassium pump
- Decreased cardiac output, blood pressure and tissue perfusion
- Patient shows classic signs and symptoms of shock

### Stages of shock

#### Stage 4: Refractory stage

- Prolonged inadequate tissue perfusion contributes to multiple organ dysfunction
  - Dysrhythmias
  - Acute Respiratory Distress Syndrome
  - Poikilothermia
  - Acute kidney injury
  - DIC
  - SIRS

### Pathophysiology



Figure 1. Pathophysiology of shock. From Wikimedia commons. Retrieved from [https://commons.wikimedia.org/wiki/File:Shock\\_cdf2.png](https://commons.wikimedia.org/wiki/File:Shock_cdf2.png). Reprinted with permission.

### **Clinical presentation**

#### **Central Nervous System**

- Initial response - restlessness, agitation and anxiety
- Later – confusion, lethargy and unresponsiveness

### **Clinical presentation**

#### **Cardiovascular System**

- Compensatory stage – Normal or slightly elevated SBP, narrowed pulse pressure

### **Clinical presentation**

#### **Cardiovascular System - As the shock progresses**

- Decreased SBP ( $<90\text{mmHg}$ )
- Narrowed pulse pressure
- Weak and thready pulse
- Tachycardia, pulse slows in later stage of shock
- Distended neck veins in patients with obstructive or cardiogenic shock
- $\text{SvO}_2$  is less than 60% in all forms of shock except septic shock

### **Clinical presentation**

#### **Renal system**

- Oliguria (urine output  $<0.5\text{ mL/kg/hr}$ )
- Concentrated urine
- Increased BUN
- Increased creatinine

### **Clinical presentation**

#### **Gastrointestinal system**

- Decreased bowel sounds, distention, nausea and constipation
- Alterations in liver enzymes – Lactate Dehydrogenase (LDH) and Aspartate Aminotransferase (AST)
- Impaired liver function – production of coagulation factors, detoxification, neutralization of invading microorganisms

### **Clinical presentation**

#### **Haematological system**

- Coagulopathy
- Petechiae
- Ecchymosis
- Blood in urine, stool, gastric aspirate and tracheal secretions
- Leucocytosis in early septic shock
- Leukopenia

### Clinical presentation

#### Integumentary system

- Central cyanosis

### Laboratory studies

- |   |   |
|---|---|
| <ul style="list-style-type: none"><li>• Glucose &lt;70 or &gt;100mg/dL</li><li>• Blood urine nitrogen &gt;20mg/dL</li><li>• Creatine &gt;1.2mg/dL</li><li>• Sodium &lt;136 or &gt;145 mEq/L</li><li>• Chlorine &gt;108mEq/L</li><li>• Potassium &lt;3.5 or &gt;5.3mEq/L</li><li>• Lactate &gt;2.2mEq/L</li><li>• AST &gt;20 units/L</li><li>• LDH &gt;102 units/L</li></ul> | <b>Haematology</b> <ul style="list-style-type: none"><li>• WBC &lt;4500 or &gt;11,000/microliters</li><li>• Haemoglobin &lt;12g/dL</li><li>• Haematocrit &lt;35%</li></ul> <b>Arterial Blood Gases</b> <ul style="list-style-type: none"><li>• pH &lt;7.35 or &gt;7.45</li><li>• PaCO<sub>2</sub> &lt;35 or &gt;45mmHg</li><li>• PaO<sub>2</sub> &lt;80mmHg</li><li>• HCO<sub>3</sub> &lt;22mEq/L</li></ul> |
|---|---|

### Management

#### Maintenance of circulatory blood volume and adequate haemoglobin level

- Administration of intravenous fluids – type of fluid depends on type of fluid lost, haemodynamic status and coexisting conditions
- Volume replacement continues until adequate MAP (65 to 70mmHg) is achieved, end-organ tissue is re-established (improved level of consciousness, urinary output and peripheral perfusion)

### Management

#### Maintenance of circulatory blood volume and adequate haemoglobin level

- Patients with severe shock require rapid volume replacement
- 3 mL of crystalloids is administered to replace 1mL of blood loss

### Management

#### Maintenance of Arterial Oxygen Saturation and Ventilation

- Proper head position
- Use of oral or nasopharyngeal airways or intubation depending on the patient's condition
- Suctioning
- Chest physical therapy

### Management

#### Maintenance of Arterial Oxygen Saturation and Ventilation

- Oxygen administration
- Mechanical ventilation to reduce work of breathing – Tidal volume 6-8 mL/kg
- ABG, pulse oximetry and hemodynamic monitoring

### Management

#### Pharmacological support – Medications that are commonly used:

- Dobutamine
- Dopamine
- Norepinephrine
- Phenylephrine
- Vasopressin
- Nitroglycerin
- Nitroprusside

### Management

#### Maintenance of body temperature

- Hypothermia occurs when fluids are infused rapidly
- Patients should be kept warm
- NOTE: Excessive warmth increases oxygen demand

### Management

#### Nutritional support

- Initiate enteral intake as soon as possible (24 to 48 hours of admission to CCU)
- Early enteral feeding decreases hypermetabolism, minimizes bacterial translocation, decreases diarrhea and decreases length of stay
- Enteral nutrition may be limited by paralytic ileus and gastric dilation
- Parenteral nutrition is given if enteral feeding cannot be tolerated

### Management

#### Maintenance of skin integrity

- Turning of patient at frequent intervals
- Use of pressure-relieving devices
- Lotion moisturizes the skin
- Elevation of the heels

### Management

#### Psychological care

- Patient and family support – will be discussed in detail in a separate session

### References

- Sole, M.L., Klein, D.G. & Moseley, M. (2013). *Introduction to critical care nursing* (6<sup>th</sup> ed.). Missouri: Elsevier Saunders.
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## V6 – Fluid management

### Fluids and electrolytes

Training of critical care nurses in  
Malawi

#### Learning outcomes

Participants will be able to:

- Describe the composition and compartments of body fluids
- Explain factors that affect fluid and electrolyte balance
- Describe the types of fluids used for resuscitation
- Define terminologies used during fluid resuscitation
- Discuss the manifestation and management of electrolyte imbalance

#### Introduction

- Body fluid - composed of water and electrolytes
- Two fluid compartments: intracellular and extracellular fluid compartment
- Intracellular compartment: consists of fluid contained within the body's cells

#### Introduction

- Total body water volume accounts for 60% of the body weight, 40 litres
- Intracellular fluid volume accounts for 40% of body weight, 25 litres
- Extracellular fluid volume accounts for 20% of the body weight, 15 litres
  - Interstitial fluid, 80% of ECF, 12 litres
  - Plasma volume, 20% of ECF, 3 litres

#### Pressure affecting fluid and electrolyte movement

**Osmotic Pressure:** refers to the force of attraction for water by undissolved particles

**Hydrostatic pressure:** exerted by the fluid against the walls of its containers

- Promotes outflow of fluid from capillaries

#### Pressure affecting fluid and electrolyte movement

**Filtration pressure:** is equal to hydrostatic pressure minus osmotic pressure

- Filtration pressure of the arteriole is positive, supports filtration out of the vessels
- Filtration pressure of the venule is negative therefore osmotic pressure pull fluid into the vessel.

### Hormonal control

- Antidiuretic Hormone (ADH)
- Aldosterone-Angiotensin system
- Parathyroid Hormone (PTH)

### Altered fluid and electrolyte balance

#### Fluid Imbalance

- *Fluid volume deficit*
- *Fluid volume excess*

#### Electrolyte imbalance

### Types of resuscitation fluids

#### Crystalloids

- Aqueous fluids that contain electrolytes which easily pass through vascular endothelial membranes barriers followed by water, leading to equilibrium between the intravascular and extracellular space
- Examples: Normal Saline, Lactated Ringer's solution, Hartmann's solution, Plasma-Lyte, 5% Dextrose

### Crystalloids

- **Isotonic crystalloids**
  - Lactated Ringer's, 0.9% NaCl
  - 25% remain intravascularly
- **Hypertonic saline solutions**
  - 3% NaCl
- **Hypotonic solutions**
  - D5W, 0.45% NaCl
  - < 10% remain intravascularly, inadequate for fluid resuscitation

### Types of resuscitation fluids

#### Colloids

- Aqueous fluids that contain both large organic macromolecules and electrolytes.
- Unlike crystalloids, the large molecules in colloids are retained in intravascular space which lead to higher oncotic pressure

### Types of IV fluids

#### Examples of colloids

##### *Natural:*

- Albumin – derived from human plasma

##### *Synthetic:*

- HES - derived from the starch of potatoes or maize
- Gelatins - derived from bovine gelatin
- Dextran is also a carbohydrate-based colloid

### Colloid Solutions

- Contain high molecular weight substances - do not readily migrate across capillary walls
- Preparations:
  - Albumin: 5%, 25%, Hydroxyethyl starches, Red cell concentrates, platelets, plasma

### Terminologies

- **Resuscitation:** administration of fluid for immediate management of life-threatening conditions associated with impaired tissue perfusion
- **Fluid bolus:** a rapid infusion to correct hypotensive shock. It includes the infusion of at least 500 ml over a maximum of 15 min

### Terminologies

- **Fluid challenge:** 100-200ml over 5-10 min with reassessment to optimize tissue perfusion
- **De-escalation:** minimization of fluid administration
- **Maintenance:** fluid administration for the provision of fluids for patients who cannot meet their needs by oral route

### Terminologies

- **Daily fluid balance:** daily sum of all intakes and outputs
- **Fluid overload:** cumulative fluid balance expressed as a proportion of baseline body weight

### Calculation of Maintenance Fluids

- |   |  |
|---|--|
| • For a 24 hr period, use <u>100/50/20 Rule</u> | • For hourly maintenance rate, use <u>4/2/1 Rule</u> |
| 100ml/kg for first 10kg                         | 4ml/kg for first 10kg                                |
| 50ml/kg for next 10kg                           | 2ml/kg for next 10kg                                 |
| 20ml/kg for every kg over 20                    | 1ml/kg for every kg over 20                          |

### Electrolytes

- Major cations (positive ions): sodium, potassium, calcium & magnesium
- Major anions (negative ions): chloride, bicarbonate and phosphate



### Sodium

- Normal concentration 136 – 145 mEq/L
- Renal absorption sites:
  - Proximal tube 65%
  - Loop of henle 25%
  - Distal tube 6%
  - Collecting duct 2-4%

### Sodium

- **Hyponatremia:** sodium level lower than 135 mEq/L
- Causes: fluid excess, sodium loss & conditions – SIADH, renal insufficiency & adrenal insufficiency
- Clinical manifestations: related to cerebral oedema – anorexia, nausea, vomiting, headache, confusion, agitation

### Sodium

- **Hypernatremia:** serum sodium > 145 mEq/L
- Causes: indicates dehydration. Includes burns, fistula, diarrhoea, diabetes insipidus
- ICU pts at great risk – unable to communicate thirst
- Symptoms: thirst, nausea, vomiting, irritability, altered mental status, disorientation & coma

### Treatment

- **Hyponatremia:** water restriction. Hypovolemic patients require volume replacement with N/S.
- **Hypernatremia:** fluid repletion for hypovolemic patients, ADH replacement with vasopressin in cases of Diabetes Insipidus

### Potassium

- Normal serum concentration 3.5 – 5.5 mEq/L
- **Hypokalemia:** concentration < 3.5 mEq/L
- Causes: alkalemia, medications like insulin, aminoglycosides, steroids
- Clinical manifestations: hypotension, arrhythmias, depressed ST segment, flattened T wave, depression, hypoventilation

### Potassium

- **Treatment of hypokalemia**  
Oral replacement in mild or asymptomatic hypokalemia. KCl is available
- IV replacement: administered for severe or symptomatic hypokalemia.
- MUST** be diluted, **NEVER** given by IV push, irritating and caustic to peripheral veins.

