UTILIZATION OF MODIFIED EARLY WARNING SCORE AMONG WARD NURSES AT KONKOLA MINE HOSPITAL, CHILILABOMBWE, ZAMBIA

BY

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DECLARATION

I, Regina Mutolwa Kanyenda, declare that this study entitled **"Utilization of Modified Early Warning Score among ward Nurses at Konkola Mine Hospital, Chililabombwe, Zambia"** is my original work and has never been presented or submitted to any academic institution in anticipation of any award. Where any foreign text has been used, citations have been duly made to acknowledge sources of that text.

Sign: _____ **Date: _____**

LETTER OF APPROVAL

This study, entitled **"Utilization of Modified Early Warning Score among ward Nurses at Konkola Mine Hospital, Chililabombwe, Zambia,"** is original work that has been prepared under my supervision. It is due for submission.

Signature **Date**

_____ _____

Dr. Wahila Ruth (*PhD*)

ABSTRACT

Background: Hospitalized patients, including those in the Intensive Care Unit, often experience clinical deterioration. The Modified Early Warning Score helps healthcare providers monitor patients' conditions to anticipate serious adverse events. The recognition, response, and treatment of deteriorating patients are essential for improving patient outcomes and reducing unexpected deaths, length of stay, and cost of Intensive Care Unit care. Therefore, improving patient monitoring, using a simple and user-friendly tool like the Modified Early Warning Score system, remains crucial for early detection and prompt treatment to prevent severe adverse effects.

Aim: To establish the utilization of Modified Early Warning Score and its associated factors among ward nurses at Konkola Mine Hospital, Chililabombwe, Zambia.

Methods: A cross-sectional descriptive study was conducted among 81 randomly selected nurses using simple random sampling. Data were collected using a validated structured questionnaire. All ethical guidelines were upheld. Data was analyzed using SPSS version 27 employing Chi-square and binary logistic regression tests.

Results: The study results revealed suboptimal utilization of the Modified Early Warning Score at 68% with significant associations between age group (p= 0.029), gender (p = 0.001), level of education (p = 0.001), training in Modified Early Warning Score (p = 0.001), attitude (p = 0.001), and knowledge (p = 0.001). Training had a significant impact on Modified Early Warning Score utilization as respondents who had not received training were less likely to utilize MEWS compared to those who had received training (AOR = 11.76; 95% CI, 1.34–103.19; p = 0.026). Respondents with a positive attitude towards Modified Early Warning Score were more likely to utilize it compared to those with a negative attitude (AOR = 5.28; 95% CI, 1.08–6.24; p = 0.003). Knowledge was another important predictor, with respondents who had adequate knowledge of MEWS being more likely to utilize it than those with inadequate knowledge (AOR = 3.05; 95% CI, 0.01–0.32; p = 0.002).

Conclusion: This study highlights the suboptimal utilization of Modified Early Warning Score among ward nurses, with significant gaps in knowledge and training. The results underscore the need for targeted education and training programs to enhance nurses' understanding and adoption of Modified Early Warning Score, ultimately improving early detection and response to patient deterioration. Addressing these gaps is critical to ensuring the effective implementation of Modified Early Warning Score and enhancing patient safety and outcomes.

Keywords: *Modified early warning score, utilization, clinical deterioration, intensive care unit*

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DEDICATION

I dedicate my dissertation work to my family and many friends. A special feeling of gratitude to my husband, Isaac, and my loving parents, Robert and Rodness Kanyenda, whose words of encouragement and push for tenacity ring in my ears. My babies, Walusungu and Lubuto, have never left my side and are very special. I also dedicate this dissertation to my many friends and church family who have supported me throughout the process. I will always appreciate all they have done. Special dedication to my supervisor, Dr. Ruth Wahila, for helping me develop my research skills. I dedicate this work and give special thanks to my classmates for being there for me throughout the entire master's programme. You have been my best cheerleaders.

Table of Contents

List of Tables

List of Figures

ABBREVIATIONS AND ACRONYMS

AVPU - Alert, Voice, Pain, Unresponsive

EOCA - Escalation of Care Algorithm

EWS - Early Warning Score

HDU - High Dependency Unit

ICU - Intensive Care Unit

KMH - Konkola Mine Hospital

MEWS - Modified Early Warning Score

NEWS - National Early Warning Score

NHS - National Health Service

NHRA - National Health Research Authority

OPD - Outpatient Department

RASS - Richmond Agitation-Sedation Scale

RRT - Rapid Response Team

TEWS - Triage Early Warning Score

UNZA - University of Zambia

UNZABREC - University of Zambia Biomedical Research Ethics Committee

CHAPTER ONE

INTRODUCTION AND BACKGROUND

1.1 Introduction

It is estimated that approximately 80% of patients admitted to the intensive care unit (ICU) or who suffer from cardiopulmonary arrest display clinical signs of deterioration up to 24 hours preceding the event (Lim et al., 2015; Kumar et al., 2020; Zheng, 2022). This suggests that earlier detection of patient deterioration may lead to more rapid intervention, and potentially prevent medical emergencies from happening. Delayed intervention may not only lead to higher mortality rates but also increase unplanned ICU admissions, longer hospital stays, and poor outcomes and this will lead to significant costs to both the patients and the healthcare system (Kruisselbrink et al., 2016 Skinner et al., 2016, Jones et al., 2022).

Providing optimal critical care in developing countries is limited by the recognition of critical illness and the lack of essential resources (Kruisselbrink et al, 2016, Goel et al., 2022). The Modified Early Warning Score (MEWS) which uses modified physiological parameters for scoring, has proven to be a useful tool for predicting patient deterioration. The MEWS is a great tool for early identification of critical illness and early medical intervention, yet multiple barriers prevent them from being used as effectively as necessary (Zegrea et al., 2023).

The motivation to undertake this study stems from the few MEWS documentations in patients' files, significant proportion of ICU admissions and cardiopulmonary arrests that are preceded by clinical signs of deterioration, coupled with the serious consequences of delayed intervention that have been observed at KMH in Chililabombwe. It is important to understand the factors affecting the utilization of MEWS as these factors directly impact the timely identification and management of patient deterioration, ultimately influencing patient outcomes and the efficiency of healthcare delivery. Therefore, by identifying and addressing barriers such as gaps in knowledge and attitudes, this study aims to enhance the effective use of MEWS, thereby reducing preventable ICU admissions and improving overall patient care.

This Chapter has various sections to help understand the topic under study. It presents the background information, the problem statement, and the study justification. It also outlines the conceptual framework, study objectives, and questions. Additionally, it explains the variables the study will test.

1.2 Background

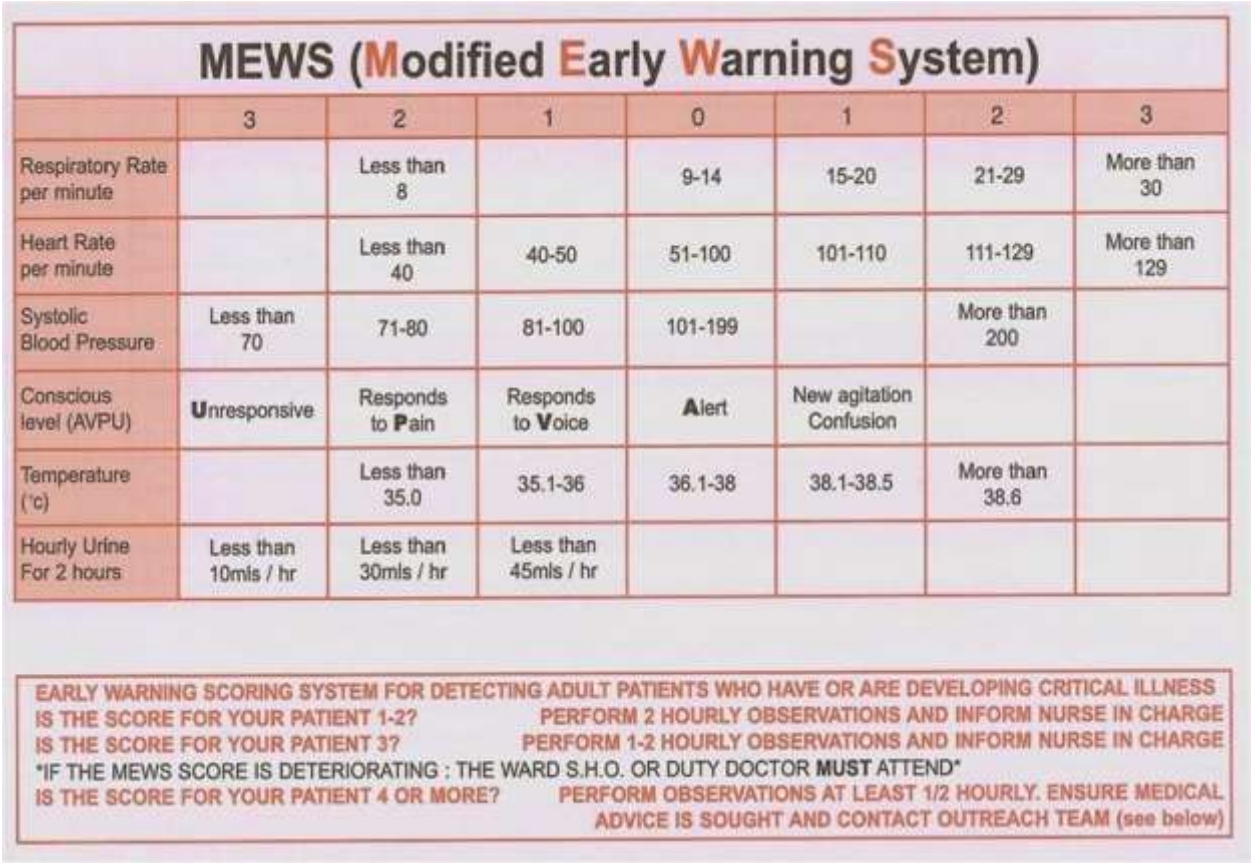
Clinical deterioration of hospitalized patients is a common phenomenon that is likely to occur in any setting including the ICU. To prevent this phenomenon from causing severe disease states and mortality among patients, various tools have been developed to monitor the general condition of these patients. The MEWS is one of the tools that has been proposed to warn healthcare providers of the potential development of serious adverse events (Kumar et al., 2020; Yu, Xu, and Chen 2021; Warren et al., 2021). Failure to identify deterioration among in-patients can lead to avoidable adverse outcomes, including cardiac code emergencies, morbidity, and mortality, and is a common root cause of serious safety events and the high cost of healthcare services (Anderson et al., 2016, Herron K., 2018, Hall, Lim, and Gale, 2020).

The MEWS is one of the most recent advancements in the healthcare sector aimed at helping improve the general well-being of ward patients. The MEWS is well understood as the distinct judgment on regularly recorded physiological data. Morgan, Wright, and William invented MEWS in 1997 (Kyriacos et al., 2019). They started by publishing the first Early Warning Signs (EWS) of five physiological parameters before advancing it further. These parameters were heart rate, respiratory rate, systolic blood pressure, and consciousness and temperature level. In 2000, Tivey, Coates, and Stenhouse modified the initial tool to include urine output coming up with the MEWS.