### Potassium

- **Hyperkalemia:** concentration > 5.5 mEq/L
- **Causes:**
  - Decreased GFR
  - Metabolic acidosis
  - Rhabdomyolysis
  - Insulin deficiency
  - Medications – potassium sparing diuretics (spironolactone)

### Potassium

- **S & S:** bradycardia, ventricular arrhythmias, cardiac arrest.
- **Watch out for ECG changes:**
  - Tall peaked T wave
  - Prolonged PR interval
  - Widening of QRS complex
  - P waves disappear, QT prolongation

### Potassium

- **Other signs of hyperkalemia:**
- Twitching, muscle weakness, apathy, confusion

### Potassium

- **Treatment of hyperkalemia**
  - Calcium chloride - stabilizes electrical conduction system of the heart
  - Dextrose and insulin – shifts potassium into intracellular space
  - Sodium bicarbonate
  - Diuretics
  - Hemodialysis

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## V7 – Selected drugs used in critical care

### Selected drugs

Training of critical care nurses in Malawi

#### Learning outcomes

Participants will be able to:

- Explain the pharmacokinetics and pharmacodynamics of selected drugs used in critical care
- Describe the nurses responsibility in the administration of the selected drug

#### Drugs acting on cardiovascular system

- Angiotensin-converting enzyme (ACE) inhibitors
- B-Adrenergic blocking drugs
- Calcium channel blocking drugs
- Antiarrhythmic agents
- Antihypertensive drugs
- Cardiac glycosides & Inotropic drugs
- Vasodilators
- Vasopressor drugs

#### Review - Anatomy & physiology

##### Alpha- $\alpha$ and Beta- $\beta$ receptors

- Different effector organs have either alpha or beta predominant receptor sites

##### (a) alpha receptors

- Associated mainly with increased contractility of vascular smooth muscles and intestinal relaxation
- Alpha 1: stimulation result in contraction of smooth muscles of peripheral blood vessels

#### Review - Anatomy & physiology

Alpha 2: predominant in intestinal tract – relaxation

##### (b) beta receptors

- Beta 1: cause cardiac stimulation and lipolysis
- Beta 2: cause bronchodilation, relaxation of blood vessels and glycogenolysis

#### 1- Angiotensin – converting enzyme inhibitors

- ACE inhibitors cause vasodilation indirectly by inhibiting Angiotensin I from forming Angiotensin II
- Angiotensin II is a potent vasopressor important in regulation of blood pressure by renin-angiotensin system
- Are important in the treatment of chronic hypertension
- Some are used to treat Congestive Heart Failure

### Angiotensin – converting enzyme inhibitors

#### Example: Captopril

- Vasodilation resulting from reduction in potent vasoconstrictor angiotensin II when ACE is inhibited

#### Uses

- Chronic hypertension
- Congestive Heart Failure
- Prophylaxis immediately after myocardial infarction

### Angiotensin – converting enzyme inhibitors

#### Captopril

#### Contraindications

- Renal function impairment
- Hepatic function impairment

#### Dosage

- Adults: 12.5 mg Q12H or Q8H initially orally
- Other examples: lisinopril, fosinopril

### 2- Beta-adrenergic blocking drugs

- Produce their greatest effect on beta-receptors of adrenergic nerves, primarily beta-receptors of the heart
- Stimulation of beta-receptors of the heart results in an increase in heart rate
- If stimulation of these receptors is blocked or interrupted, heart rate decreases
- Example: Propranolol

### 3- Calcium channel blocking drugs

- Calcium is involved in the transmission of nerve impulses
- Cardiac muscles lack calcium stores & depend on the influx of calcium for maintenance of contraction or tone
- Calcium channel blockers cause relaxation by preventing the calcium needed for contraction
- Examples: Nifedipine, Nimodipine, Nicardipine, Diltiazem

### Calcium channel blocking drugs

#### Example: Nifedipine

- Blocks calcium-ion influx into cardiac and vascular smooth muscle cells
- Results in dilation of coronary arteries & peripheral arteries & arterioles
- A potent peripheral vasodilator with minimal direct effect on cardiac electrophysiology

### Calcium channel blocking drugs

#### Example: Nifedipine

#### Uses

- Chronic hypertension
- Acute, severe hypertension

### Calcium channel blocking drugs

**Example: Nifedipine**

**Contraindications**

- Severe hypotension
- Myocardial infarction
- Severe Congestive Heart Failure

**Dosage**

- 10 mg Q8H; maximum daily dose 80-90mg (antianginal); 120mg antihypertensive

### 4- Antiarrhythmic drugs

- Primarily used to treat cardiac dysrhythmias (arrhythmias)
- Cardiac muscle (the myocardium) has properties of both nerves and muscles
- Some cardiac dysrhythmias are caused by generation of an abnormal number of electrical impulses (stimuli)
- The abnormal impulses may come from the sinoatrial node, where others may be generated in other areas of the myocardium

### Antiarrhythmic drugs

**Example: Amiodarone**

- Slows SA nodal firing
- Also prolongs the refractory period

**Uses**

- Ventricular arrhythmias: indicated for arrhythmias that do not respond to other agents

### Antiarrhythmic drugs

**Contraindications**

- Severe sinus bradycardia
- Atrioventricular nodal blockade

**Dosage**

- P.O initial daily dose 800 to 1600mg divided in 3 doses

- Other drugs: lidocaine, disopyramide

### Antihypertensive drugs

- Diuretics and beta blockers are drugs of choice for initial monotherapy
- Monotherapy also includes ACE inhibitors, combination of  $\alpha$ - and  $\beta$ -blockers and calcium channel blockers
- The following agents are added when a single drug does not adequately control blood pressure

### Antihypertensive drugs

**Example: Hydralazine**

- Relaxes arterial smooth muscle to reduce blood pressure with reflex increase in heart rate and cardiac output
- Dilation creates an increase in the lumen of the arterial blood vessels
- Because blood volume remains constant, an increase in space in which blood circulates lowers blood pressure

### Antihypertensive drugs

#### Use

- Chronic hypertension
- Hypertensive crisis

#### Precautions

- Usually taken with diuretics and  $\beta$ -blockers to reduce side effects
- Crosses placenta and produces symptoms in newborns

### Antihypertensive drugs

#### Dosage

- P.O. 10mg Q6H initially
- IV or IM 10-40mg repeated if necessary

#### Side Effects

- CVS: Fluid retention, headache, hypotension, oedema
- GI: Anorexia, nausea, vomiting, diarrhoea

### 6- Cardiac glycosides & inotropic agents used for congestive heart failure

- Cardiac Glycosides increase contractility of the heart, improving output & may also slow heart rates
- Also depress the SA node & slow conduction of electrical impulses to the AV node
- Slowing this part of nerve transmission decreases the number of impulses & the number of ventricular contractions per minute

### Cardiac glycosides & inotropic agents used for congestive heart failure

#### Example: Digitoxin

#### Dosage

- Adult: P.O. loading dose 0.6mg, then 0.4mg after 4-6 hours
- Maintenance dose: 0.05-0.3mg daily

#### Side effects

- CV: Bradycardia
- CNS: stimulation of the medullary centres leading to anorexia, nausea, vomiting, confusion, drowsiness, depression

### Cardiac glycosides & inotropic agents used for congestive heart failure

#### Nursing consideration

- Apical pulse for a full minute. Withhold dose and notify physician if heart rate is below 60 bpm in adult, below 90-110bpm in an infant or small child
- Blood pressure, Weight, Intake and Output
- For CHF: auscultate lung sounds, assess for jugular venous distension
- Lab data: serum electrolytes, BUN & creatinine

#### Discussion: Patient Education

### 7- Vasodilators

- Can be divided into two groups according to their use:
- *Peripheral vasodilators*: used mainly in the treatment of peripheral vascular diseases
- *Antianginal agents*: used in the treatment of angina
- A vasodilating agent relaxes smooth muscle layer of arterial blood vessels, results in vasodilation

### Vasodilators

Nitrates (example: Nitroglycerine)

- Used in the treatment of angina pectoris, myocardial infarction
- They have a direct relaxing effect on smooth muscle layer of blood vessels thereby producing vasodilation

Dosage

- Adult: 0.15-0.6mg sublingual. Can be repeated if no relief in 5 minutes

### 8- Vasopressor drugs

- Used to support blood pressure in severely hypotensive patients
- Adrenergic drugs act like or mimic the activity of the sympathetic nervous system
- Also sympathomimetic drugs
- Adrenergic drugs may act on alpha-receptors only, beta receptors only or both

### Vasopressor drugs

**Example: Dobutamine**

- Acts primarily on myocardial  $\beta_1$ -receptors to improve cardiac output with modest increase in heart rate and blood pressure

Uses

- Cardiogenic shock
- Dosage: IV infusion 2.5 -10 $\mu$ /kg/minute

Side effects: increased systolic blood pressure, angina pain, palpitation, increased blood glucose

### Vasopressor drugs

**Example: Dopamine**

- Dose-dependent dominergic,  $\beta$ -adrenergic and  $\alpha$ -adrenergic actions
- Low dose (5  $\mu$ /kg/minute) cause dilation of renal & splanchnic blood vessels
- Medium dose (5-10  $\mu$ /kg/minute) activate cardiac  $\beta$  receptors (increased myocardial contractility)
- High doses (20  $\mu$ /kg/minute) activate cardiac  $\beta$  receptors
- Higher doses – activate alpha receptors (increased blood pressure from increased peripheral resistance)

### Vasopressor drugs

**Example: Epinephrine**

- Activates both  $\alpha$ - and  $\beta$ -adrenergic receptors
- Raises the heart rate and force of contraction ( $\beta$ -adrenergic receptors)
- Relaxes smooth muscles particularly the bronchi

Dose: 2.5-10  $\mu$ /kg/minute

### Vasopressor drugs

**Example: Norepinephrine**

- Stimulates  $\alpha$ - adrenergic receptors to contract blood vessels
- Increases peripheral resistance caused by vasoconstriction
- Slows the heart rate as a result of reflex vagal stimulation triggered by increased blood pressure

### Vasopressor drugs

Use: acute hypotension

Dosage:

- Adult: IV infusion 2-3ml/min, 0.4mg/100ml solution
- Adjust rate to maintain low-normal blood pressure

### Vasopressor drugs

Nursing considerations:

Assess:

- BP, Pulse, Intake and Output
- IV insertion site: extravasation may cause tissue necrosis
- Blanching along the vein pathway is a preliminary sign of extravasation

Implement:

- IV dilution, closely monitor BP until patient is stable

### Other drugs - Atropine

- Anticholinergic or muscarinic antagonist drug
- Used as:
  - Preoperative medication to decrease salivary secretions
  - An agent to increase heart rate when there is bradycardia
  - An antidote for muscarinic agonist poisoning

### Atropine

- Blocks acetylcholine by occupying the muscarinic receptor
- Increases heart rate by blocking Vagus stimulation
- Promotes dilation of the pupils by paralyzing the iris sphincter
- The onset of action via IV is immediate, peaks at 2 to 4 minutes

### Adverse effects of atropine

- Dry mouth
- Decreased perspiration
- Blurred vision
- Tachycardia
- Constipation
- Urinary retention

Dose

- 0.5-1 mg I.V. in adults, repeat q5min PRN up to 2 mg
- 0.01 mg-0.02 mg /kg in children

### Contraindications

- Narrow angle glaucoma
- Obstructive GI disorders
- Tachycardia
- Benign prostatic hypertrophy
- Hypersensitivity
- Myocardial ischemia



### Other drugs – Benzodiazepines

- Sedative-hypnotics for inducing sleep
- Increase action of the inhibitory neurotransmitter gamma-aminobutyric acid (GABA)
- Reduced neuron excitability
- Alcohol or opioids taken with benzodiazepine may cause depressive CNS response
- Example: Diazepam, Midazolam and Lorazepam (Ativan)

Other drugs will be covered in a separate session –  
Pain and sedation

### Reference

- Kee, J.L., Hayes, E.R. & McCuiston, L.E. (2015).  
*Pharmacology: A patient-centred nursing  
process approach* (8<sup>th</sup> ed.), St. Louis, Missouri:  
Elsevier/Saunders

## V8 – Pain and sedation management

### Pain management and sedation Training of critical care nurse in Malawi

#### Definitions

- Pain - Unpleasant sensory and emotional experience. The patient is the authority on the pain that is being experienced
- Anxiety – a state of marked apprehension, agitation, arousal, fearful, withdraw
- Pain and anxiety are interrelated

#### Predisposing factors

- Pre-existing diseases
- Invasive procedures
- Monitoring devices
- Nursing care
- Trauma

#### Physiology of pain - Review

- Pain is classified as acute or chronic, malignant or non-malignant, nociceptive or neuropathic
- The sensation of pain is carried to the central nervous system by activation of two separate pathways
- Fast (sharp) pain signals are transmitted by A-delta afferent fibres
- Slow (burning or chronic) pain is transmitted by the unmyelinated, polymodal C fibres
- Nociceptors – the most abundant receptors in the nervous system for pain recognition
- Nociceptors adapt very little to pain response

#### Physiology of anxiety – Review

- Compared to pain, the physiology of anxiety is less clearly understood
- Anxiety stimulates SNS response
- Linked to reward and punishment centres within the limbic system
- Punishment centre is more dominant

#### Pain assessment

- Challenging in critically ill patient because of the inability to communicate
- Verbal communication is altered by endotracheal intubation, altered LOC, restraints, sedation and therapeutic paralysis
- Assessment involves self-report of the pain (if the patient is able to communicate) and behavioural markers

#### Pain measurement tools

- PQRSST method (used in assessing patients with chest pain)
  - P – Provocation or position
  - Q – Quality
  - R – Radiation
  - S – Severity or symptoms associated with the pain
  - T – Timing and triggers
- FACES pain scale
- Visual Analog Scale (VAS)

#### Anxiety and sedation measurement tools

- Richmond Agitation-Sedation Scale (RASS) – 10-point scale
- Ramsay Sedation Scale
- Sedation-Agitation Scale

#### Pain and anxiety assessment challenges

- Delirium
  - Characterised by changing or fluctuating mental status
  - Common among critically ill patients
  - Lead to longer duration of mechanical ventilation and longer ICU stay
- Neuromuscular blockade
  - Used to facilitate intubation and mechanical ventilation, to control increased ICP and to facilitate other procedures
  - Patients who receive NMB are unable to communicate or produce any voluntary muscle movement

#### Pharmacological management of pain

- Opioids - Example: Morphine
- Dosage:
  - SC/IM 2.5 mg every 3-4 hours
  - IV 10 mg every 4 hours
- Side effects
  - Hypotension
  - Decreased gastric motility
  - Constipation
  - Respiratory depression
  - Nausea and vomiting

#### Nursing implications

- Titrate infusion
- Monitor BP, HR and respiratory status
- Administer fluids as indicated

#### Pharmacological management of anxiety

- Example: Diazepam
- Dosage
  - IV loading dose 0.5-4 mg, may be repeated 10-15 minutes
  - Infusion: 1-7 mg/hour
- Side effects:
  - CNS depression
  - Hypotension
  - Respiratory depression
  - Paradoxical agitation

#### **Nursing implications**

- Titrate infusion up or down by 25-50%
- Monitor BP and respiratory status
- Administer fluids as indicated
- Slow weaning – 10-25% every few hours

#### **Nonpharmacological management of pain and anxiety**

- Reorientation and repeated explanation
- Family involvement
- Pictures of family members

#### **References**

- Sheppard, M. & Wright, M. (2000). *Principles and practice of high dependency nursing*, London: Harcourt Publishers Limited
- Sole, M.L., Klein, D.G. & Moseley, M. (2013). *Introduction to critical care nursing* (6<sup>th</sup> ed.). Missouri: Elsevier Saunders.

## V9 – Meeting patient's nutritional needs

### Meeting patients nutritional needs

Training of critical care nurses in Malawi

#### Learning outcomes

Participants will be able to:

- Explain nursing responsibilities in enteral feeding
- Calculate feeding requirements based on existing guidelines
- Explain nursing responsibilities in preventing complications of tube feeding

#### Introduction

- Carbohydrates, proteins, fats, water, electrolytes and trace elements are required for energy production
- Patients unable to meet their nutritional needs are started on enteral nutrition in 24 to 48 hours
- Enteral feeding – delivery of nutrients into GI tract

#### Enteral nutrition

- Depends on intact bowel
- Feeding tubes require radiological confirmation
- Large-bore NGT are used
- Small NGT may be inserted if the patient does not tolerate a larger tube
- Administered continuously via feeding pump

#### Enteral nutrition – nursing responsibilities

- Feedings can also be administered intermittently – every 4 hours depending on the patients needs
- Feeding tubes are flushed with 30 mls of water every 4 hours during continuous feeding
- Intermittent feeding – feeding tube should be flushed before and after intermittent feeding and medication administration

#### Enteral nutrition – nursing responsibilities

- Check gastric residual volume (GRV) every 4 hours
- Checking GRV helps to assess intolerance of feeds
- GRV of 200-250mls should be of great concern – Medication that promotes gastric motility may be ordered
- If GRV is more than 500mls, feeding should be held and patient assessed for signs of intolerance

#### **Signs of tolerance of feeds**

- Presence of bowel sounds in four quadrants
- Presence of bowel movements
- Palpation of soft abdomen
- Tympanic findings on percussion of the abdomen

#### **Signs of intolerance**

- Presence of nausea and vomiting
- Absent bowel sounds
- Abdominal distension or cramping

#### **Fluid intake**

- Given in form of water
- Based on the patient's total fluid intake requirements
- Patients require 30 mL/kg

#### **Tube feeding complications**

- Tube obstruction
- Improper tube placement
- Aspiration
- Diarrhoea
- Dumping syndrome
- Hyperglycaemia
- Electrolyte imbalance

#### **Tube obstruction – Nursing responsibilities**

- Flush feeding tube with at least 30 mls every 4 hours
- Irrigate tube with warm water

#### **Improper tube placement – Nursing responsibilities**

- Verify position of the tube by x-ray before initiating feeds
- Identify patients at risk. For example impaired gag/cough reflex

### **Aspiration – Nursing responsibilities**

- Mark feeding tube at exit site
- Monitor GRV
- If GRV is >200 to 250mls consider promotility agents
- If GRV is >500mls hold feeding
- Keep head of the bed elevated to 30 degrees, preferably 45 degrees
- Monitor abdominal girth
- Assess bowel sounds

### **Diarrhoea – Nursing responsibilities**

- Review medication
- If infection is not suspected, administer fibre-enriching formulas or agents
- Prevent bacterial contamination
- Administer feeds at room or body temperature
- Limit bolus to less than 300mls

### **Dumping syndrome – Nursing responsibilities**

- Slow rate and frequency of the feeding bolus if abdominal distension or cramping occurs

### **Hyperglycaemia – Nursing responsibilities**

- Administer insulin as ordered
- Monitor fluid status closely

### **Electrolyte imbalance – Nursing responsibilities**

- Monitor electrolytes for changes

### **Parenteral nutrition**

- Infusion of nutrient solutions into blood stream
- Central intravenous access required
- It is a successful method to provide nutrients to patients who are unable to tolerate enteral feeds
- Not done in Malawian hospitals

### **Reference**

Sole, M.L., Klein, D.G. & Moseley, M. (2013).  
*Introduction to critical care nursing* (6<sup>th</sup> ed.).  
Missouri: Elsevier Saunders.