The MEWS (Table 1.1 below) is a structured objective way of monitoring patients' condition using physiological parameters. It aggregates vital signs, mental status assessments, and urine output values taken by nurses during observation. The aggregates are scored, and a trigger is initiated when the threshold is reached (NHS, 2012, MDCalc, 2022, Tang et al., 2019). The MEWS is rated on a scale from 0-3 for each vital sign. The sum of all the scores equals the total MEWS score. Based on this MEWS score, the escalation of care algorithm (EOCA) is used to

guide nurses on how to intervene and escalate care (Ede et al., 2020). Scores between 0-2 require no intervention while scores of three and above prompt the nurses to notify the charge nurse or the medical doctor (MDCalc, 2022)

Table 1.1: Modified Early Warning System



MEWS (Modified Early Warning System)

	3	2	1	0	1	2	3
Respiratory Rate per minute		Less than 8		9-14	15-20	21-29	More than 30
Heart Rate per minute		Less than 40	40-50	51-100	101-110	111-129	More than 129
Systolic Blood Pressure	Less than 70	71-80	81-100	101-199		More than 200	
Conscious level (AVPU)	**U**nresponsive	Responds to **P**ain	Responds to **V**oice	**A**lert	New agitation Confusion		
Temperature (°c)		Less than 35.0	35.1-36	36.1-38	38.1-38.5	More than 38.6	
Hourly Urine For 2 hours	Less than 10mls / hr	Less than 30mls / hr	Less than 45mls / hr				

EARLY WARNING SCORING SYSTEM FOR DETECTING ADULT PATIENTS WHO HAVE OR ARE DEVELOPING CRITICAL ILLNESS
IS THE SCORE FOR YOUR PATIENT 1-2? PERFORM 2 HOURLY OBSERVATIONS AND INFORM NURSE IN CHARGE
IS THE SCORE FOR YOUR PATIENT 3? PERFORM 1-2 HOURLY OBSERVATIONS AND INFORM NURSE IN CHARGE
*IF THE MEWS SCORE IS DETERIORATING : THE WARD S.H.O. OR DUTY DOCTOR **MUST** ATTEND*
IS THE SCORE FOR YOUR PATIENT 4 OR MORE? PERFORM OBSERVATIONS AT LEAST 1/2 HOURLY. ENSURE MEDICAL ADVICE IS SOUGHT AND CONTACT OUTREACH TEAM (see below)

Source: Indiana Journal of Critical Care Medicine (2022)

Unlike the traditional observational charts, MEWS guides the nursing staff on when to call for medical staff to intervene. MEWS eliminates the nursing staff's reliance on clinical acumen to identify deteriorating patients and decide when to call for help. This is because the traditional chart method of monitoring patients does not guide the nurse at which point the patient's change in condition warrants review by the concerned doctor. Therefore, the clinician is often called too late only to certify the patient dead (O'Neill et al., 2021). On the other hand, Shamsa and Salma (2023), argued that the nurse should have the technical knowledge to be able to recognize and respond to early warning signs.

The use of MEWS to identify patients at risk for sudden deterioration on admission to hospital is common in high-income countries. In the United Kingdom, the National Early Warning Score (NEWS) which also falls under the main types of EWS is used in all National Health Service Hospitals as a way of standardizing care (Holland and Kellet, 2023). Providing optimal critical care in developing countries is limited by a lack of recognition of critical illness and a lack of essential resources and such as MEWS has been suggested as potentially useful in low-resource environments (Krussisblink, 2016, Goel et al., 2022).

The recognition, response, and treatment of deteriorating patients are essential basics of improving patients' outcomes and reducing unexpected deaths, length of stay, and cost of ICU care (Tang et al., 2019, Anesty et al., 2019, Pimental et al., 2021 and Credland, 2018). A study conducted showed that 50% of ICU unplanned admissions were due to monitoring failures in clinically deteriorating patients. To reduce the unplanned ICU admissions there is a need to improve monitoring of this patient and therefore MEWS remains one of the methods through which changes in a patient's condition are detected early and treated promptly thereby preventing severe adverse effects (Vincent et al., 2018, Tang et al., 2019). Therefore, the MEWS if utilized well by nurses can reduce morbidity and mortality burden. According to Tang et al, (2019), the application of MEWS in general departments helps medical staff make clinical decisions and provide acute care that impacts patients at an early stage and effectively reduces the death rate. Tang et al (2019) also recommend the integration of the EWS in the emergency room to enable early assessment of patient's clinical deterioration. On the other hand, the failure to identify patients at risk of deterioration will lead to poor outcomes and higher costs of healthcare (Gerry et al., 2020).

Currently, several hospitals in Zambia employ MEWS in a modified version called the Triage Early Warning Score (TEWS) to identify serious illnesses in patients with both medical and traumatic conditions. The TEWS is being used in outpatient departments to identify critical illnesses and properly prioritize the care of patients. Konkola Mine Hospital (KMH) is one of the hospitals that has adopted the use of MEWS as a standard practice in identifying critical illness in general wards. KMH introduced MEWS in 2015 and in the same year, 30 nursing staff were trained on how to use the MEWS (KMH, 2015). Training on MEWS is offered to all new

employees and leave returnees. Additionally, the MEWS and EOCA charts were made available to outpatient departments (OPD) and all general wards to help nurses identify patients who are at greater risk of clinical deterioration and need close monitoring or early transfer for critical care or other timely interventions.

Application of the MEWS in general wards provides a useful tool to improve patient care, ensure optimal utilization of resources, and prevent inappropriate discharge or neglect of sick patients as well as delayed or unplanned ICU use. The use of the MEWS to identify patients at risk of deteriorating is suggested as potentially useful in low-resource environments (Kruisselbrink, 2016, Warren et al 2021) and it is therefore important that Zambia also promotes its utilization. Tang et al., (2019) further stated that the MEWS is a simple bedside tool that may be of help in recognizing patients with potential deterioration and help in the timely initiation of adequate treatment which may influence outcomes positively and prevent unnecessary ICU admissions and cut down on healthcare costs. Warren et al, (2021) revealed that the MEWS is useful for preventing unrecognized deterioration, and implications for nursing management suggested that it will help evaluate nurses on how they assess acute clinical deterioration in inpatients.

Given the above background for both developed and developing countries, research studies have concluded that MEWS can be easily applied in general wards and emergency departments to identify patients at risk of deterioration who require levels of high care in the ICU or HDU. A study by Warren et al., 2021 revealed that the MEWS is useful for preventing unrecognized deterioration. However, the level of utilization of the MEWS and its associated factors are not known. Therefore, this study is worth undertaking to assess the utilization of the MEWS among nurses in identifying critical illness at KMH, Chililabombwe Zambia.

1.3 Statement of the Problem

In contemporary healthcare settings, identification and prompt management of critical illness are pivotal factors in ensuring patient safety and improving overall clinical outcomes. (Samani and Rattani, 2023) The utilization of MEWS plays a crucial role in this process, offering a systematic approach to assessing and identifying patients at risk of deterioration (Julnes et al., 2023). Early detection of deterioration in the general hospital wards enables rapid targeted management and can reduce the need for transfers to higher care units, reduce hospital stay and costs, and improve

survival rates (O'Neill et al., 2021). However, despite the potential benefits, there exist notable challenges and gaps in the effective implementation and utilization of MEWS at KMH.

Ideally, the utilization of MEWS should ensure that a high percentage of ward patients are routinely assessed and monitored for early signs of deterioration, enabling timely interventions and reducing ICU admissions and mortality rates. However, at KMH, the current situation reveals significant gaps, with consistently low percentages of ward patients receiving documented MEWS assessments despite high rates of ICU admissions within 24-48 hours as highlighted in table 2. This critical deficiency in early detection and management of patient deterioration, has led to increased healthcare costs, prolonged hospital stays, and preventable deaths.

Moreover, since the introduction of MEWS at KMH in 2015, no research study has been conducted to assess the utilization of the tool among nurses in identifying critical illness. This lack of evaluation necessitates the need to investigate how effectively MEWS is being implemented, identify the barriers hindering its optimal use, and understand the factors influencing its utilization. Addressing these gaps is essential to improve early detection of patient deterioration, enhance clinical outcomes, and ensure that the healthcare system operates efficiently and effectively.

Table 1.2: Ward -ICU Admissions and Mortality Rates at KMH

Year	Total ICU Admissions	Ward to ICU Admissions	Patients with Documented on MEWS Tool Ward	Total Deaths	ICU Deaths within 2448 hours	Total Deaths of Ward to ICU Admissions
2021	48	12 (25%)	4 (33%)	19	6 (31%)	3 (50%)
2022	68	14 (20%)	3 (21%)	16	9 (56%)	4 (48%)
2023	77	25 (32%)	9 (36%)	26	15 (58%)	15 (58%)

According to Table 2.1 above, over the three years from 2021 to 2023 at KMH, the number of wards to-ICU admissions varied, with percentages ranging from 20% to 32% of total ICU admissions. However, the proportion of patients with documented MEWS tool assessments on the ward remained consistently low, ranging from 21% to 36%. Mortality rates within 24-48 hours of ICU admission were notably high, ranging from 31% to 58% of total deaths, with similar rates observed specifically among ward-originating ICU admissions. These findings emphasize the critical need for optimizing the utilization of the MEWS tool at KMH for early detection of deterioration among ward patients, improving documentation practices, and implementing proactive monitoring strategies to mitigate high mortality rates observed shortly after ICU admission. This low utilization of MEWS on the ward poses a significant healthcare issue, as it can result in unplanned ICU admissions, prolonged hospital stays, high ICU costs, and an increased risk of death.

The lack of MEWS utilization may be attributed to gaps in knowledge or attitude among nurses in identifying critical illness, a shortage of monitoring equipment, or a lack of institutional support. However, the absence of published previous studies investigating the utilization of MEWS at KMH despite the high ICU admissions and mortality shows that little attention has been paid to understanding the factors that lead to the optimal use of the MEWS. This propels the researcher to undertake this study as it aims at assessing the utilization of the MEWS among ward nurses at KMH in Chililabombwe District.

1.4 Justification

Studies focusing on the utilization of the MEWS are crucial for enhancing patient care and improving healthcare systems. This study investigated the utilization of the MEWS among ward nurses at KMH in Chililabombwe, providing insights that can inform policy and practice to strengthen the healthcare system. The findings offer valuable evidence on how effectively MEWS is being utilized to identify and manage patient deterioration. By identifying gaps in its utilization, the study has contributed to enhancing early detection and prompt management of critical illnesses, ultimately improving patient safety and clinical outcomes. The results provide evidence-based data that can inform hospital policies and protocols to standardize care and improve monitoring of patients at risk of deterioration. Additionally, the study has identified gaps in

knowledge and attitudes among nurses towards MEWS, highlighting areas where additional training and education are required to enhance competency. Understanding the barriers to effective MEWS utilization, such as knowledge deficits and negative attitudes, will help healthcare administrators allocate resources more effectively.

This study contributes to achieving Sustainable Development Goal (SDG) 3, which focuses on ensuring healthy lives and promoting well-being for all at all ages. Specifically, it aligns with SDG 3.8, which aims to achieve universal health coverage by improving access to quality healthcare services. By facilitating early identification of deteriorating patients, MEWS helps reduce hospital readmissions and improves patient outcomes, ensuring timely and appropriate healthcare interventions. Furthermore, the study supports SDG 3.4, which targets the reduction of premature mortality from non-communicable diseases through early detection and effective treatment. The improved utilization of MEWS can contribute to this goal by enabling timely interventions that prevent complications and reduce mortality rates.

Prior to this study, there were no published studies assessing the utilization of MEWS at KMH, despite its implementation in 2015. Previous studies conducted in Zambia, such as Mbewe (2018), focused on comparing clinical acumen and MEWS in post-operative patients, while Foy et al. (2022) examined the tool's predictive capabilities rather than its actual utilization. Therefore, this study has addressed a critical gap by providing context-specific evidence that can be used to improve the implementation of MEWS in clinical settings.

1.5 Conceptual Framework

To understand the utilization of the MEWS at KMH, the Donabedian Model (Donabedian, 1966) was used.

1.5.1 Description of the Donabedian Model

The Donabedian model is a conceptual model that provides a framework for examining healthcare services and evaluating the quality of care (Donabedian, 2005). The concept of healthcare quality defined by Avedis Donabedian in the model: Structure-Process-Outcomes has been widely used in literature, especially for the development of standards. The Donabedian model also has been used to evaluate the emergency department triage process and has successfully validated the relationship between structure and process measures (Worth et al., 2019, Binder et al., 2021)

According to the model information, quality can be drawn from Structure, process, and outcomes. Donabedian defined “Structure” or Input as a feature of the setting in which care occurs. This includes all the resources needed for the provision of healthcare such as infrastructure, equipment, drugs, financing, knowledge, and staffing. Process denotes the component of care delivered, including the use of resources in terms of what is required in giving and receiving care. These include prescription patterns, referral rates, interventional rates, payment of staff, collection of funds, etc. Finally, the outcome describes the effects of healthcare on the health status of patients. The model also visualizes Donabedian position that good structure increases the likelihood of good process, and good process increases the likelihood of good outcome (Basse et al., 2019).