## V10 – Nursing care of a patient with chest drains

### Care of a patient with chest drains

Training of critical care nurses in Malawi

#### Learning outcomes

Participants should be able to:

- Identify equipment for chest tube insertion
- Explain the types of chest drain systems
- Explain the required nursing assessment and management
- Explain complications of chest drains

#### Chest tubes

- A chest tube is a drain which is used to remove air, fluid or blood from the pleural space
- This helps to re-expand collapsed lungs and prevents reflux of the drainage back into the chest
- Most chest tubes are multifenestrated transparent tubes with distance and radio-opaque markers
- This allows the physicians or other qualified health care professionals to visualise the tube on the chest radiograph and thereby position it properly

#### Chest tubes

- All openings in the tube should be placed within the ribcage so that air does not leak in the subcutaneous tissue or outside the chest wall.
- There are two types of chest tubes namely: pleural and mediastinal depending on the location of the tip of the tube
- At times patients may have more than one tube in different locations. This depends on the purpose of the tubes
- Large tubes (20-36 French) are used for blood or thick pleural drainage while small tubes (16 -20 French) are used to remove air.

#### Equipment for chest tube insertion

- |  |  |
|--|--|
| • Chest tube insertion tray (with scalpel blade) | • Large haemostasis                              |
| • Chest tube                                     | • Suture material (2-0 silk) on a cutting needle |
| • 1% Lidocaine                                   | • Gauze swabs                                    |
| • Syringe for lidocaine infiltration             | • Chest drainage system and suction              |
| • Antiseptic solution                            | • Sterile water for water seal systems           |
| • Sterile gloves                                 | • Medication for pain and sedation               |

#### Drainage system

- Promotes intrapleural negative pressure, a seal for the chest tube which prevents air from outside entering into the system is required
- An underwater drainage system is commonly used
- Reviewing the multichambered system may provide knowledge in understanding the commonly used disposable drainage systems
- This knowledge allows nurses to safely manage complicated chest drains



### Types of chest drainage systems

- One chamber system
- Two chamber system – has a water seal and a collection chamber
- Three chamber system – includes a suction control chamber

### Two chamber system

- First chamber is collection receptacle and the second is water seal
- Sterile water is added to the second chamber to the 2 cm level to achieve a seal

### Two chamber system

- The level represents the negative pressure that is exerted on the pleural space while the water closes the chest drain to prevent air from outside, which acts as a one way valve
- The water seal allows air to escape while preventing air from outside to enter the pleural space
- Fluid levels above 2cm of water exerts great negative pressure on the pleural space and prevent resolution of air leak

### Two chamber system

- A higher column of water in the seal chamber can make breathing difficult because the patient has a larger column of fluid to move during inspiration
- The patient's chest tube is connected to a 6-Ft length of latex tubing that is attached to an outlet on the top of the drainage collection chamber
- The second chamber (the water seal) has a vent that remains open, allowing air from the pleural space to escape as it bubbles through the water seal to the atmosphere

### Two chamber system

- The fluid level in the water seal fluctuates during respiration
- During inspiration pleural pressures become more negative, making the fluid level in the water seal chamber to rise
- During expiration pleural pressures become more positive causing the fluid levels to descend

### Two chamber system

- However, if the patient is mechanically ventilated this process is reversed
- Bubbling is only seen in the underwater seal chamber during expiration (or during inspiration with positive pressure ventilation) as air and fluid drain from the pleural cavity
- Continuous bubbling may indicate air leak in the system or broncho-pleural fistula

#### Three chamber system

- A suction is added to the two chamber system
- It is the safest way to regulate the amount of suction
- Suction can be achieved by adding water to the prescribed level in the suction chamber normally -20cm of water

#### Three chamber system

- The amount of wall suction applied to the chamber should be adequate to create 'gently rolling' bubble in the suction control chamber
- Vigorous bubbling lead to loss of water through evaporation, changing the suction pressure and increasing noise level in the room.

#### Three chamber system

- Caregivers should check water loss and add sterile water as required to maintain the prescribed level of suction
- The bubbles should be assessed for gentle suction and the water level (-20 cm of water) is assessed every 8 hours and when condition changes

#### Suction

- Dry suction systems which deliver higher levels of suction may be necessary in patients with large bronchopleural fistulas, haemorrhage or obesity
- The Emerson pleural suction pump may be used instead of wall suction. It can be set up using a two or three bottle system as well as a disposable chest drainage system
- The pressure control knob on the front of the pump control the suction generated

#### Suction

- Heimlich valves are reserved for the treatment of pneumothorax
- The valve is composed of a small-bore chest tube attached to a one way valve which allows air to escape but not re-enter the pleural space. This does remove fluid

#### Assessment and nursing management

- Nurses should ensure patency and proper function of the chest tube drainage system
- Effective nursing care can reduce complications in patients with chest drainage system
- The latex tubing frequently drains into the collection container
- Coiling the latex tubing loosely on the bed prevents kinking and pooling of blood in a drainage loop on the floor

#### **Assessment and nursing management**

- The patient should not lie on the tube
- The chest tube drainage system is never raised above the chest to prevent backflow into the chest
- Check the chest tube drainage for drainage regularly

#### **Assessment and nursing management**

- Inspect all connections on the tubing for leak and secure them with a tape to prevent accidental disconnection
- Check the tube for patency and respiratory cycle fluctuations it is necessary to disconnect the suction (system placed only to water – not clamped).

#### **Observations**

- Monitor cardiopulmonary status and vital signs 2 hourly/PRN
- Check and maintain patency of the tube 2 hourly
- Monitor the amount and type of drainage
- Check and maintain patency of the tube every 2 hours/PRN
- Mark amount of drainage every shift and document
- Refill water systems with sterile water to the water seal level and prescribed suction level

#### **Observation**

- Assess the patient for pain and treat accordingly
- Assess the chest tube insertion site for signs of infection and subcutaneous emphysema with dressing changes
- Change dressing daily/PRN

#### **Drainage monitoring**

- Assess and document the colour, amount, consistency and note any changes
- A sudden increase indicates bleeding/patency of blocked tube
- A sudden decrease indicates obstruction of the chest tube or failure of the chest tube or drainage system

#### **To re-establish tube function**

- Proper position of the tube and the patient
- If a clot is visible, straighten the tubing between the chest and drainage unit and raise the tube to enhance the effect of gravity
- Milking and stripping are prohibited due to complications

### Water seal monitoring

- Monitoring the water seal of the chest drain is important
- Visual checks should be done to ensure water seal chambers are filled to the 2-3cm water line
- Make sure the water line is at the recommended level (-20 cm of water).
- The tubing should never be left clamped to avoid pneumothorax or fluid building in the chest
- Respiratory fluctuations should be observed in the water seal chamber

### Water seal monitoring

- Absence may indicate re-expansion of the lungs or the tube is blocked
- Check tubings for disconnection

### Positioning

- Semi fowlers position is most suitable
- Change of position 2 hourly enables air and fluid evacuation
- Teach the patient to splint the chest wall near the tube site insertion using a pillow/arms
- Encourage coughing, deep breathing and ambulation
- Administer pain medication before exercises to decrease pain and enhance lung expansion

### Transporting a patient with chest tubes

- The critically ill patient requires close assessment to prevent tube disconnections. The disconnections can cause pneumothorax
- Maintain chest drain system integrity by positioning the drainage system below the level of the chest
- Secure the system to the foot of the bed with no kinking
- Frequent assessments are necessary for the patient and drainage system.
- Check for air leaks, dressing integrity, water level and drainage

### Complications

- Tension pneumothorax
- Chest tube may fall accidentally, immediately seal with gauze and plaster to prevent air entry into the pleural

### Reference

- Morton, P.G. & Fontaine, D. (2009). *Critical care nursing: A holistic approach* (9<sup>th</sup> ed.), Philadelphia: Wolters Kluwer Health/Lippincott Williams & Wilkins

## V11 – Documentation

### **Documentation in nursing**

#### **Training of critical care nurses in Malawi**

#### **Learning outcomes**

Participants should be able to:

- Define documentation
- Explain the purpose of documentation
- Explain the importance of Documentation
- Explain the principles of Documentation
- Explain the methods of documentation

#### **Introduction**

- Documentation is an important part of safe and effective nursing practice
- Encompasses all written and/or electronic entries
- Reflects all aspects of patient care planned, recommended or given to that patient
- It is essential for good clinical communication.

#### **Definition**

- Documentation is anything written or electronically generated that describes the status of a client or the care or services given to that client
- Documentation is a written information or instruction that describes what has been done or not done (Perry & Potter, 2010)

- It is a written evidence of the interactions between and among health care professionals, clients, their families, and health care organizations.

#### **Importance of Documentation**

##### **1. Communication**

- Reflects the client's perspective about health, care provided, the effect of care and the continuity of care
- Confirms the care provided to the client.
- Clearly outlines all important information regarding the client
- Accurate documentation also reflects the effectiveness of the care provided.

### Importance of Documentation

#### 2. Accountability

- The health record demonstrates nurses' accountability
- Gives credit to nurses for their professional practice
- May be used in legal proceedings

### Importance of Documentation

#### 3. Quality improvement

- Information from the health record is often used to evaluate professional practice during quality improvement processes, such as performance reviews
- Clear documentation facilitates the evaluation of the client's progress toward desired outcomes
- It enables nurses to identify and address areas that need improvement.

### Importance of Documentation

#### 4. Research

- Health records can be a valuable source of data for health research
- Accurately recorded information is essential to provide accurate research data
- Through research, nurses can improve nursing practice.

### Principles of Documentation

Nurses should maintain documentation that is:

- Clear, brief and comprehensive
- Avoid generalisation e.g. had good urine output, slept well
- Relevant
- Accurate, true and honest - reflective of observations made-chart only what you see, feel, hear.

### Principles of Documentation

- Chart as soon as possible after care is given
- Organised
  - start every entry with the date and time
  - chart in chronological order- present a clear picture of events
- Use common vocabulary. This lessens the chance of misunderstanding between members of the health team.

### Principles of Documentation

- Use only approved abbreviations, acronyms or symbols
- Avoid abbreviations that can be misunderstood
- Write legibly and neatly
  - do not erase writing if an error occurs
  - cross nicely with a clean line and the content in question must remain visible.
  - sign and date the correction

### Principles of Documentation

- Client-focused
- Complete and organized
- Do not leave blank spaces
- No charting should be done in advance

REMEMBER: anything not documented is not done

### Methods of documentation

The nursing process- assessment, diagnosis, planning, implementation, evaluation

Problem solving charting using SOPIER format

Use of forms

### Group discussion

Discussion on nursing process

Discussion on the forms used in critical care units

### Reference

Perry, A. G. & Potter, P.A. (2010). *Clinical nursing skills & techniques* (7<sup>th</sup> ed.), St. Louis, Mo: Mosby Elsevier

## V12 – Cardiopulmonary resuscitation

### Basic Life support

Training of critical care nurses in Malawi

#### Learning outcomes

- Participants should be able to:
  - Assess a collapsed victim
  - Perform chest compression and rescue breathing
  - Assist an unconscious breathing victim in the recovery position.