1.5.2 Application of the Donabedian Model of this Study

According to the Donabedian model, information on structure, process, and outcome must be collected to evaluate the quality of care which in this study it refers to the utilization of the MEWS system in identifying critical illness. Effective use of MEWS in general wards yielded better patient outcomes such as reduced hospital stays, reduced mortality rates, reduced unnecessary ICU admissions and improved patient outcomes.

In the Donabedian structure-process-outcome model, problems are addressed by examining all three areas at the same time. Equipment, systems, and knowledgeable personnel must be in place to adequately utilize the MEWS in identifying patients at risk of deterioration. The model revealed that factors such as trained staff, and availability of monitoring equipment or tools to use, could be some enablers or barriers for nurses to utilize the MEWS in identifying critical illness. The Donabedian model fits into the current study as follows:

Structure

In the Donabedian model, "structure" refers to the various factors that affect the context within which the MEWS is used. These factors can be divided into three categories: physical structure, human resource structure, and organizational structure.

a) The physical structure includes the environment in which nurses use the MEWS system. This encompasses the availability of monitoring equipment like monitors, observation charts,

MEWS escalation charts, and the overall workspace layout.

b) The human resource structure evaluates the education and training that nurses receive on the use of the MEWS system. It also assesses the adequacy of training programs and the skills of nursing staff.

c) Finally, under the organizational structure, we examine the support provided to both the MEWS and the nursing staff. This includes the availability of MEWS protocols, a clear reporting and escalation structure, and management's provision of continuous training.

Process

The process of healthcare is made up of all the actions that contribute towards achieving the desired outcome. These actions reflect the systems and processes in place. The focus of this study is to evaluate the implementation of the MEWS, communication and training programs by the nurses. The aim is to assess how well they integrate the MEWS system into their daily practice, including the frequency and consistency of MEWS assessments, and whether they adhere to the protocol guidelines. The process will also involve an assessment of the communication among healthcare teams, exploring how they communicate and escalate higher MEWS scores. Effective communication is crucial in ensuring early detection of critical illness and rapid intervention.

Outcome

The outcome includes changes in health status, mortality, morbidity, quality of life, coping ability, and improved knowledge. The study aims to evaluate patient outcomes by examining how the utilization of the MEWS affects critical illness identification. Early identification of critical illness enables timely interventions and leads to improved patient outcomes. The study will also assess the nurse's performance by evaluating the impact of their use of the MEWS on critical illness identification. Furthermore, the study will determine the nurses' level of confidence and competence and whether it positively affects their ability to identify critical illness. The study will assess the efficiency of the MEWS by evaluating the efficient use of resources, timely responses, and overall effectiveness in preventing adverse events.

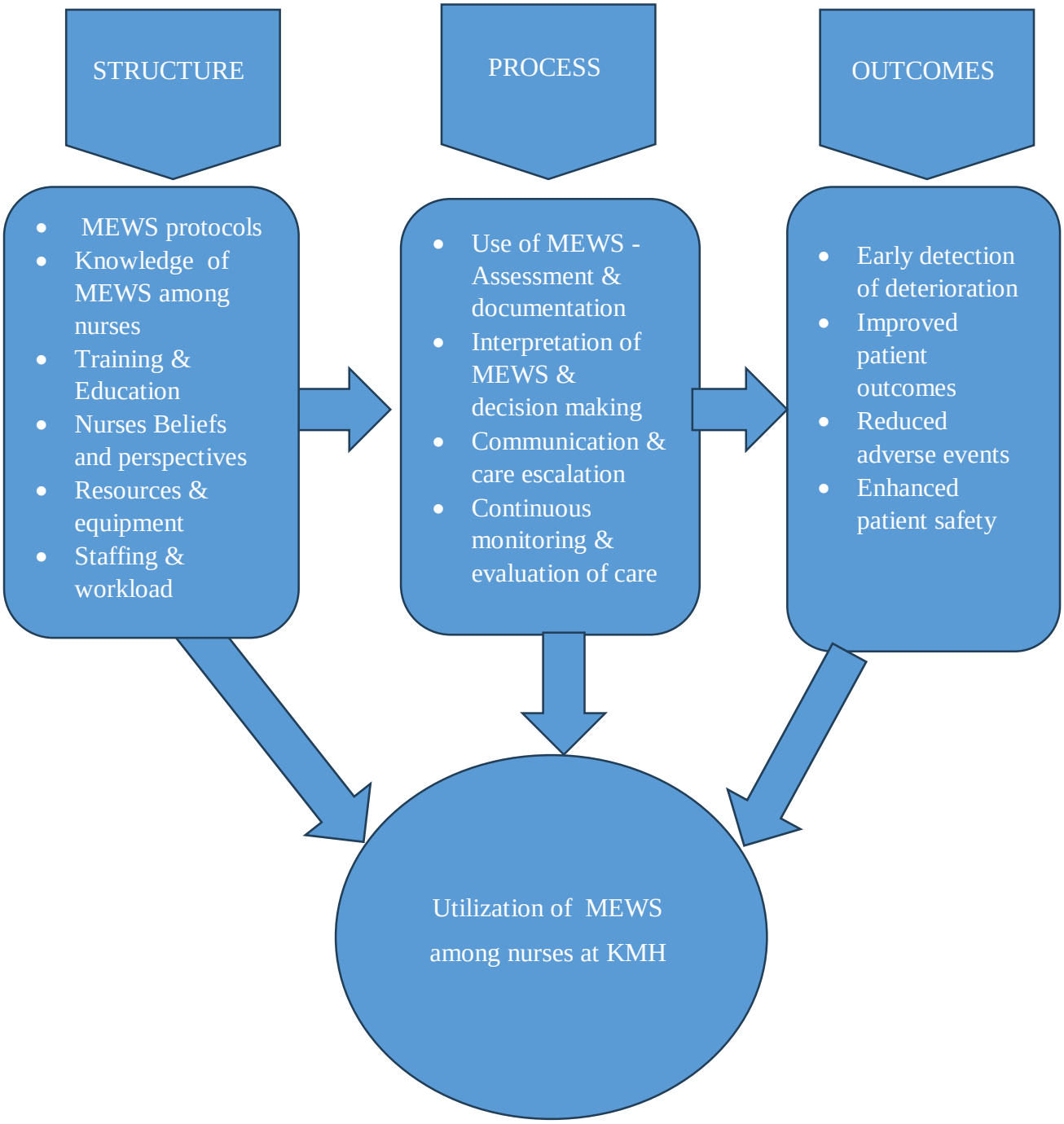


Figure 1.1: Adapted Donabedian Model on Utilization of MEWS (Source: Researcher)

1

1.6 Research Objectives

1.6.1 General Objective

To establish utilization of MEWS and its associated factors among ward nurses at KMH, Chililabombwe, Zambia.

1.6.2 Specific Objectives

1. To determine the level of utilization of MEWS among ward nurses at KMH, Chililabombwe, Zambia.
2. To determine the level of knowledge of nurses on the use of the MEWS among ward nurses at KMH.
3. To assess the nurse's attitude towards utilization of MEWS identification among ward nurses at KMH.

1.7 Research Question

What is the level of utilization of MEWS among ward nurses at KMH, Chililabombwe, Zambia, and what are the associated factors influencing its utilization?

1.8 Research Variables

1.8.1 Dependent Variables

Utilization of the MEWS

1.8.2 Independent Variables

a. Knowledge of MEWS
b. Attitude towards utilization of MEWS

Table 1.3: Variables, indicators, cut-off points and scale of measurement

Variable	Conceptual definition of variables	Operational Definition of Variables	Level of measurement			Question number
			Indicator	Cut-off-points	Type	
Utilization	This refers to the extent or degree to which a particular resource, service, or tool is effectively and efficiently used to achieve its intended purpose or goal within a given population or setting. (Mbewe, 2015)	This study, will refer to the consistent and timely application of the MEWS tool during patient assessments to monitor physiological parameters, record MEWS scores promptly in patient records, and incorporate MEWS data into clinical decision-making for interventions or care escalation based on score indications.	Utilized	Documented MEWS by the nurse in patients' files	Nominal	6
			Not utilized	No documented MEWS by the nurse in patients' files		

Variable	Conceptual definition of variables	Operational Definition of Variables	Level of measurement			Question number
			Indicator	Cut-off-points	Type	
Knowledge	Knowledge refers to awareness of or familiarity with various objects, events, ideas, or ways Henriques, 2013)	In this study, this will refer to nurses' understanding and familiarity with the parameters used in calculating a patient's MEWS, their comprehension of the significance of MEWS thresholds in identifying patient deterioration, confidence in interpreting MEWS scores to determine patient risk levels, and familiarity with protocols and guidelines for responding to elevated MEWS scores.	Adequate	Score equal to or greater than 10	dichotomous	7-11
			Inadequate	Score less than 10		

Variable	Conceptual definition of variables	Operational Definition of Variables	Level of measurement			Question Number
			Indicator	Cut-off-points	Type	
Attitude	Attitude refers to a set of emotions, beliefs, and behaviours toward a particular object, person, thing, or event" (Cherry, 2019)	nurses' overall disposition, beliefs, and perceptions regarding the Modified Early Warning Score (MEWS), encompassing their level of concern and receptiveness towards utilizing MEWS for identifying patient deterioration, adherence to MEWS protocols, receptivity towards MEWS-related training and education, and the extent to which they perceive MEWS as beneficial and effective in clinical practice.	Negative	Scores equal to or above 8	Ordinal	12-15
			Positive	Scores less than 8		

1.9 Conclusion

Since most health departments from different nations are experiencing a problem with the early identification of health issues, it is significant for the effectiveness of MEWS to be considered. Most studies found it to be effective in identifying cases that could result in death, cardiac arrest, or admission to the ICU (Tang et al., 2019, Samani and Rattani, 2023). However, the rate of nurses utilizing the tool to identify cases that result in complications is low. In this case, further studies needed to be conducted to determine factors that are influencing the use of MEWS among nurses at KMH, Chililabombwe, Zambia. Some of these factors to be examined included but are not limited to the cost of implementation, nurses' knowledge and skills, rules and regulations set by the hospital, staffing levels, nurses' attitudes, and experience (O'Neil et al., 2029) The study was vital in informing nurses and facilities on the considerations to make when implementing MEWS. It also created awareness of the effectiveness of the tool.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The literature review was conducted to gain a better understanding of how different researchers studied this topic and analyzed their findings, and it further informed the methodology for the current study. This chapter provides a comprehensive literature review that includes a range of scholarly sources, such as peer-reviewed journal articles, systematic reviews, meta-analyses, and research studies published in relevant medical and nursing journals. Various databases such as Google Scholar, PubMed, ScienceDirect, ResearchGate, and Google Search were used to find related papers and research study records for the past eight years. To ensure thorough coverage of the literature, a combination of medical subject headings, terms, and keywords such as "MEWS scoring system, critical care nursing, deterioration, utilization, knowledge, and attitude towards MEWS" were used. Similar studies published in the English language from inception to the present with no restrictions on study design have been used in this study.

The chapter is organized into an introduction, overview of the MEWS, utilization, knowledge, and attitude towards MEWS. It delves into the latest and most important research on MEWS, examining its relevance to utilization and critical care nursing. Through a thorough investigation of relevant works and ongoing discussions, insightful background information on the Modified Early Warning score is provided, and the matter at hand was discussed in comprehensive detail.

2.2 Overview of the Modified Early Warning Score

Research findings have demonstrated that the MEWS aids in the early detection of the deterioration process (Warren, 2021). MEWS is a physiological scoring system employed by nursing staff at the bedside to pinpoint patients vulnerable to clinical deterioration (Alves et al., 2021). Elevated MEWS values indicate patients with deteriorating clinical conditions, necessitating activation of a rapid response team for prompt intervention (Alves et al., 2021). Using six vital signs, heart rate, blood pressure, respiration rate, core body temperature, mental status, and urine output, the MEWS is a straightforward bedside scoring index that assesses the patient's physiological state. Several studies have found that critical illness and significant adverse

events in hospitalized patients are preceded by clinical deterioration in up to 80% of those afflicted (Souza et al., 2019). As a result, changes in physiological indicators can be utilized to predict adverse events such as shock, cardiac arrest, death, and unanticipated ICU admissions (Burgos-Esteban et al., 2022).