#### Basic Life Support

- ABC – Airway, Breathing and circulation versus
- CAB – Circulation, Airway and Breathing
- 2015 evidence suggested that it may be reasonable to begin CPR with chest compressions

#### Basic Life Support

- A foundation of saving lives for cardiac arrest
- A sequence of procedures performed to restore circulation of oxygenated blood

#### Basic Life Support - steps

- Verify scene safety
- Check response
- Shout for help
- Looking for breathing and pulse (simultaneously)
- 30 chest compressions
- 2 rescue breaths
- AED arrives

#### Verify scene safety

- Verify the environment is safe for the provider
- Make sure there are no imminent threats – toxic and electrical hazards



### Check response

Shake shoulders gently and ask "are you all right?"

- Victim is unresponsive
- Shout for nearby help
- Activate emergency system response
- Send someone to bring a defibrillator and emergency equipment

### Looking for breathing and pulse (simultaneously)

- Look for no breathing
- Or only gasping and check pulse (simultaneously)
- Is pulse definitely felt within 10 seconds?

### Looking for breathing and pulse (simultaneously)

No normal breathing but has pulse

- Provide rescue breathing 1 breath every five to six seconds or about 10-12 breaths per minute
- Activate emergency response system if (if not already done) after 2min.
- Continue rescue breathing; check pulse every 2mins. If no pulse, begin CPR
- In case of opioid overdose give naloxone.

### Looking for breathing and pulse (simultaneously)

Normal breathing, has pulse

- Monitor until emergency responders arrive
- No breathing or only gasping, no pulse**
- Start CPR
- Begin cycles of 30 compressions and 2 breaths
- Use a **defibrillator as soon as it is available**
- (by this time in all scenarios, emergency system or backup is activated. A defib. and emergency equipment are retrieved or someone is retrieving them).

### CPR

- Position yourself at the victims side
- Victim lying on a firm flat surface
- Put heel of one hand the center of the victims chest on the lower half of the breast bone
- Put the heel of your other hand on top of the first hand.

### CPR

- Start compressions within 10 seconds of diagnosis of cardiac arrest
- Push hard at least 5cm (maximum 6cm) and fast (100-120/min) and allow complete chest recoil.
- Minimize interruption in compressions.
- Avoid excessive ventilation
- Rotate compressor every 2 min. or sooner if fatigued
- If no advanced airway, 30:2 compression-ventilation ratio.

### Open airway - Head tilt and chin lift

- Place one hand on the forehead and push with your palm to tilt the head back
- Place fingers on the bony part of the lower jaw near the chin forward
- Do not press deeply into the soft tissue under the chin
- Do not use the thumb to lift the chin
- Do not close the mouth of the victim completely

### Open airway – Jaw thrust

- Place one hand on each victim's head resting on the elbows on the surface on which the victim is lying
- Place your fingers under the angles of the victim's lower jaw and lift with both hands, displacing the jaw forward
- If the lips close, push the lower lip with your thumb to open the lips
- If jaw thrust does not open the airway use 'head tilt and chin lift'

### 2 Rescue breaths

- Mouth to mouth
- Adult mouth to barrier device
- Using the -bag mask with supplementary oxygen.



Figure 1. 2012 Healthcare Provider Adult Cardiac Arrest Algorithm—2012 Update. Adapted from "Part 2: Adult basic life support and cardiopulmonary resuscitation update: 2012 American Heart Association guidelines update for cardiopulmonary resuscitation and emergency resuscitation care", by D.L. Eisenberg, D.S. Berman, D.D. Chikara, S.H. Brown, M. Terry, D.J. DeVito, ... T. Eas, 2012, *Circulation*, 126(suppl 2), p.3612. Copyright 2012 by Wolters Kluwer Health, Inc.

### Continue CPR until

- Qualified help arrives and takes over
- The victim starts breathing normally
- Rescuer becomes exhausted

### When can I stop CPR?

- Victim revives
- Trained help arrives
- Too exhausted to continue
- Unsafe scene
- Physician directed
- Cardiac arrest for more than 30 minutes

#### CPR may fail because of

- Delay in starting
- Improper procedures
- Delay in defibrillation
  - Only 15% who receive CPR live to go home
  - Improper techniques
- Terminal or unmanageable disease (For example, massive heart attack)

#### Complications of CPR

- Vomiting
- Aspiration – what should be done?
  - Place victim on left side
  - Wipe vomit from mouth with fingers wrapped in a cloth
  - Reposition and resume CPR

#### References

- Berg, R.A., Hemphill, R., Abella, B.S., Aufderheide, T.P., Cave, D.M., Hazinski, M.F.,... 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):S685–S705. doi: 10.1161/CIRCULATIONAHA.110.970939
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- Thygerson, A.L., Thygeson, S.M., Gulli, B. & Piazza, G. (2012). *First aid, CPR and AED* (6<sup>th</sup> ed.), Sudbury: Jones & Bartlett Learning

## V13 – Suctioning and tracheostomy care

### Tracheostomy care and Suctioning

Training of critical care nurses in Malawi

#### Learning outcome

Participants will be able to:

- Define a tracheostomy care
- Explain the indications for tracheostomy
- Describe the tracheostomy care
- Describe the procedure for suctioning
- List complications of suctioning

#### Introduction

- Review structures of the lower respiratory tract

#### Tracheostomy

A surgical opening into the trachea below the larynx through which an indwelling tube is placed

Tracheostomy tube provides airway directly into anterior portion of the neck

Tracheostomy tube reduces work of breathing

#### Indications

- Failed intubation
- Oxygenation/mechanical ventilation
- Removal of secretions
- Maintain open airway
- Bypass obstruction in the upper airway which prevents insertion of ETT

#### Tracheostomy tubes

- Take a look at the different tubes provided
- Identify the parts of the tubes
- Designs:
  - Cuffed versus uncuffed tracheostomy tubes
  - Single-versus double-cannula tracheostomy tubes
  - Fenestrated tracheostomy tube
  - Speaking tracheostomy valves

### Assessment

- Secretions
- Signs and symptoms of impaired gaseous exchange
- Bleeding - expect small amount but constant bleeding requires intervention
- Inflammation – pain, redness and drainage
- Subcutaneous emphysema

### Tracheostomy care

- Change the tracheal dressing and tie, daily or when visibly soiled
- The tracheal tie should not be too tight or loose - one to two fingers between the tie and the skin
- Position the tracheostomy at midline to prevent pressure on surrounding tissue
- Clean the stoma with normal saline

### Tracheostomy care

- If the stoma is infected clean with half strength hydrogen peroxide and rinse with normal saline
- Maintain cuff pressures (20-30 mmHg) at the minimum. This is required to prevent air leak and reduce risk for tube breakdown
- Remove sutures after 7 days
- Skin care
- Suction the tracheostomy every 2 hours or PRN

### Tracheostomy care

- Provide humidified oxygen to prevent drying of the mucosa or blockage of the tube
- Have an emergency tracheostomy at the bedside in case of unplanned decannulation or obstruction
- Keep the patient well hydrated
- Reassure the patient
- Explore alternative methods of communication
- Suctioning prior to feeding may be helpful

### Strategies for mobilising secretions

- Frequent repositioning
- Deep breathing and coughing
- Chest physiotherapy
- postural drainage
- Oral and parenteral hydration
- Supplemental humidification

### Complications of tracheostomy

- Bleeding
- Pneumothorax during insertion
- Accidental/unplanned decannulation
- Tube blockage
- Surgical emphysema
- Infection
- Tracheal stenosis

### Suctioning

- A procedure which is performed in patients with artificial airways
- Performed to clear airway of the secretions from the oropharynx, endotracheal tube (ETT) or tracheostomy to prevent obstruction.

### Methods of suctioning

There are 2 methods of suctioning:

#### 1. Shallow suctioning

Involves insertion of a catheter to a predetermined depth, usually the length of the artificial airway plus the adapter.

#### 2. Deep suctioning

Defined as the insertion of a suction catheter until resistance is met, followed by withdrawal of the catheter by 1 cm before applying negative pressure

### Patient assessment

The following should be monitored prior to, during and after the procedure:

- Breath sounds
- Oxygen saturation
- Respiratory rate and pattern
- Hemodynamic parameters (Pulse, Bp, ECG)
- Sputum characteristic (colour, volume, consistency and odor)
- Ventilator parameters (PEEP, tidal volume, FiO<sub>2</sub>)
- Suction only as indicated by patient assessment

### Preparation for suctioning

- Sterile gloves
- Stethoscope
- Goggles, apron and face mask
- 2 suction catheters and pack.
- Use a smaller catheter - diameter of the catheter should not exceed  $\frac{1}{4}$  the inner diameter of the artificial airway

### Preparation for suctioning

- An assistant if possible
- Oxygen source - 100%
- Check the suction machine is working by occluding the end of suction before attaching it to the catheter.
- The suction pressures should be set as low as possible to effectively clear the secretions (80-120 mm Hg)

### Selecting a Tracheostomy suction catheter

- Selection of the appropriate size suction catheter helps to reduce the risk of trauma during suctioning
- Divide the internal diameter of the tracheostomy by two, then multiply the answer by three to obtain the French gauge suction catheter:

#### Example:

- Size 8 tracheostomy tube (patient);  $(8\text{mm}/2) \times 3 = 12$
- Therefore, a size 12F gauge catheter is suitable for suctioning

### Procedure

- Put on protective wear
- Explain the procedure to the patient
- Pre oxygenate the patient with 100% oxygen for 30-60 secs
- Switch on the suction machine
- Connect the catheter to the suction machine

### Procedure

- Put on the sterile glove
- Ask the assistant to disconnect the patient from the ventilator or from any other oxygen source or use the non dominant hand to disconnect the patient from ventilator
- Cover the patient's chest with a sterile towel on which to place the catheter

### Procedure

- Hold the sterile catheter with a sterile gauze and lubricate the tip of suction catheter with saline
- Insert the catheter 15-20cm until you meet resistance then withdraw a 1 cm and suction while rotating the catheter. The duration of suctioning should not exceed 15 secs.
- Allow suction to take place only during withdrawal of catheter