The systolic blood pressure, heart rate, respiratory rate, temperature, and level of consciousness, as measured by the AVPU (alert, responds to voice, response to pain, unresponsive scale, or RASS (Richmond Agitation Sedation Scale) score, are combined to create the MEWS, a commonly used illness severity score. A total score between 0 and 14 is produced by scoring each of these four vital signs and observing consciousness separately, with higher numbers indicating more severe sickness (MDCal,2022).Early warning scores, such as MEWS, have a good ability to predict death and cardiac arrest within 48 hours in academic metropolitan hospitals in economically developed countries, according to a systematic analysis by Burgos-Esteban et al., (2022). To support clinical staff in giving extra care and attention to patients who need it most (justifiable appropriation of care), early warning scores have also been found to give precise, succinct, and clear methods of recognizing and communicating about clinical deterioration (World Bank, 2019).

2.3 Utilization of Modified Early Warning Score

The utilization of the MEWS plays a pivotal role in healthcare settings, particularly in the timely identification and monitoring of patients at risk of clinical deterioration (Bhatnagar, Sirohi, and Dubey, 2021). Studies conducted across various countries have highlighted its effectiveness in triaging patients, reducing adverse outcomes, and enhancing overall patient outcomes. Danesh et al., (2019) report that utilization of MEWS has emerged as valuable for triaging and monitoring patients in medical emergency units thereby aiding in the timely identification of those at greater risk of deterioration. The evidence established by Danesh and colleagues comparing patient outcomes before and after the implementation of MEWS demonstrates its efficacy in reducing unplanned ICU transfers, cardiac arrests, hospital duration of stay, mortality rates, and the frequency of Rapid Response Team (RRT) activations. Bryan (2023) in the United States revealed that implementation of the MEWS proved effective in identifying patients at risk of clinical deterioration and enhancing patient outcomes.

Bryan's (2023) study observed a reduction in in-hospital cardiac arrests following the utilization

of MEWS by ward nurses. Similarly, Bhatnagar, Sirohi, and Dubey (2021) in India observed that MEWS utilization was significantly associated with early prediction of in-hospital mortality, with MEWS scores above 5 at 24 hours of admission serving as a reliable predictor. This therefore helped with ward nurses identifying patients at risk and setting up rightful interventions to prevent the worst patient outcomes.

In low-income countries such as African countries, where healthcare costs are burdensome, implementation of MEWS helps alleviate financial strain by facilitating early identification and intervention for critical illness, thereby reducing unplanned ICU admissions and hospital stays (Tang et al., 2019). However, challenges in MEWS utilization have been reported in some settings. Tuyishime's study (2019) in Uganda highlighted difficulties faced by ward nurses in recognizing deteriorating patients, often attributed to a lack of situation awareness, inexperience, skill deficits, and excessive workload.

Furthermore, research in sub-Saharan Africa by Nakitende et al. (2020) suggested that MEWS generated in developed healthcare settings may not perform as effectively in low-resource settings, with reduced utilization attributed to incomplete vital sign assessments and equipment unavailability. Similarly, studies in South Africa indicated that while MEWS observation charts improved the documentation of physiological parameters, they did not necessarily enhance nurses' ability to identify early signs of clinical deterioration (Kyriacos et al., 2019; Olang et al., 2019). However, healthcare resources, infrastructure, training, and contextual factors could have led to the discrepancy in findings between the African studies and the studies conducted in developed countries. The findings highlighted the importance of enhancing healthcare professionals' training and proficiency in MEWS utilization to improve patient outcomes effectively.

2.4 Knowledge on Modified Early Warning Score

Assessing nurses' knowledge regarding the Modified Early Warning Score reveals critical insights into their proficiency in identifying and managing clinical deterioration (Warren et al., 2020). Studies conducted across various regions shed light on both the adequacy of nurses' knowledge and the areas where further training is necessary to ensure optimal patient care.

In Eastern Indonesia, a study conducted by Olango et al., (2019) aimed to assess nurses' knowledge regarding the utilization of the MEWS. While the study found that nurses generally possessed adequate knowledge, there was a recognized need for training to enhance and refresh their understanding. The conclusion drawn was that improved knowledge in MEWS utilization would contribute to delivering high-quality healthcare services both presently and in the future. On the other hand, the findings of Alias and Ludin (2021) in Malaysia hinted at a potential lack of proficiency among nurses in EWS scoring, raising concerns about their ability to identify patient deterioration. This highlights the critical importance of ensuring nurses are well-informed to prevent medical errors and promote optimal patient care as integral members of the healthcare team. Duran (2019) in the United States observed that patient deterioration occurred when nurses lacked adequate knowledge and incorrectly identified MEWS, emphasizing the critical importance of nurses' proficiency in utilizing MEWS for effective patient management.

In Africa, studies have shed light on significant gaps in nurses' knowledge concerning the recognition of early clinical signs indicating patient deterioration. Tuyishime's study (2019) in Uganda found that many nurses lacked sufficient knowledge to recognize early clinical signs of patient deterioration, particularly evident in paediatric wards where nearly half of the nurses responded inadequately to deteriorating children due to their limited knowledge of MEWS. Factors like advanced education levels, paediatric department experience, and critical care nursing skills were linked to more appropriate responses among nurses. In Ethiopia, Moore et al. (2019) identified a lack of knowledge of specific scales, such as the numerical pain scale and conscious level, among nurses, which served as a limiting factor in the utilization of MEWS in clinical wards. Similarly, Sridhar et al. (2020) conducted a study in Rwanda, evaluating the EWS protocol's impact on nurses' knowledge, skills, and clinical deterioration recognition. While the implementation of EWS improved nurses' technical skills and knowledge regarding the tool, challenges persisted due to the low-resource setting. On the other hand, a study in Egypt by Nadr et al. (2023) reported a significant improvement in nurses' performance in identifying and responding to clinical deterioration following an educational intervention on EWS. The intervention resulted in a notable enhancement in nurses' knowledge scores, emphasizing the positive influence of educational programs on healthcare professionals' proficiency in utilizing early warning scoring systems.

Inadequate proficiency in utilizing MEWS among nurses has been associated with various adverse outcomes, ranging from delayed interventions to preventable patient deterioration. Furthermore, the implications of inadequate knowledge extend beyond individual patient care to broader systemic challenges within healthcare institutions (Salman, et al., 2020). Failure to recognize early signs of deterioration due to insufficient knowledge can result in increased healthcare costs, prolonged hospital stays, and additional strain on resources (Albutt et al., 2020). Addressing these knowledge gaps through targeted training and educational interventions, as demonstrated in Nadr et al.'s (2023) study in Egypt, not only improves nurses' proficiency but also contributes to more efficient healthcare delivery and better patient outcomes. However, cautionary findings from Flenady et al. (2020) suggest that the experience or knowledge level of clinicians does not consistently translate into effective practice. Hence, it is crucial to assess factors beyond mere knowledge to effectively utilize MEWS, thereby enhancing patient safety and improving outcomes.

2.5 Attitude towards Modified Early Warning Score

Assessing nurses' attitudes towards the MEWS offers valuable insights into the acceptance and challenges associated with its integration into clinical practice (Burke and Conway, 2023). Through various studies conducted across different regions, researchers have uncovered diverse perceptions and factors influencing nurses' attitudes towards MEWS implementation. Xiong et al. (2022) unveiled that most healthcare workers exhibited a positive attitude towards the utilization of MEWS-S, serving as a strong impetus for recommending and implementing EWS within domestic hospitals. However, over 50% of physicians expressed concerns about the perceived time-consuming nature of applying EWS, fearing it could intensify nursing workloads and lead to inaccuracies in MEWS score calculation due to time constraints across the hospital staff. Similarly, a study by Foley and Dowling (2019) in Ireland indicated a positive attitude towards the use of MEWS but a negative perception towards the escalation protocol. Instances were noted where nurses, relying on their clinical judgment, managed patients without adhering to the escalation protocol, emphasizing the importance of fostering a culture valuing evidence-based practice and protocol adherence. Contrarily, Frost's study (2022) in Lebanon suggested that noncompliance with MEWS usage was not solely attributed to negative attitudes towards MEWS but also

stemmed from a lack of inter-professional training and support from senior physicians, contributing to nurses' negative perceptions regarding the scoring tool.

In Ethiopia, Moore et al. (2019) reported positive attitudes towards MEWS among the majority of department staff, perceiving it as beneficial in managing work demands and facilitating the detection of unwell patients, with attitudes gradually improving over time. However, limitations in retrospective case note reviews due to lack of documentation may hinder the reflection of actual clinical MEWS practices among healthcare workers which could have led to these results. On the other hand, Nadr et al. (2023) conducted a study in Egypt and reported that nurses did not implement good practice in MEWS usage due to concerns about it being overly demanding and time-consuming, describing it as unnecessary and disruptive to normal workflow. The findings highlighted the various factors influencing attitudes towards MEWS among nurses, including perceived time constraints, inter-professional dynamics, and organizational support structures

2.6 Conclusion

MEWS has demonstrated significant potential in aiding the early detection of patient deterioration, as evidenced by its utilization in various healthcare settings worldwide. Studies have shown its effectiveness in reducing adverse outcomes such as unplanned ICU transfers, cardiac arrests, and mortality rates, thereby emphasizing its importance in improving patient care. However, challenges in MEWS utilization have been observed, particularly in low-resource settings, where factors such as inadequate knowledge, limited resources, and workflow disruptions hinder its effective implementation. Additionally, attitudes towards MEWS among healthcare workers vary, with some expressing positive perceptions regarding its utility in patient care, while others raise concerns about its perceived time-consuming nature and lack of inter-professional support.

Furthermore, it is worth noting the scarcity of literature addressing factors contributing to the low utilization of MEWS specifically in Zambia. This knowledge gap highlights the necessity for conducting further research to investigate the underlying reasons behind the suboptimal implementation of MEWS in Zambian healthcare settings. By identifying and addressing these factors, healthcare professionals and policymakers can develop targeted interventions to enhance the utilization of MEWS, ultimately improving patient outcomes and healthcare delivery in

Zambia. Therefore, this study aimed at filling this crucial gap in the literature by examining the utilization, knowledge, and attitudes of nurses towards MEWS at Konkola Mine Hospital, Chililabombwe, Zambia.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents a description of the methodology that was used to obtain data to address the study objectives, and ultimately answer the research questions. The chapter commences with a description of the research design that guided the framework of the study, the study population (including eligibility), sample size calculation, and sampling procedures. The chapter continues by describing data collection methods, tools, quality control techniques, the data management and analysis plan, and ethical considerations.

3.2 Study Design

This study used a cross-sectional descriptive survey design to investigate the utilization of MEWS and its associated factors among ward nurses at KMH, Chililabombwe, Zambia. This design was chosen to provide comprehensive information on the utilization of MEWS within a relatively short time frame, thereby providing evidence that serves as a foundation for future research.

3.3 Study setting

The study took place at Konkola Mine Hospital (KMH), a level II hospital located in Chililabombwe, Copperbelt Province, Zambia with a catchment area population of 44,000. KMH is the only hospital of its kind in the district and boasts specialty departments for medical, surgical, orthopedics, peadiatric, and gynaecology. The hospital also has supportive departments for Radiology, Pharmacy, and Physiotherapy. A multidisciplinary team is involved in providing 24-hour care. KMH is a private hospital with 82 beds with 111 nurses and provides level II ICU services to critically ill patients, including mechanical ventilation for over 24 hours, and specific organ support such as dialysis and inotropic infusions. The ICU services the entire Chililabombwe district, serving a total population of 117,000 individuals including parts of Congo DRC.

3.4 Study population

The study population were all nursing staff working at KMH in Chililabombwe district, Zambia.

3.4.1 Target population

Target population included nurses working in ward settings of KMH in Chiliabombwe district and were involved in providing direct care to patients.

3.4.2 Accessible Population

The accessible population included nurses providing direct care to patients on the wards of KMH, who were available during data collection period and had provided informed consent.

3.5 Sample size

In this study, a total population sample (census) would have been ideal but due to the nurses' workload and the institution's strict policy of minimizing disruption to patient care, a sample size was calculated. Therefore, total of 87 respondents were sampled from the total population of 111 nurses. The Krejcie and Morgan formula was used to arrive at a sample size of 87. The Krejcie and Morgan formula is commonly used for determining sample sizes in studies that involve a finite population, where the exact size of the population is known or can be determined while taking into consideration the finite population size and ensuring adequate statistical power and reliability of the study results.

$$n^1 = \frac{NZ^2P(1-P)}{d^2(N-1) + Z^2P(1-P)}$$

This is true where n' = sample size with finite population correction,

N = Population size = Number of all nursing staff = 111

Z =3 Z statistic for a level of confidence, = 1.96

P = Expected proportion (in proportion of one) = 50% = 0.50

d = Precision (in proportion of one) = 5% = 0.05

Therefore:

$$n^1 = \frac{111 \times 1.96^2 \times 0.5(1-0.5)}{0.05^2(111-1) + 1.96^2 \times 0.5(1-0.5)}$$

$$n^1 = \frac{106.6044}{0.0025\ (111-1) + 0.9604}$$

$$n^1 = \frac{106.6044}{0.0025\ (110) + 0.9604}$$

$$n^1 = \frac{106.6044}{1.2354}$$

$n^1 = 86.291$ which was rounded off to 87 Nurses.

The researcher anticipated reaching the stated sample size of participants from the total population of 111 nurses at KMH by employing strategies such as clear communication, timely follow-ups, and respecting participants' rights and confidentiality to maintain trust and maximize participants' response rates thereby ensuring efficient data collection. Contingency plans were put in place to address potential challenges in recruitment of participants such as accessing them after shifts or during break times.

3.6 Sampling Technique

A simple random sampling technique, specifically the lottery method, was employed to ensure that each nurse had an equal chance of being selected as a respondent. The selection process was conducted during the nurses' work shifts, using a list of all available nurses for that day as the sampling frame. Each nurse on the list was assigned a unique serial number, which was written on a piece of paper and placed in a box. The box was shaken thoroughly to ensure complete randomization, and numbers were drawn at random. This process was repeated daily until the required average of 8 nurses per day was achieved, ensuring a fair and unbiased selection throughout the data collection period.

3.7 Inclusion and Exclusion Criteria

3.7.1 Inclusion Criteria

The study included registered nurses currently employed at KMH who provided direct care to

patients. The nurses should have been working in their current role for a minimum of six months and were willing to participate voluntarily in the study.

3.7.2 Exclusion Criteria

Nurses who were not available at the time of data collection such as those on leave or ill were excluded from the study.

3.8 Data Collection Tools and Techniques

3.8.1 Data Collection Tool

The researcher used a structured questionnaire known as the *MEWS Utilization Assessment Tool (MUAT)*, developed by Richard et al. (2018) and later evaluated in Lingli's study (2020), which reported a Cronbach's α reliability coefficient of 0.72 (Richard et al., 2018; Lingli, 2020). The questionnaire was adapted from La Thanh and Nuong (2022), who successfully used it in a similar study population. The *MUAT* questionnaire consists of four sections, each addressing key aspects related to the study objectives:

a) **Section A**: Captured respondents' socio-demographic characteristics, including age, gender, work experience, level of education, and prior MEWS training.
b) **Section B**: Focused on the utilization of MEWS, with questions assessing frequency and consistency of use in clinical practice.
c) **Section C**: Assessed respondents' knowledge regarding MEWS through questions addressing the understanding of MEWS parameters, interpretation, and action thresholds.
d) **Section D**: Evaluated respondents' attitudes towards the use of MEWS, using a 4-point Likert scale (4 = Strongly agree, 3 = Agree, 2 = Disagree, 1 = Strongly disagree).

Responses to knowledge questions were coded on a 4-point Likert scale as follows: 4 = Fully understand, 3 = Partially understand, 2 = Have some understanding, and 1 = Do not understand.

To ensure data validity, the measurement on utilization of MEWS was further verified by reviewing patient files to check for documented records, with nurses identified by their names and signature on the MEWS chart.

The *MUAT* questionnaire was selected because it measured variables relevant to the study and has been successfully used in other healthcare settings like Zambia. A study by La Thanh and Nuong

(2022) applied this tool in Vietnam to assess nurses' knowledge, attitudes, and practices regarding MEWS utilization, revealing significant gaps in knowledge and training, which aligns with the challenges observed at Konkola Mine Hospital (KMH). Similarly, a study conducted in South Africa by Molefe et al. (2021) utilized the *MUAT* to evaluate the effectiveness of early warning score systems in public hospitals, emphasizing the importance of ongoing training and policy reinforcement to enhance utilization. Permission to use the *MUAT* questionnaire was not sought as it was available for public use and the authors were acknowledged.

3.8.2 Data Collection Techniques

Before the commencement of the study, the necessary approvals were obtained from both the University of Zambia (Ref No. 5380-2024), National Heath Research Association (Ref No. 1483/19/08/2024), and the administration of Konkola Mine Hospital (KMH). Nurses were recruited using a *voluntary participation strategy*, where they were approached during their break times and after working hours to avoid disrupting their duties. The purpose of the study, its significance, objectives, and the confidentiality of their responses were explained to potential respondents. Written informed consent was obtained from those willing to participate.

Questionnaires were distributed to respondents for self-completion on the same day, primarily during their break time and after working hours. The researcher remained available throughout the process to provide clarifications without influencing responses. Once completed, questionnaires were collected immediately to ensure no follow-up was required, thereby maintaining efficiency and minimizing disruptions. Respondents were thanked for their participation, and contact information was provided should they have any further questions.

3.8.3 Validity

3.8.3.1 External Validity

External validity, which concerns the generalizability of study results across different settings, populations, and times, was rigorously addressed in this research. Firstly, a probability sampling method was employed to ensure the sample represents the target population at KMH. This approach mitigates selection bias and enhances the ability to generalize findings to a broader population of ward nurses. Additionally, a pilot study was conducted at Nchanga South Hospital,

a comparable institution to KMH, to assess the questionnaire's effectiveness in diverse settings. The pilot study identified and resolved any issues with the questionnaire, thereby strengthening the applicability of the research findings beyond a single hospital context. Moreover, efforts were made to include a diverse sample of ward nurses, encompassing various demographics and professional backgrounds. This diversity aims to capture a wide spectrum of perspectives and practices related to the utilization of the MEWS, thereby enhancing the relevance and transferability of the study's outcomes to different healthcare environments.

3.8.3.2 Internal Validity

Internal validity, crucial for establishing accurate cause-and-effect relationships between variables, was meticulously ensured in this study. Firstly, an extensive review of existing literature and consultations with experts was conducted to identify and incorporate relevant dimensions and constructs associated with the MEWS. This thorough approach ensured that the questionnaire items developed comprehensively covered these dimensions, minimizing threats to construct validity.

Secondly, the questionnaire underwent a rigorous piloting process at Nchanga South Hospital to assess its effectiveness in capturing the intended content. This pilot study evaluated factors such as language competency, content validity, respondent fatigue, question comprehensibility, and respondent engagement feasibility. Adjustments were made based on pilot study feedback to enhance the questionnaire's clarity and relevance, thereby strengthening internal validity.

Thirdly, the study adopted a validated measurement tool, ensuring that the instrument had undergone prior testing for reliability and validity. This adaptation further enhanced the study's internal validity by utilizing a proven measurement tool tailored to the study's specific objectives and context. These measures collectively aimed at establishing robust internal validity, ensuring that the study accurately identifies and measures the relationships between variables related to MEWS utilization among ward nurses at KMH.

3.8.4 Reliability

To ensure reliability in data collection, the study utilized a modified adapted data collection tool originally developed by Richard et al. (2018) and previously employed in numerous similar research endeavors. The questionnaire has demonstrated a Cronbach’s alpha of 0.72, indicating

satisfactory internal consistency. Past studies conducted in comparable contexts have affirmed the validity of this tool and recommended its utilization for data-gathering purposes. By leveraging a validated and recommended data collection tool, the study aimed to fortify the reliability of its outcomes, thereby facilitating the capture of precise and consistent data. To further enhance reliability, regular checks of research data was conducted to ensure accuracy, relevance, completeness, consistency, and uniformity. Additionally, the data collection tool underwent pretesting to identify and address any potential issues, thereby bolstering its reliability in capturing meaningful data.

3.9 Data management and storage

To ensure the integrity, confidentiality, and accessibility of the collected data, a systematic approach to data management and storage was employed throughout the study. All completed questionnaires were reviewed for accuracy and completeness before data entry. The data were then entered into SPSS version 27.0 for analysis, with validation checks conducted to identify and correct any errors or inconsistencies.

Confidentiality was maintained by assigning unique identification codes to each questionnaire instead of using personal identifiers. Hard copy data were securely stored in a locked cabinet accessible only to the researcher, while electronic data were stored on a password-protected computer to prevent unauthorized access.

To safeguard data integrity, regular backups were created and stored in an encrypted external storage device to prevent data loss. Data will be retained for a period of five years following ethical guidelines, after which all physical and digital records will be securely disposed of through shredding and permanent deletion, respectively.

3.10 Data Analysis

Effective data analysis and presentation are critical for deriving meaningful insights from research findings. In this study, data were processed and analyzed using SPSS version 27.0, which facilitated both descriptive and inferential statistical analyses. Descriptive statistics, including frequencies, percentages, and means, were used to summarize the demographic characteristics of the study respondents, providing a general overview of the sample population.

For inferential analysis, the Chi-square test of independence and Fisher's exact test were utilized to determine associations between categorical variables such as age, gender, level of education, and the utilization of MEWS. These tests were chosen due to their appropriateness in analyzing categorical data and determining whether observed associations were statistically significant. The significance level was set at $p < 0.05$. Additionally, binary logistic regression analysis was conducted to identify predictors of MEWS utilization by calculating odds ratios (OR) with 95% confidence intervals (CI), allowing the determination of the likelihood of utilization based on independent variables. The results were presented using tables and charts to ensure clarity and facilitate interpretation. This structured approach provided a comprehensive and insightful overview of the factors influencing the utilization of MEWS among ward nurses at KMH.

3.11 Pilot study

A pilot study was conducted at Nchanga South Hospital to pretest the research instruments and assess their reliability and validity before full-scale implementation at Konkola Mine Hospital. The pilot-sampled size was 10% of the study sample size, implying that the pretest sampled was about 8 nurses. To ensure that the pilot study that was conducted would practically inform the main study, it was conducted in a manner that replicates how the data collection session was introduced and what type of study materials were administered (consent forms, questionnaires) during the main data collection process. The researcher looked out for language competency, content validity of data collection materials, Time length, respondent fatigue and respondent comprehensibility of the questions in the tool. The pilot study helped identify potential challenges related to data collection and allowed for refinement of the questionnaire based on participant feedback.

3.11 Ethical Considerations

Approval to conduct the study was sought initially from The University of Zambia School of Nursing Sciences, followed by the University of Zambia Biomedical Research Ethics Committee (UNZABREC) (Reference No.: 5380-2024). Additionally, registration to carry out the study was obtained from the National Health Research Authority (NHRA) (Ref 1483/19/08/2024) for authority to conduct the study. Permission was also obtained from the management of KMH, ensuring that the study adheres to institutional guidelines and protocols. All necessary ethical

approvals were secured to protect the rights and well-being of respondents.

All respondents involved in the research were required to provide informed consent before participating, ensuring their voluntary involvement and ethical consideration. The researcher thoroughly explained the research's purpose, the extent of participation required, and the expected duration of questionnaire administration. Respondents were also briefed on the handling of results post-data collection. Subsequently, both verbal and written consent were sought from each respondent before data collection commences. If any interviewee declines to participate or provide consent, their decision was respected, and alternative respondents were sought.