### Procedure

- Suction the mouth after completion of airway suctioning
- Clean and rinse the catheter between each suction pass
- Allow the patient 20 to 30 seconds to rest between suction passes.
- Limit suctioning to 3 passes of catheter
- Discontinue if HR drops by 20; increases by 40, produces arrhythmias, or decreases O<sub>2</sub> < 90%
- Reassure the patient as much as you can

### Procedure

- Assess the consistency of the secretions, colour, smell
- Use the sterile gauze to wipe the catheter
- Maintain sterility throughout the procedure
- After the procedure, rinse the catheter in a sterile bowl with normal saline
- Adjust the oxygen concentration back to the previous level

### Procedure

- Turn off the suction machine
- Auscultate the lungs to assess effectiveness of suctioning
- Wash hands
- Remember to document after the procedure

**Note:** Current evidence discourages routine instillation of normal saline to loosen secretions

### Complications of suctioning

- Decrease in dynamic lung compliance and functional residual capacity
- Atelectasis
- Hypoxia/hypoxemia
- Trauma to the tracheal or bronchial mucosa
- Bronchospasm/bronchoconstriction
- Infection of the lower airway
- Increased intracranial pressure
- Hypertension

### References

- Sole, M.L., Klein, D.G. & Moseley, M. (2013). *Introduction to critical care nursing* (6<sup>th</sup> ed.). Missouri: Elsevier Saunders.
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## V14 – Arterial Blood Gas analysis

### **Respiratory Monitoring/Arterial Blood Gas Analysis**

Training of critical care nurses in  
Malawi

#### **Learning outcome**

Participants will be able to:

- Describe parameters of respiratory monitoring
- Interpret arterial blood gases

#### **INTRODUCTION**

- Function of the respiratory system - supply oxygen to tissues and remove carbon dioxide
- ICU nurse must understand physiology, pathophysiology and variety of monitors used to evaluate respiratory status
- Guides decisions about pulmonary function and gas exchange

#### **RESPIRATORY MONITORING - PARAMETERS**

- Physical examination
- Chest x-rays
- Arterial carbon dioxide tension (PaCO<sub>2</sub>)
- End Tidal Carbon Dioxide (Capnography)
- Arterial oxygen tension (PaO<sub>2</sub>)
- Arterial oxygen saturation (SaO<sub>2</sub>)
- Pulse oximetry (SpO<sub>2</sub>)
- Acid-Base balance
- Arterial blood gas

#### **Physical Examination**

- Use of inspection, palpation, auscultation and percussion
- Provides first clue when something goes wrong
- Often underestimated due to increasing use of technology

#### **Chest x-ray**

- Routine in ICU
- Helps in early detection of lung pathology
- Provides information about catheters and tubes and progression of lung disease
- Limitations: lack of correlation with other monitors 'lag time'

### **Arterial carbon dioxide tension (PaCO<sub>2</sub>)**

- Measured from arterial blood gas
- Reflects respiratory component of the acid-base status
- Most reliable method for evaluating the effectiveness of ventilation

### **End Tidal Carbon Dioxide (Capnography)**

- Capnography - Non invasive measurement and graphic display of CO<sub>2</sub> at the end of exhalation
- Analyser (capnometer) is portable, less expensive to maintain

### **Arterial Oxygen Tension (PaO<sub>2</sub>)**

- Reflects the ability of the lungs to transfer oxygen from the environment to the circulating blood
- Direct measurement from arterial blood gas
- Ranges from 80 – 100 mmHg

### **Arterial Oxygen Saturation (Sao<sub>2</sub>)**

- Each haemoglobin molecule has the capacity to carry four oxygen molecules.
- How much of that capacity is filled by oxygen at any time is called the oxygen saturation.
- Expressed as a percentage
- Normal is > 95%

### **Pulse Oximetry (SpO<sub>2</sub>)**

- Non invasive display of arterial oxygen saturation of blood
- Different probe sites used to increase accuracy

### **Relationship between SaO<sub>2</sub> and PaO<sub>2</sub>**

- Exhibited by oxyhaemoglobin dissociation curve
- Oxyhaemoglobin dissociation curve describes the relationship between the partial pressure of oxygen (x-axis) and the oxygen saturation (y-axis).
- The amount of oxygen bound to the haemoglobin is related to the partial pressure of oxygen to which the haemoglobin is exposed.

### Oxygen-hemoglobin dissociation curve

- In the lungs, at the alveolar-capillary interface
  - the partial pressure of oxygen is high
  - oxygen binds readily to haemoglobin that is present.
- As the blood circulates to other body tissues in which the partial pressure of oxygen is less, the haemoglobin releases the oxygen into the tissues

### Factors that affect oxygen-haemoglobin dissociation curve

- A **rightward shift** indicates that the haemoglobin under study has a decreased affinity for oxygen.
- *Means: more difficult for haemoglobin to bind to oxygen, but easier for the haemoglobin to release oxygen bound to it.*

### Factors that affect oxygen-haemoglobin dissociation curve

- The **leftward shift** indicates that the haemoglobin under study has an increased affinity for oxygen
- *Means: haemoglobin binds oxygen more easily, but unloads it more reluctantly.*

### Factors that affect oxygen-haemoglobin dissociation curve

	Left shift (high affinity for O <sub>2</sub> )	Right shift (low affinity for O <sub>2</sub> )
Temperature	decrease	increase
2-3 diphosphoglycerate (2- 3 DPG)	decrease	increase
Carbon Dioxide	decrease	increase
pH	increase (alkalosis)	decrease (acidosis)

### ACID BASE REGULATION

- Arterial pH – concentration of hydrogen ions
- Reflects the balance between carbon dioxide (an acid regulated by the lungs) and bicarbonate (HCO<sub>3</sub>) regulated by the kidneys
- Normal acid-base ratio is 1:20, one part of acid to 20 parts of base
- If this balance is altered, derangements in pH occur

### ACID BASE REGULATION

#### **Buffers**

- Act immediately after an abnormal pH level occurs

#### **Bicarbonate buffer**

- Buffers acids
- Its reabsorption, excretion are regulated by the kidneys

#### **Phosphate buffer**

- Aids in excretion of hydrogen ions

## ACID BASE REGULATION

### Ammonium buffer

- Ammonia combines with hydrogen to form ammonium

### Respiratory system

- Acidemia increases alveolar ventilation (hyperventilation) where as alkalemia decreases alveolar ventilation (hypoventilation)
- Hyperventilation eliminates carbon dioxide
- Hypoventilation retains carbon dioxide

## ACID BASE REGULATION

### Renal system

- Regulates acid-base by increasing or decreasing bicarbonate ions
- Retention or excretion of hydrogen ions
- Ammonium synthesis for hydrogen excretion
- When hydrogen ion is excreted, bicarbonate is generated by the kidneys

## ARTERIAL BLOOD GASES (ABG)

Arterial Values	Normal Range
pH	7.35 – 7.45
PaCO <sub>2</sub>	35 – 45 mmHg
PaO <sub>2</sub>	80 – 95 mmHg
SaO <sub>2</sub>	95 – 99%
Base Excess	+ or -1
Serum Bicarbonate	22-26 mEq/L

## ARTERIAL BLOOD GASES (ABG)

### pH

- Reflects acid-base status
- Does not differentiate between respiratory and metabolic components
- Normal pH is 7.35-7.45
- Indicates whether pH is normal (7.4), acidic (<7.35) or alkalotic (>7.45)

## ARTERIAL BLOOD GASES (ABG)

### PaCO<sub>2</sub>

- Respiratory component of acid-base regulation
- Adjusted by changes in the rate and depth of pulmonary ventilation
- Hypercapnia signals hypoventilation & respiratory acidosis
- Hypocapnia signals hyperventilation & respiratory alkalosis

## ARTERIAL BLOOD GASES (ABG)

### PaO<sub>2</sub>

- No primary role in acid-base regulation
- Measures partial pressure of oxygen in plasma
- Hypoxemia (PaO<sub>2</sub> <80mmHg) can lead to anaerobic metabolism, lactic acid production and metabolic acidosis

### ARTERIAL BLOOD GASES (ABG)

#### Saturation (SaO<sub>2</sub>)

- The degree to which Hb is saturated by oxygen
- The relationship between saturation and PaO<sub>2</sub> is illustrated by the oxygen dissociation curve
- Affected by changes in temperature, pH and PaCO<sub>2</sub>

### ARTERIAL BLOOD GASES (ABG)

#### Base excess or deficit

- Indicates amount of buffers (hemoglobin & plasma bicarbonate)
- High values reflect alkalosis
- Low values reflect acidosis

### ARTERIAL BLOOD GASES (ABG)

#### Serum bicarbonate

- Renal component of acid-base regulation
- Decreased bicarbonate levels (<22mEq/l) indicate metabolic acidosis
- Elevated bicarbonate levels (>26mEq/l) reflect metabolic alkalosis

### Arterial Blood Gas Analysis – Step-by-Step

#### Step 1

- Determine if pH is normal or acidotic (<7.35) or alkalotic (>7.45)

#### Step 2

- Check PaCO<sub>2</sub>
- Compare pH and PaCO<sub>2</sub> values
- If pH and PaCO<sub>2</sub> move in opposite direction, the problem is respiratory

### Arterial Blood Gas Analysis – Step-by-Step

#### Step 3

- Assess HCO<sub>3</sub> value
- Normally, as the pH increases the HCO<sub>3</sub> should also increase
- If they move in the same direction, the problem is metabolic

### Arterial Blood Gas Analysis – Step-by-Step

	pH	PaCO <sub>2</sub>	HCO <sub>3</sub>
Respiratory Acidosis	↓	↑	Normal
Respiratory Alkalosis	↑	↓	Normal
Metabolic Acidosis	↓	Normal	↓
Metabolic Alkalosis	↑	Normal	↑

### Compensation

- Homeostasis aims to achieve a pH of 7.4
- Identify whether respiratory function is compensating for metabolic acidosis/alkalosis or vice versa
- If pH has not normalised then compensation has failed

### Scenario for practice

- pH 7.23
- PaCO<sub>2</sub> 53.25mmHg
- PaO<sub>2</sub> 58.5mmHg
- HCO<sub>3</sub> 28mEq/l

Interpretation?  
Any compensation?

### Scenario for practice

- pH 7.13
- PaCO<sub>2</sub> 33mmHg
- PaO<sub>2</sub> 48mmHg
- HCO<sub>3</sub> 10mEq/l
- SaO<sub>2</sub> 88%

Interpretation?  
Any compensation?