Confidentiality was meticulously maintained by securing all collected data and limiting access to authorized personnel only. Respondents' identities were anonymized in any resulting reports or publications, using codes. Results were presented in aggregate form to prevent individual responses from being discerned. Despite the study being conducted at the facility level, privacy was strictly observed, with interviews conducted in a designated private room. Respondents retained the right to choose whether to participate, with no coercion, deception, or incentives offered to influence their decision. Written consent was obtained before interviews, and both parties signed an agreement confirming consent. Nurses who opted not to participate faced no repercussions or intimidation.

3.12 Conclusion

This chapter outlined the research methodology used to assess MEWS utilization among ward nurses at Konkola Mine Hospital. A cross-sectional study design was employed, using a structured questionnaire to collect data from all eligible ward nurses. The study ensured data reliability and validity through a random sampling approach and robust data collection procedures, including confidentiality measures to encourage honest responses.

Data analysis was conducted using SPSS version 27.0, with descriptive and inferential statistics, including Chi-square, Fisher's exact, and logistic regression, used to identify significant associations between Knowledge, attitudes, and MEWS utilization. While the study design provided valuable insights, limitations such as the inability to establish causality and potential response bias were acknowledged and mitigated through objective data verification.

CHAPTER FOUR

PRESENTATION OF RESULTS

4.1 Introduction

This chapter presents the results of the study on the utilization of Modified Early Warning Score (MEWS) among nurses at Konkola Mine Hospital (KMH) in Chililabombwe, Zambia. The results are based on data analysis collected from 81 ward nurses out of the calculated sample size of 87 respondents, representing a response rate of 93.1%. The results presented in this chapter provide an insight into the utilization of the MEWS and its associated factors. The presentations of results are structured to address the research question and objectives and include descriptive and inferential statistics presented in clear and concise manner using tables, and figures to facilitate understanding.

4.2 Results

The study's results are presented using frequency tables, charts, and contingency tables, which are organized in alignment with the order of questions and sections outlined in the study questionnaire. This presentation style aims to provide a clear and concise summary of the results, enhancing the comprehensibility of the results. The structured arrangement of these visual aids follows the logical flow of the questionnaire, allowing readers to easily follow and interpret the information. Socio-demographic characteristics have been presented using a table, the dependent variable utilization of the Modified Early Warning Score is presented using a bar chart, and knowledge and attitude are illustrated using histograms, while results from Chi-square/Fisher's and logistic regression tests are presented using tables. Frequency tables systematically break down responses, charts visually depict patterns and trends, and contingency tables clarify relationships between variables. Finally, the results of binary logistic regression are presented to assess how different categories perform in terms of odds ratios when associated with the dependent variable, utilization of MEWS. This approach provides a deeper understanding of the interplay between these variables.

4.2.1 Socio-demographic characteristics

Table 4.1 presents the socio-demographic characteristics of the study respondents. The variables considered include age group, gender, years of work experience, level of education, and training in the MEWS. The table provides a systematic breakdown of these socio-demographic factors, offering valuable insights into their distribution within the respondent sample.

Table 4.1. respondents' socio-demographic characteristics (n=81)

Variables	**Number**	**Percentage**
Age group		
20-29	17	21
30-39	43	53
>40	21	26
Total	**81**	**100**
Gender		
Male	19	23
Female	62	77
Total	**81**	**100**
Experience		
1-2 years	11	14
>2years	70	86
Total	**81**	**100**
Level of Education		
Diploma	73	90
Bachelor	8	10
Masters	0	0
Total	**81**	**100**
Trained in MEWS		
Yes	46	57
No	35	43
Total	**81**	**100**

The table above shows that slightly more than half, 53% of the respondents were aged 30-39. The majority, 77% were female, with males comprising 23%. Regarding work experience, 86% of respondents had more than two years of experience. In terms of education levels, the majority ,90% held a diploma in nursing. Additionally, 57% of respondents reported being trained in the MEWS.

4.2.2 Utilization of the Modified Early Warning Score

The utilization of the MEWS was assessed by checking the consistent and timely application of the tool during patient assessments, which included monitoring physiological parameters, recording MEWS scores in patient files, and incorporating MEWS data into clinical decision-making for interventions or care escalation based on score indications. Respondents were categorized into two groups: Utilized, where MEWS was documented by nurses in patients' files, indicating consistent use of the tool, and Not Utilized, where no documentation of MEWS was found, suggesting a lack of utilization. This classification was based on the question, "Do you actively use the MEWS tool in inpatient wards for identifying and monitoring clinical deterioration?" with response options of Yes or No. The aggregated scores were analyzed, and the results are presented in Figure 4.1, showing the proportion of nurses who utilized the MEWS tool compared to those who did not.

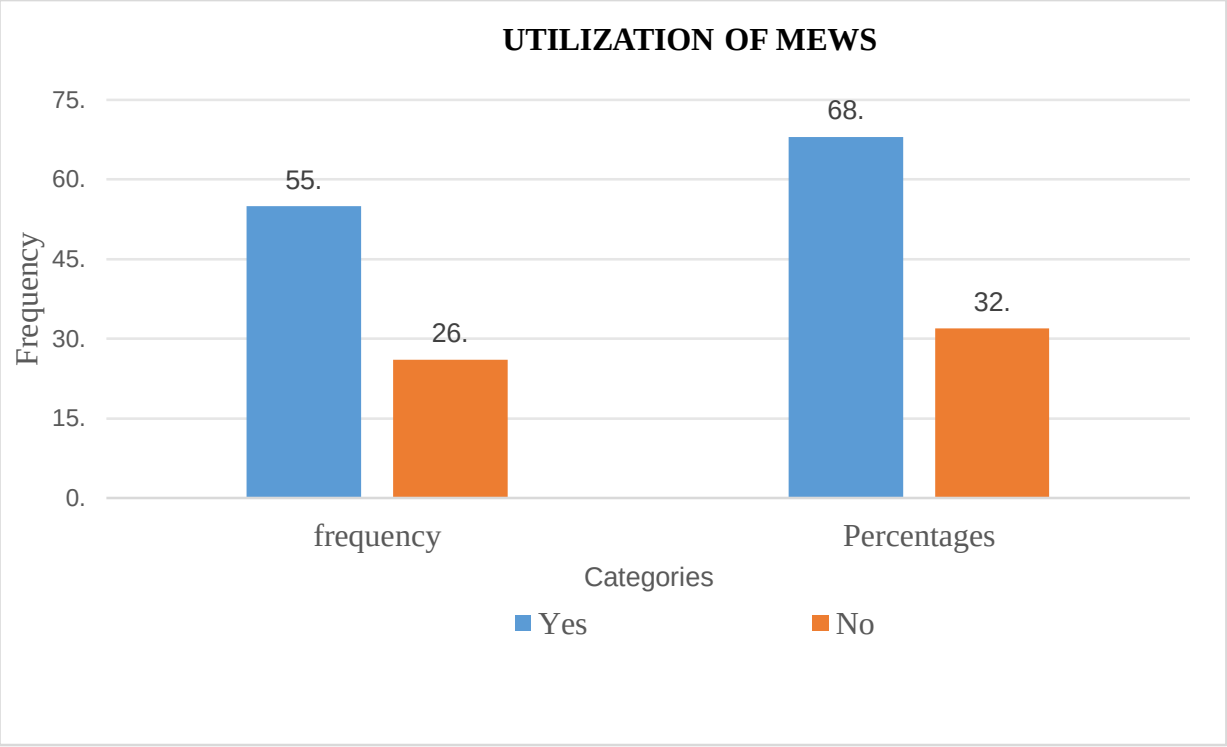


Figure 4.1: Utilization of the MEWS (n=81)

As depicted in Figure 4.1 above, most of the respondents, 68%, had utilized the MEWS.

4.2.3. Knowledge Regarding the Use of Modified Early Warning Score (MEWS)

The level of knowledge was assessed based on responses to five key questions outlined in Section C of the questionnaire. The questions evaluated their understanding of the vital signs typically included in calculating a MEWS score, awareness of symptoms indicating the need for MEWS assessment, confidence in interpreting MEWS scores, knowledge of actions required when a patient's MEWS score is elevated and understanding of how changes in MEWS scores impact treatment plans. The results of this assessment are summarized in Table 4.2. Respondents' knowledge was scored and categorized into two groups: inadequate (score less than 10) and adequate (score equal to or greater than 10) following the categorization prescribed standard from this scale.

Table 4.2: Knowledge Regarding the Use of the MEWS (n=81)

Question	Do not understand	Have some understanding	Partially understand	Fully understand
Do you know which vital signs are typically included in calculating a patient's MEWS score?	56 (69%)	12 (15%)	13 (16%)	0 (0%)
Are you aware of common symptoms that might indicate a need to assess a patient's MEWS score	49 (60%)	19 (23%)	9 (11%)	4 (5%)
How confident are you in interpreting MEWS scores to determine patient risk levels?	52 (64%)	9 (23%)	14 (17%)	69 (7%)
How much do you understand about the actions nurses should take when a patient's MEWS score is elevated	46 (58%)	19 (24%)	13 (16%)	2 (3%)
Do you understand how changes in a patient's MEWS score can impact their treatment plan	45 (56%)	16 (20%)	19 (23%)	1 (1%)

Table 4.2 shows that a significant majority, 69% of respondents, reported that they did not understand how vital signs are used to calculate a patient's MEWS score. Additionally, 60% of the respondents were unaware of the symptoms that may indicate the need to assess a patient's MEWS score. Furthermore, 64% expressed a lack of confidence in interpreting MEWS scores to determine patient risk levels. More than half of the respondents, specifically 58%, indicated that they did not understand the appropriate actions nurses should take when a patient's MEWS score is elevated.

Similarly, 56% reported having no understanding of how changes in the MEWS score can impact patient's treatment plan.

The level of knowledge on utilization of the MEWS respondent have been summarized in the figure 4.2 below which shows that more than half, 69% of the respondents had inadequate knowledge on the use of the MEWS.

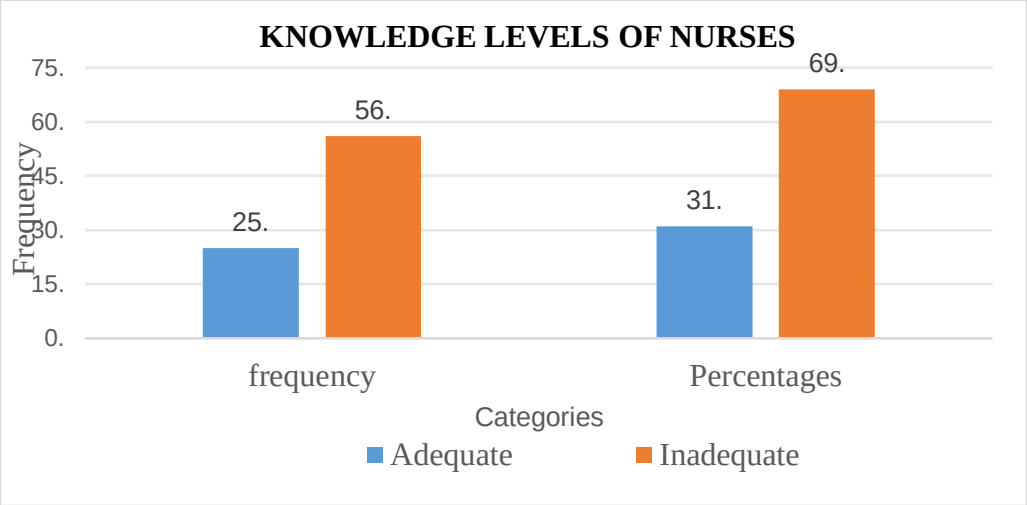


Figure 4.2: knowledge levels of respondents regarding the MEWS (n=81)

4.2.4 Attitude of nurses towards the use of the Modified Early Warning Score in Clinical Practice

The attitude variable towards the Modified Early Warning Score (MEWS) has been measured using a Likert scale with four response categories: Strongly Agree, Agree, Disagree, and Strongly Disagree. This scale assesses nurses' disposition, beliefs, and perceptions about various aspects of MEWS, including its time consumption, its impact on nurses' workload, the necessity of MEWS in well-trained nurses, and its effectiveness in recognizing patient deterioration.