### Scenario for practice

- pH 7.0
- PaCO<sub>2</sub> 17mmHg
- PaO<sub>2</sub> 90mmHg
- HCO<sub>3</sub> 4mEq/l
- BE -18
- SaO<sub>2</sub> 90%

Interpretation?  
Any compensation?

### Scenario for practice

- pH 7.52
- PaCO<sub>2</sub> 17mmHg
- PaO<sub>2</sub> 90mmHg
- HCO<sub>3</sub> 24mEq/l
- SaO<sub>2</sub> 98%

Interpretation?  
Any compensation?

### References

- Sole, M.L., Klein, D.G. & Moseley, M. (2013). *Introduction to critical care nursing* (6<sup>th</sup> ed.). Missouri: Elsevier Saunders.
- Woodrow, P. (2000) *Intensive care nursing: A framework for practice*, New York, NY: Routledge

## V15 – Care of family members of patients admitted to CCU

### **Family care during critical illness**

**Training of critical care nurses in Malawi**

#### **Intoduction**

- A family – definition
- A family is a unit.
- Critical illness causes psychological stress.

#### **Intoduction**

- Holistic care has generated great interest in family needs.
- Widely explored in research
- Families are not psychologically prepared for critical illness

#### **Psychological impact of critical illness**

- The social responsibilities no longer present.
- Family crisis occurs which lead to havoc and grief.
- Families experience emotional turmoil

#### **Psychological impact of critical illness**

- Levels of stress related to demographic status
- Females, children and people with lower education status experience high levels of stress (Mc Adam & Puntillo, 2009)
- Worse in intensive care unit.

#### **Coping strategies among family members**

- Coping – Definition
- Three major strategies:
  - Enduring uncertainty – waiting for information (common).
  - Putting self aside – reassurance.
  - Forming personal cues – looking for answers in a strange environment.
  - Other strategies - divorce (escape), belief in God & social support.

### **Family-centred care**

- A notion - patients are part of the 'whole'.
- Has a positive impact on the quality of care.
- Creates a win-win situation to patients, families and nurses
- Research has identified family needs during critical illness.

### **Family needs during critical illness**

- Original work - Nancy Molter (Molter, 1979).
- Developed 45 needs
- Revised by Leske (1986) and called Critical Care Family Needs Inventory (CCFNI).

### **Family needs during critical illness**

- Five categories:
  - Information
  - Assurance
  - Comfort
  - Closeness or proximity
  - Support

### **Need for information**

- Emerged as most important
- Information about what happened to the patient, condition of the patient and what might happen, etc.
- Affects families in both negative and positive ways

### **Need for assurance**

- Assurance about patient's condition helps to reduce anxiety
- Gives the family a sense of trust in the care giver
- Most important needs relate to assurance and information

### **Need for comfort**

- Comprises needs which provide personal comfort.
- Ranked lowly - Priority given to the needs of the patient
- Should be interpreted with caution!!!!!!



### Need for support

- Comprises:
  - the need to trust in oneself
  - to be supported as a person and a relative
  - to feel considered by health professionals
- Lowly ranked - Priority given to the needs of the patient.

### Need for closeness or proximity

- To be by the bedside at all times
- They seek information and have a chance of helping the patient

### Need for closeness or proximity

- Helps to reduce anxiety experienced by the patient and family.
- Highly favoured among relatives of a dying patient.

### Most important needs - specific

- To feel that health care professionals care about the patient.
- To be assured that the best possible care is given to the patient.
- To have questions answered honestly.
- To know details concerning the patient's progress.
- To have explanations given that are understandable.
- To feel accepted by health professionals.
- To feel there is hope.
- To have directions as what to do at the bedside.
- To know exactly what is being done for the patient.
- To be told about transfer plans while they are being made

### Summary

- Families go through a traumatic experience when a relative is critically ill.
- Health professionals must include families in the orbit of care.
  - Reduces families' stress
  - Promotes their ability to support the patient
  - Facilitating the patient's recovery.

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## V16 – Sepsis

### Surviving sepsis campaign

Training of critical care nurse in Malawi

#### Outline

Participants will be able to:

- Identify groups of people at risk of sepsis
- Explain the pathophysiology of sepsis
- Explain the sepsis continuum
- Explain the priorities of surviving sepsis campaign

#### Definitions

- **Infection** - presence of microorganisms in a sterile site
- **Bacteremia** - cultivatable bacteria in the blood stream
- **Sepsis** - systemic inflammatory response to infection

#### Risk groups

- Underlying diseases : neutropenia, leukemia, diabetes, AIDS, serious chronic conditions
- Critical care patients due to increased number of invasive lines, drains, tubes; frequency of invasive procedures
- Prior drug therapy: immuno-suppressive drugs
- Miscellaneous conditions: septic abortion, wide spread burns, trauma

#### Pathophysiology

- Invasion of bacterial fragments. Attach to lipopolysaccharide-binding proteins
- Provoke macrophages, release pro-inflammatory mediators, TNF, interleukin-1,6,12

#### Pathophysiology

- Under normal physiological conditions, these mediators are moderated by anti-inflammatory cytokines
- Failure to control pro-inflammatory mediators result in systemic overspill
- Diverse physiological effects, ARDS, DIC, MODS

### Sepsis continuum

SIRS	Sepsis	Severe sepsis	Septic shock
Known predisposing condition with atleast 2 of the following: Pulse rate > 90 b/min RR > 20 b/min Temp > 38 or < 36 WBC > 12,000 or < 4,000	SIRS due to infection	Sepsis with one or more organ failure	Severe sepsis with unresponsive hypotension (< 90 mmHg)
Mortality 7%	Mortality 16%	Mortality 20%	Mortality 46%

### Signs of organ hypoperfusion

- SBP < 90 mmHg
- Acute mental status change
- PaO<sub>2</sub> < 60 mmHg
- Increased lactic/acidosis
- Oliguria
- DIC or Platelet < 80,000
- Liver enzymes > 2 x Normal

### Surviving sepsis campaign

- International campaign
- Increase awareness and improved outcome related to severe sepsis
- A group of experts on infectious disease and critical convened
- Addressed incidence of sepsis and high associated mortality rate
- Evidence based guidelines for diagnosis and treatment of sepsis

### Diagnosis

- Atleast 2 blood cultures before initiation of antimicrobial therapy
  - One drawn percutaneously
  - Atleast one drawn through each vascular access device if inserted longer than 48 hrs

### Diagnosis

- Other cultures, urine, CSF, wounds, respiratory secretions as clinical situation dictates
- Imaging and sampling to determine the source and causative organism

### Sepsis resuscitation bundle

- Serum lactate measured
- Blood culture
- Improve time to broad-spectrum antibiotics
- In the event of hypotension or lactate > 4 mmol/L (36mg/dl)
  - Deliver crystalloids (or colloid equivalent) – 20ml/Kg
  - Apply vasopressors for ongoing hypotension

### Sepsis resuscitation bundle

- In the event of persistent hypotension despite fluid resuscitation:
  - Achieve CVP > 8 mmHg
  - Central venous oxygen saturation > 70%

### Sepsis management bundle

- Fluid resuscitation
- Appropriate cultures
- Early targeted antibiotics and source control
- Use of vasopressors/inotropes when fluid resuscitation optimized

### Sepsis management bundle

- Evaluation for adrenal insufficiency
- Stress dose corticosteroids, Hydrocortisone
- Low tidal volume mechanical ventilation for ARDS
- Tight glucose control
- Supportive therapy - FAST HUG

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## V17 – Use and care of equipment

### Care of equipment

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### Learning outcomes

Participants should be able to:

- Know the equipment that is used in critical care units
- Explain the nursing responsibilities in the care of equipment

### Knowing and understanding equipment

- Knowledge of equipment is as important
- It is critical to know the equipment we use in our unit
- Do not operate any equipment by try and error
- Love your equipment as you do to your mobile gadgets.

### Categories of the equipment

- Oxygen sources
- Monitoring Equipment
- Airway Equipment
- Other Equipment

### How to use the monitor

- The multiparameter monitor is very handy and useful equipment.
- All the components must function always otherwise you are forced to bring additional equipment for the patient.

### How to use the monitor

- Delicate as well as sensitive components are: BP and Oximeter probe
- Never leave the BP cuff pump without the patient, it damages the pump transducer inside
- Use the probe on the fitting finger so that the springs are not overstretched

#### **How to care for the concentrator**

- Place two metres above the ground.
- It should be one metre away from the wall.
- Clean the gross particle filter once a week.
- Daily damp dusting.
- Never use a wet Gross particle filter.

#### **How to care for the concentrator**

- Use humidification so that patient does not complicate with dry secretions.
- Use new tubing for new patients or change regularly in a patient who stay on oxygen for many days.

#### **Precautions on the use of cylinders**

- Make sure the Cylinders are well supported
- Do not open cylinder in front of the colleague or patient
- No fire or smoking near.

#### **Precautions on the use of cylinders**

- Make sure the connections are tightly fitting, leaks are very common with cylinders
- Do not use oils on the connectors and cylinder holes

#### **Other machines**

Guidelines on the use of suction:

- a) Make sure the suction bottle cover is tightly fitted to make sure you are able to create vacuum.
- b) Empty the bottle when it is three quarter full. avoid overfilling the bottles because you damage the motor.
- c) Always rinse the suction tubings to make sure they are clean.

**More details to be discussed during the practical session**

## V18 – Head injury

### Management of head injury

Training of critical care nurses in Malawi

#### Classification - Review

Can be classified according to three anatomical sites:

- The scalp
  - Abrasions
  - Contusion
  - Laceration
- The skull
- The brain
  - Focal injuries – Contusion and haemorrhage
  - Diffuse injuries – concussion, acute axonal injury and hypoxic injury

#### Management

- Aims at preventing or limiting secondary damage
- Secondary damage occurs due to oedema, haematoma, ischemia and infection
- Thorough assessment – to gather baseline data
- Continuous assessment of the patient neurological state

#### Management priorities

- Maintain open airway
- Recognition of changes in the patient's condition
- Fluid balance and adequate nutrition
- Maintain normothermia, reduce metabolism and oxygen consumption
- Prevent complications

#### Maintain open airway

- Maintaining an airway in an unconscious patient is vital to ensure adequate ventilation and tissue perfusion
- An oral airway may be used and the mouth oral pharynx kept clear of saliva, mucus, blood and vomitus
- Place patients on the sides to facilitate breathing (sims position is useful)

#### Maintain open airway

- For intubated patients they are nursed in supine position
- Respiratory infections hinder recovery and are a major cause of mortality.
- Therefore, care should be given to prevent aspiration hence regular suctioning and changing of the patients position are essential
- Early regular chest physiotherapy shall be ensured, dentures should always be removed

#### **Maintain open airway**

- Obstructed respirations increase intrathoracic pressure which reduces the venous return to the heart while raising the intracranial pressure

#### **Recognition of change in the patient's condition**

- Assessment of the level of consciousness and other vital signs
  - Level of consciousness**
- This is the most important observation relating to an unconscious patient
- Accurate assessment and recording are essential
- Is the level of consciousness improving or deteriorating?