Nurses who Strongly Agree or Agree with negative statements, such as MEWS being time-consuming or increasing workload, are categorized as having a negative attitude, while those who Strongly Disagree or Disagree are considered to have a positive attitude. The scores are categorized as follows: Negative (scores equal to or above 8), reflecting a less favorable attitude, and Positive (scores less than 8), indicating a more favorable attitude toward the use of MEWS in clinical

practice. The scores for each question, including percentages and frequencies, are presented in Table 4.3 below, while the categorized data is illustrated in the bar graph, displaying the distribution of Positive and Negative attitudes.

Table 4.3: Attitudes Towards the Use of the Modified Early Warning Score (n=81)

Statement	**Strongly disagree**	**Disagree**	**Agree**	**Strongly agree**
MEWS is increasing the workload of nurses disproportionately	20 (25%)	52 (64%0	9 (11%)	0 (0%)
The use of MEWS is unnecessary in attentive and well-trained nurses	40 (49%)	24 (30%)	10(12%)	7 (9%)
MEWS should not be systematically used in all wards as it is not very effective in recognizing the deterioration of a patient's general condition	40 (49%)	27(33%)	11(14%)	3 (4%)

Table 4.3 shows that 64% of respondents disagreed with the statement that "MEWS is increasing the workload of nurses disproportionately," while no one selected "Strongly Agree." For the statement regarding the necessity of MEWS-S, 49% strongly disagreed, compared to just 9% who strongly agreed. Similarly, 49% strongly disagreed that "MEWS-S should not be used systematically," with only 4% in strong agreement. This data highlights skepticism among respondents about the necessity and effectiveness of the MEWS-S system.

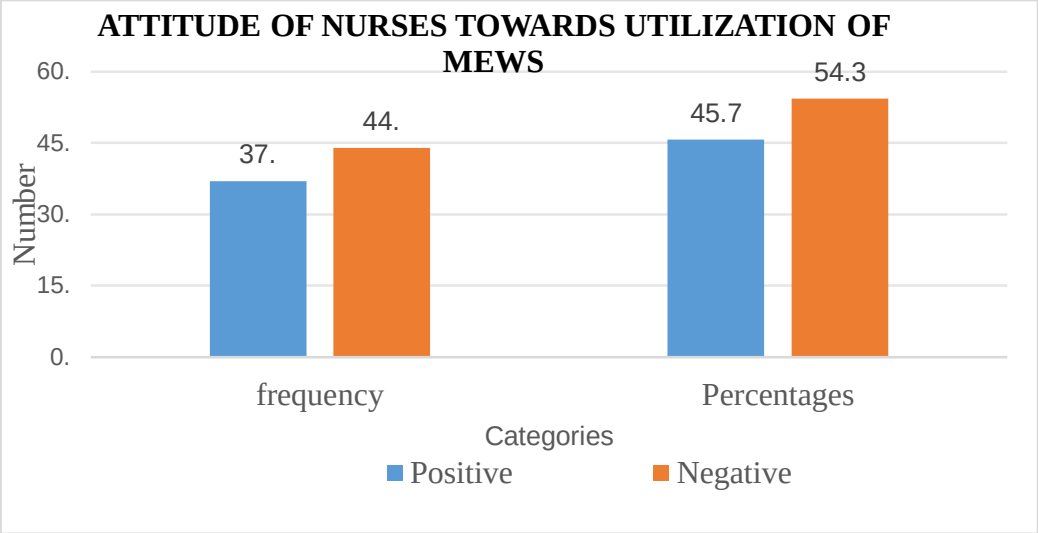


Figure 4.3: Attitudes towards the Use of the Modified Early Warning Score (n=81)

Figure 4.3 shows that a majority, 54.3%, of respondents held a negative attitude towards the use of the MEWS.

4.2.5. Chi-square test results of association between variables

Table 4.4 presents the distribution of respondents' utilization of the MEWS across various independent variables. The table shows the breakdown by age group, gender, experience, level of education, training on MEWS, attitude, and knowledge. For each variable, the number and percentage of respondents who did not utilize and those who utilized the MEWS are presented. The table also includes the corresponding *p*-values to indicate the statistical significance of the associations.

Table 4.4: Chi-square Test Results of Factors Associated with Utilization of the Modified Early Warning Score (n = 81)

Variables	Utilization of MEWS				P-value
	Not Utilized		Utilized		
	Frequency	Percentage	Frequenc	Percentage	
Age group					0.029*
20-29	10	58.8	7	41.2	
30-39	11	25.6	32	74.4	
>40	5	23.8	16	76.2	
Total	26		55		
Gender					0.001*
Male	7	36.8	12	63.2	
Female	19	30.6	43	69.4	
Total	26		55		
Experience					0.651[FE]
1-2 years	11	100.	0	0.0	
Above 2years	15	21.4	55	78.6	
Total	26		55		
Level of education					0.001[FE]*
Diploma	24	32.9	49	67.1	
Bachelor	2	25.0	6	75.0	
Total	26		55		
Trained MEWS					0.001*
Yes	7	15.2	39	84	
No	19	54.3	16	45.7	
Total	26		55		
Attitude					0.001*
Positive	20	54.1	17	45.9	
Negative	6	14.0	37	86.0	
Total	26		55		
Knowledge					0.001*
Inadequate	8	14.3	48	85.7	
Adequate	18	75.0	6	25.0	
Total	26		55		

**= Refers to statistically significant result. FE: Fishers' Exact Test*

Table 4.4 reveals that age group (p = 0.029), gender (p = 0.001), level of education (p = 0.001), training in MEWS (p = 0.001), attitude (p = 0.001), and knowledge (p = 0.001) are all statistically significantly associated with the utilization of the MEWS, indicating that these factors influence whether respondents utilize the MEWS.

4.2.6. Binary Logistic Regression Results: Factors Associated with the Utilization of the Modified Early Warning Score

Data analysis was conducted to assess factors associated with the utilization of the MEWS, including age group, gender, education, and training in MEWS, attitude, and knowledge. The results are presented in the table below, which shows the Unadjusted Odds Ratios (UOR) and Adjusted Odds Ratios (AOR) with their corresponding 95% confidence intervals (CI) and p-values for each variable.

Table 4.5: Logistic Regression Results of Factors Associated with the Utilization of the Modified Early Warning Score (n = 81)

Variable	UOR (95% CI)	*p*-value	AOR (95% CI)	*p*-value
Age Group				
20-29	1		1	
30-39	5.80 (0.40 – 84.55)	0.198	12.32 (1.26 – 120.76)	0.031
40 and above	4.36 (0.18 – 106.14)	0.366	11.90 (0.81 – 173.98)	0.07
Gender				
Male	1		1	
Female	1.08 (0.08 – 13.87)	0.954	0.32 (0.06 – 1.79)	0.193
Experience				
1-2 years	1		1	
Above 2 years	4.31 (1.86-17.2)		2.03 (0.00 – 0.22)	0.001
Education				
Diploma	1		1	
Bachelor	2.35 (4.75-65.2		6.34 (0.10-22.7)	0.632
Trained MEWs				
Yes	1		1	
No	0.45 (0.06 – 3.29)	0.434	11.76 (1.34 – 103.19)	0.026
Attitude				
Negative	1		1	
Positive	0.05 (0.01 – 0.43)	0.006	5.28 (1.08-6.24)	0.003
Knowledge				
Inadequate	1		1	
Adequate	0.07 (0.01 – 0.44)	0.005	3.05 (0.01 – 0.32)	0.002

Table 4.5 reveals that several factors significantly influenced the utilization of the Modified Early Warning Score (MEWS). Age emerged as a significant predictor, with respondents aged 30-39 years being significantly more likely to utilize MEWS compared to those aged 20-29 years (AOR

= 12.32; 95% CI, 1.26–120.76; p = 0.031). Experience also played a key role, as respondents with more than 2 years of experience were more likely to utilize MEWS compared to those with 1-2 years of experience (AOR = 2.03; 95% CI, 0.00–0.22; p = 0.001). Education level showed that respondents with a bachelor's degree were more likely to utilize MEWS compared to those with a diploma (AOR = 6.34; 95% CI, 0.10–22.7), though this relationship was not statistically significant (p = 0.632).

Professional training in MEWS had a significant impact on its utilization. Respondents who had not received training were less likely to utilize MEWS compared to those who had received training (AOR = 11.76; 95% CI, 1.34–103.19; p = 0.026). Attitude also played a significant role, with respondents who had a positive attitude towards MEWS being more likely to utilize it compared to those with a negative attitude (AOR = 5.28; 95% CI, 1.08–6.24; p = 0.003). Knowledge was another important predictor, with respondents who had adequate knowledge of MEWS being more likely to utilize it compared to those with inadequate knowledge (AOR = 3.05; 95% CI, 0.01–0.32; p = 0.002).

However, gender and age group 40 and above did not significantly influence MEWS utilization. There was no significant difference between male and female respondents (AOR = 0.32; 95% CI, 0.06–1.79; p = 0.193). Additionally, respondent 40 years of age were no more likely to utilize MEWS compared to those aged 30-39 years (AOR = 11.90; 95% CI, 0.81–173.98; p = 0.07). These findings indicate that while age, experience, training, attitude, and knowledge were significant factors in MEWS utilization, gender and age group 40 and above had no significant effect.

4.3 Conclusion

The findings of this study provide critical insights into the utilization of the Modified Early Warning Score (MEWS) among ward nurses at Konkola Mine Hospital in Chililabombwe, Zambia. The study revealed significant gaps in knowledge and training, with a substantial proportion of respondents demonstrating inadequate understanding of MEWS parameters, thresholds, and their implications for clinical decision-making. Despite these knowledge deficits, many respondents actively utilized the MEWS tool, suggesting a practical recognition of its value in patient care. However, the study also highlighted varying attitudes towards MEWS, with some nurses

perceiving it as an added workload or questioning its necessity among well-trained staff. The results underscore the need for targeted interventions to enhance MEWS-related knowledge through structured training programs and continuous professional development initiatives. Additionally, fostering positive attitudes towards MEWS through advocacy and demonstrating its impact on improving patient outcomes could further enhance its consistent utilization. Overall, the study highlights the critical role of knowledge, training, and attitudes in optimizing the use of MEWS, emphasizing the importance of addressing these factors to strengthen early detection and response to clinical deterioration, thereby improving patient safety and care quality.

CHAPTER FIVE

DISCUSSION OF RESULTS

5.1 Introduction

This chapter presents a detailed discussion of the study results based on the objectives outlined in Chapter One. The discussion begins with the demographic characteristics of the respondents and proceeds to analyze each specific objective in detail. Each section incorporates comparisons with other relevant studies, interprets the implications of the results, and applies the Donabedian Model to contextualize the results within the structure-process-outcome framework. The chapter concludes with a summary and recommendations.

5.2 Demographic Characteristics and their Influence on Modified Early Warning Sign (MEWS) Utilization

Several socio-demographic characteristics were found to significantly influence the utilization of MEWS among ward nurses at KMH. The results of this study demonstrated that age, gender, level of education, MEWS training, attitude, and knowledge were significantly associated with MEWS utilization ($p < 0.05$). Age was significantly associated with MEWS utilization ($p = 0.029$). Nurses aged 30-39 years were more likely to utilize MEWS compared to those aged 20-29 years. This finding aligns with research by Basour (2021), who reported that mid-career professionals are more likely to adopt clinical tools due to accumulated experience and exposure. Older nurses may have better decision-making capabilities, which facilitate adherence to protocols like MEWS.

The study showed a statistically significant association between gender and MEWS utilization ($p = 0.001$), with female nurses being more likely to utilize the tool than their male counterparts. This could be attributed to the predominance of female nurses in the workforce, as highlighted by Tang et al. (2019), and their increased involvement in direct patient care.