#### **Recognition of change in the patient's condition**

##### **Glasgow coma scale**

- Used to assess all unconscious patients using:
  - Eye opening
  - Verbal response
  - Motor response
- Pupils are also checked for size, equality and reaction to light
- A dilated pupil or pinpoint must be reported immediately

#### **Recognition of change in the patient's condition**

- Basic observations like blood pressure, pulse rate, respirations, oxygen saturation and temperature should be checked  $\frac{1}{4}$  hourly to 2 hourly
- The colour, temperature of the skin and moisture of the skin indicate the adequacy of tissue perfusion

#### **Maintain fluid balance and adequate nutrition**

- The unconscious patients should be given fluids intravenously
- Nasogastric feeds should be given to prevent stress ulcers
- A urinary catheter should be used to monitor fluid output
- A condom catheter may be used

#### **Maintain normothermia and reduce metabolism and oxygen consumption**

- Pyrexia increases metabolism hence oxygen consumption
- The brain is most sensitive to hypoxia which results in death of brain cells, irreparable cerebral damage and even death
- Effective management of pyrexia in these patients is crucial



**Prevent complications which result from stasis and complete bed rest**

- Hypostatic pneumonia, deep vein thrombosis, dropped foot or wrist etc are common
- Chest physiotherapy is given to encourage deep breathing and coughing
- Endotracheal suctioning is done as required to remove secretions

**Prevent complications which result from stasis and complete bed rest**

- Chest physiotherapy is essential to prevent atelectasis and lung infections and should be done 2 hourly
- Passive exercises to improve circulation
- The limbs should be positioned in a good functional position to prevent contractures, deformities and wrist or foot drop

**ICU management of head injury**

- Head injury patients present with high mortality
- If they survive they often develop neurological deficits
- Therefore specific treatment is required for ICU patients to avoid or reduce poor neurological outcomes

**Neuroprotective analgosedation**

- Patients are sedated according to ICU protocol
- Propofol perfusor: 50 mls 1% (1 ml = 10 mg) for 3-5 days.
- Assess level of sedation and adjust accordingly
- Pethidine bolus 50 mg 6 hourly. Assess and adjust accordingly – 5 days
- Ketamine 1g in 30 mls NS (20 mg/ml). Assess and adjust accordingly - 5 days

**Neuroprotective analgosedation**

- Diazepam bolus: 5mg every 8 hours. Assess and adjust accordingly – 5 days
- Continue to give Diazepam bolus for the first 24 hours. Assess and adjust accordingly

**Ventilator treatment**

- Ventilate the patient to aim for oxygen saturation levels of above 95%
- Use volume control mode (assist control)
- Monitor end tidal carbon dioxide (35-40 mmHg) 2 hourly
- Endotracheal suctioning 2 hourly/PRN

#### **Patient positioning**

- Elevate head of the bed, 30 to 40°
- Keep head in neutral central position
- Strictly avoid compression of the internal and external jugular veins

#### **Fluid administration**

- Ensure adequate fluid infusion
- Aim at CVP of 8-12mmH<sub>2</sub>O
- Hypotonic solutions i.e. 5% Dextrose is not recommended
- Aim at MAP of 70-75mmHg
- Aim at urine output of 0.5-1ml/kg/hr
- Give Mannitol if there are signs of increased intracranial pressure: bradycardia, increased BP
- Give Mannitol for 3 to 5 days

#### **General management**

- Glucocorticoids administration is not indicated
- Monitor blood glucose to within 100-150 mg/dl
- Treat fever aggressively
- Treat convulsions/seizures aggressively with Phenobarbitone 100 mg
- Ensure nutritional support for optimal metabolism

#### **Reference**

- Bersten, A.D. & Soni, N. (2014). *Oh's intensive care manual* (7<sup>th</sup> ed.), Oxford: Butterworth Hienemann Elsevier
- Sheppard, M. & Wright, M. (2000). *Principles and practice of high dependency nursing*, London: Harcourt Publishers Limited
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## V19 – Mechanical ventilation

### **Mechanical ventilation**

Training of critical care nurses in Malawi

#### **Learning outcomes**

Participants will be able to:

- Explain the indications for mechanical ventilation
- Describe types of ventilation
- Discuss different modes of ventilation & ventilator settings
- Discuss complications of mechanical ventilation
- Discuss weaning process and commonly used weaning modes
- Discuss nursing care of a ventilated patient

#### **Introduction**

- **Ventilation:** the movement of air into and out of the lungs to carry oxygen to the lungs and remove waste carbon dioxide
- **Mechanical ventilation:** the artificial control of the breathing cycle by means of a machine

#### **Indications**

- Reducing the work of breathing
- Supporting cardiopulmonary gas exchange
- Reversing hypoxaemia and acute respiratory acidosis
- Preventing and reversing atelectasis
- Decreasing intracranial pressure

#### **Types of ventilation**

Non-invasive mechanical ventilation

Invasive mechanical ventilation

#### **Invasive Mechanical Ventilation**

**Negative Pressure Ventilation (NPV)** - applied externally, decreases the atmospheric pressure surrounding the thorax to initiate inspiration. No longer used.

**Positive Pressure Ventilation (PPV)** – uses mechanical drive mechanism to force air into the pt's lungs through endotracheal or tracheostomy tube.

### Modes of ventilation

- Ventilator mode refers to how the machine will ventilate the patient.
- Determines how much the patient will participate in his or her own ventilatory pattern.
- Choice depends on the patient's situation and the goals of treatment

### Modes of ventilation

Commonly used modes:

**SIMV** (Synchronized Intermittent Mandatory Ventilation): ventilator is set to deliver a certain number of breaths at a specified tidal volume.

Patient can take spontaneous breaths between the ventilator breaths but not during them.

### Modes of ventilation

**PSV** (Pressure Support Ventilation): ventilator gives an inspiratory boost to each breath, augments each spontaneous breath to a specified peak airway pressure.

Patient controls rate, inspiratory flow & tidal volume

**CPAP** (Constant Positive Airway Pressure): positive pressure applied during spontaneous breaths; patient controls rate, inspiratory and tidal volume

Increases functional residual capacity & improves oxygenation by opening collapsed alveoli

### Ventilator settings

- A variety of settings on the ventilator
- Allow the ventilator parameters to be individualised
- Patient's ventilatory patterns are displayed

### Ventilator settings

Include:

- Tidal volume – 10 -12 ml/Kg
- Respiratory Rate (*f*)– 6-20 breaths/min
- Oxygen concentration (*Fio2*) – set 21% - 100%
- Positive End-Expiratory Pressure (pressure applied at the end of expiration)- 3 -5 cmH2O
- Pressure Support – 5 - 10 cmH2O
- Inspiration : Expiratory ratio – Rate 1: 2 to 1: 1.5

### Complications of mechanical ventilation

#### i. Ventilator induced lung injury

- Air leaks – can be a result of excessive pressure in the alveoli (**barotrauma**), excessive volume (**volutrauma**) and shearing due to repeated opening and closing of alveoli (**atelectrauma**)
- Can result into air leaking into surrounding spaces

### Complications of mechanical ventilation

- ii. **Cardiovascular compromise** – positive pressure ventilation increases intrathoracic pressure
  - Venous return to the right side of the heart is decreased
  - Decreased preload results in decreased cardiac output

### Complications of mechanical ventilation

- iii. **Gastrointestinal disturbances** – occurs when air leaks around the endotracheal or tracheostomy cuff, overcomes esophageal sphincter  
Vomiting can occur due to pharyngeal irritation  
Hypomotility & constipation – due to immobility
- iv. **Patient-ventilator dyssynchrony** – mode & settings used can increase work of breathing and lead the patient to breath out of synchrony  
Results in decreased effectiveness of mechanical ventilation, development of psychological stress

### Complications of mechanical ventilation

- v. **Ventilator Associated Pneumonia (VAP)** – the development of pneumonia while undergoing ventilation  
Artificial airway bypasses or impairs many of the lung's normal defence mechanism
- vi. **Oxygen toxicity/intoxication/poisoning** – due to high FiO<sub>2</sub>. Can cause oxidative damage to cell membranes, the collapse of the alveoli in the lungs, retinal detachment, renal damage and seizures

### Weaning

- Is the gradual withdrawal of mechanical ventilator and the reestablishment of spontaneous breathing
- Factors to consider before weaning:
  - Correction of the original process which required mechanical ventilation
  - Patient stability
  - Length of time on ventilator

### Weaning

Evaluate patient for readiness for weaning:

- level of consciousness
- physiologic and haemodynamic status
- adequacy of oxygenation
- spontaneous breathing pattern
- respiratory rate and pattern

### Weaning methods

- Three main methods:
  - T-tube (T- piece) trials : alternating periods of ventilatory support with periods of breathing
  - SIMV : ventilator is in SIMV mode and slowly decreasing the rate to zero
  - Pressure Support Ventilation (PSV). Level of support during inspiration is gradually reduced

### Nursing care of a ventilated patient

#### i. Patient safety

- Patient assessment
- Equipment assessment

#### ii. Patient comfort

- #### iii. FAST HUG – Feeding, Analgesia, Sedation, Thrombolytic agents, Head of bed elevation, Prevention of Ulcers, Glucose control

### Patient safety

#### • Patient assessment

- Primary survey - to identify immediate life threatening events. ABCDE approach is used.
- Secondary survey – involves systemic assessment of body systems: neurological, respiratory, cardiovascular, GIT, metabolic, renal, skin.

### Patient safety

- Equipment assessment – ensure emergency equipment is available

- Resuscitation bag
- Suction unit
- Intubation equipment
- Oxygen source
- Correct attachment of IVs & monitoring devices

### Patient comfort

- Measures which promote patient comfort

- Position
- Turning
- Hygiene – oral care, bed bath
- Management of stressors – communication difficulties, sleep disturbances, feeling of isolation and loneliness
- Pain management – follow ICU protocol
- Sedation- follow ICU protocol

### Reference

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