The results showed that nurses with a diploma qualification were less likely to utilize MEWS compared to those with bachelor's degrees ($p = 0.001$). Nurses with higher qualifications demonstrated better comprehension and adherence to clinical protocols, a finding supported by

Duran (2019), who noted that advanced education correlates with improved critical thinking and clinical decision-making. Nurses with bachelor's degrees were nearly three times more likely to utilize MEWS (AOR = 3.05; 95% CI, 0.01–0.32; p = 0.002), highlighting the importance of continuous professional development. Training in MEWS was a significant predictor of utilization (p = 0.001). Nurses who had undergone formal training were more likely to utilize MEWS compared to those without training (AOR = 11.76; 95% CI, 1.34–103.19; p = 0.026). These results reinforce the importance of continuous professional training in enhancing adherence to clinical guidelines. Studies by Alves et al. (2021) support this observation, emphasizing that structured training significantly enhances the application of evidence-based tools like MEWS.

From the Donabedian perspective, the human resource structure specifically, the educational and training background directly impacts the effective utilization of MEWS. Nurses with advanced education and consistent training are better positioned to utilize MEWS for early identification of clinical deterioration, reducing adverse patient outcomes. Enhancing educational opportunities and providing continuous professional development can strengthen the nursing workforce at KMH and improve patient outcomes. Investing in partnerships with academic institutions to offer accessible degree programs and certifications in critical care tools like MEWS would be a strategic move to elevate the overall quality of care.

5.3 Utilization of Modified Early Warning Score

Utilization of the MEWS is an important part of a risk management strategy that is simple to implement. The utilization level of the Modified Early Warning Score (MEWS) at 68% indicates moderate adherence to early warning systems in clinical practice. This rate suggests that while the tool is being used in a majority of cases, there is still a significant gap in full compliance, which may impact its effectiveness in preventing patient deterioration (Smith et al., 2021). Comparatively, studies from high-income settings report higher adherence rates, often exceeding 80%, due to better integration into hospital protocols, electronic documentation, and routine staff training (Jones et al., 2019; Alam et al., 2021). For instance, a study in the United Kingdom found a MEWS utilization rate of 85%, attributed to national policies mandating early warning score (EWS) use in acute care (Mitchell et al., 2020). Conversely, studies in resource-limited settings have reported lower utilization rates, often below 50%, due to staff shortages, lack of training, and

inconsistent monitoring practices (Mohammed et al., 2022; Kyriacos et al., 2019). A study in South Africa found only 45% adherence, highlighting the need for continuous education and system-level improvements (Subbe et al., 2020). The 68% utilization rate, while relatively encouraging, suggests a need for further interventions, such as automated EWS integration, refresher training, and policy reinforcement, to enhance compliance and improve patient safety outcomes (Kyriacos et al., 2019; Alam et al., 2021).

In this study, the marked difference between the utilization rates of trained and untrained nurses is a clear indication that structured training programmes are essential in promoting the consistent use of MEWS. The 84.8% utilization rate among trained nurses is reflective of the fact that when healthcare professionals are well-trained, they are more likely to adhere to evidence-based guidelines and use tools that assist in the early detection of clinical deterioration. A systematic review by Escobar et al. (2022) found that nurses with MEWS training were 1.5 times more likely to recognize early warning signs of deterioration compared to untrained nurses. Conversely, the 45.7% utilization rate among untrained nurses suggests that without training, even well-established clinical tools may be underutilized, which could result in missed opportunities for early intervention and jeopardize patient safety (Credland et al., 2018).

Moreover, the differences in utilization rates also highlight the potential gaps in institutional training efforts. While some nurses have benefitted from training, others have not been reached, creating inconsistencies in practice. Gearing et al. (2020) suggest that institutional support, in the form of mandatory training sessions and continuous professional development, is crucial to overcoming these disparities. These gaps not only undermine the effectiveness of MEWS in some units but also point to the importance of ensuring universal access to training (Burke & Conway, 2023).

The results of this study are consistent with findings from international studies, though challenges may vary depending on local contexts. For instance, Kyriacos et al. (2019) conducted a study in South Africa and found that the utilization of early warning scores, including MEWS, was lower in settings where resources were scarce and where there was incomplete or inadequate documentation. Resource constraints, such as limited access to training, insufficient support from

management, and a lack of essential medical supplies, were cited as factors that hindered the effective use of MEWS (Moore et al., 2019). These results underscore the importance of addressing resource limitations to ensure that training is accessible to all healthcare workers and that necessary materials for implementation are available.

In the case of KMH, the relatively higher utilization rates (68%) suggest that training initiatives are having a positive impact. However, the discrepancy in utilization between trained (84.8%) and untrained (45.7%) nurses reflects the need for further expansion of training programs. Similar challenges were highlighted by O'Neill et al. (2021), who found that hospitals with inconsistent training approaches faced varying levels of MEWS adoption, leading to suboptimal patient monitoring. The results also point to potential challenges in documentation practices or other institutional barriers that may prevent untrained nurses from fully utilizing MEWS, as documented by McGaughey et al. (2017). To bridge this gap, KMH should consider evaluating the reasons why some nurses remain untrained and address these barriers to ensure that training is universally accessible.

The results suggest that while training programs are having a positive effect, continuous education efforts are essential to maintain high utilization rates. Similar recommendations were made by Gerry et al. (2020), who emphasized the role of regular refresher training sessions and mentorship programs in sustaining the effective use of clinical tools such as MEWS. Addressing barriers such as workload constraints and competing responsibilities, which were identified as common deterrents to training attendance by Tang et al. (2019), can further enhance participation in training initiatives at KMH.

The Donabedian Model offers a valuable framework for assessing the quality of healthcare practices, particularly in terms of the structure, process, and outcomes of care. Applying this model to the utilization of MEWS provides a deeper understanding of how training impacts care delivery and outcomes at KMH. According to Basse et al. (2019), the structural component of the Donabedian Model refers to the resources and infrastructure that support clinical practices. In this case, the structure includes the availability of training resources, MEWS tools, and access to educational materials. While KMH has successfully implemented some training initiatives,

expanding access to training materials and ensuring adequate resources are available to all nurses will further strengthen the structure of MEWS utilization (Smith et al., 2018).

The *process* aspect of the Donabedian Model refers to how MEWS is applied in practice. This includes the integration of MEWS into nursing routines, documentation practices, and decision-making processes. According to Vicente et al. (2018), the difference in utilization rates between trained and untrained nurses suggests that the process of MEWS application is not uniform across all staff members. Standardizing the process and ensuring that all nurses have the skills and knowledge to apply MEWS consistently can improve the overall process and lead to better clinical outcomes.

The ultimate *outcome* of utilizing MEWS is to improve patient safety by identifying clinical deterioration early and preventing adverse events. While the study does not provide specific data on patient outcomes, the higher utilization rates among trained nurses suggest that proper use of MEWS can lead to improved outcomes, such as quicker identification of deteriorating patients and more timely interventions. This aligns with findings from Tang et al. (2019), who reported a 30% reduction in ICU admissions when MEWS was consistently utilized by trained nursing staff.

The higher utilization rates at KMH indicate that training programs are having a positive effect but also highlight the need for expanded and continuous training efforts to ensure that all nursing staff are adequately trained in MEWS. The disparity in MEWS utilization between trained and untrained nurses at KMH calls for targeted interventions that can bridge this gap and promote more widespread adoption of the tool. These interventions could include structured in-service training, e-learning modules, and competency assessments as recommended by Warren et al. (2021). By adopting a comprehensive approach to training, KMH can ensure sustainable improvements in the utilization of MEWS, leading to better patient safety and clinical outcomes.

5.4 Knowledge of the Modified Early Warning Score

Knowledge levels of the MEWS among nurses play a crucial role in its effective utilization and impact on patient outcomes. Studies indicate varying levels of knowledge, with some nurses demonstrating good understanding, while others exhibit knowledge gaps that hinder proper implementation (Smith et al., 2021; Alam et al., 2022). The current study revealed significant

knowledge gaps among nurses at KMH, with 69% of respondents demonstrating inadequate knowledge of the MEWS. Only 31% of the nurses exhibited an adequate understanding, particularly in interpreting scores and recognizing signs of patient deterioration. These knowledge deficits were especially prominent in understanding vital signs, MEWS scoring thresholds, and appropriate clinical responses. This finding aligns with similar studies conducted in other countries. For example, Tuyishime (2019) in Uganda and Moore et al. (2019) in Ethiopia found that nurses in their respective studies struggled with effectively applying early warning systems due to limited training and insufficient understanding of clinical criteria. Similarly, studies by Alhassan et al. (2020) in Ghana and Chukwuma et al. (2021) in Nigeria report comparable challenges, with healthcare workers lacking the necessary training and understanding to utilize early warning systems, which hindered timely patient monitoring and intervention. These studies suggest that the challenge of inadequate knowledge is widespread across various healthcare settings in low- and middle-income countries, emphasizing the need for structured training programs to bridge these gaps.

However, the results of Nadr et al. (2023) in Egypt contrast with this trend, as their study demonstrated that targeted educational interventions significantly enhanced knowledge levels and improved the application of MEWS among healthcare workers. Their results suggest that with well-designed, focused training efforts, nurses can develop a better understanding of the MEWS system and apply it effectively to detect signs of clinical deterioration early. This aligns with the conclusion drawn from the KMH study, where the inadequate knowledge is largely attributed to limited training opportunities and inconsistent reinforcement of MEWS protocols across shifts and units. These findings highlight the importance of continuous education and regular assessments to maintain a high level of knowledge and proficiency among nursing staff.

A study conducted in a tertiary hospital setting found that 72% of nurses and doctors had adequate knowledge of MEWS, correlating with higher adherence to the scoring system (Jones et al., 2019). However, in resource-limited settings, knowledge levels are often lower, with studies reporting as little as 40%–50% of healthcare workers fully understanding MEWS criteria and interpretation (Kyriacos et al., 2019; Mohammed et al., 2022). A study in South Africa found that only 48% of nurses could correctly calculate MEWS, emphasizing the need for ongoing training and

reinforcement (Subbe et al., 2020). In contrast, hospitals with regular MEWS training programs have demonstrated higher competency levels, with knowledge scores exceeding 80%, leading to better patient monitoring and early intervention (Mitchell et al., 2020; Alam et al., 2021). The disparities in MEWS knowledge suggest that standardized education programs, continuous professional development, and bedside training simulations could enhance competency and, ultimately, improve patient safety (Kyriacos et al., 2019; Smith et al., 2021).

The Donabedian Model's structural component emphasizes the need for a robust educational framework to support the consistent and effective application of clinical tools like MEWS (Squires et al.,2020). In the context of KMH, the structure refers to the availability of training resources, educational materials, and a consistent approach to reinforcing MEWS protocols across all nursing staff. To address the knowledge gaps identified in this study, KMH should prioritize the development of comprehensive, structured training programs that not only provide foundational knowledge but also integrate practical, scenario-based simulations that enhance nurses' ability to respond to deteriorating patients using MEWS (Kelly et al., 2020).

In addition to theoretical training, incorporating practical simulations into the educational framework can significantly improve nurses' confidence and proficiency in using MEWS in clinical practice (Reilly et al., 2019). Simulations allow staff to practice recognizing signs of deterioration and applying appropriate interventions in a controlled environment, which can enhance real-time decision-making skills when faced with actual patient conditions (Hughes et al., 2018). Moreover, periodic assessments should be included as part of the training to ensure that nurses maintain their knowledge and skills over time (Bucknall et a., 2019).

By addressing these knowledge gaps through targeted, continuous education and training programs, KMH can improve the proficiency of nursing staff in utilizing MEWS, thereby enhancing the hospital's ability to detect patient deterioration early and initiate timely interventions. This, in turn, will contribute to better patient outcomes and help ensure that the hospital is equipped to manage clinical risks effectively. Implementing a robust educational system that includes ongoing training, practical applications, and regular assessments is essential for bridging the knowledge gaps identified and fostering a culture of clinical excellence in patient care (WHO,

2019)

5.5 Attitudes toward utilization of the Modified Early Warning Score

Attitude of nurses toward the MEWS significantly influences its adoption and effectiveness in clinical practice. Attitude toward its implementation vary depending on workload, familiarity, and perceived usefulness (Smith et al., 2021; Alam et al., 2022). The study revealed mixed attitudes toward the utilization of MEWS among nursing staff at KMH, with 54.3% of respondents expressing negative perceptions of the tool. Many nurses described MEWS as time-consuming and unnecessary, particularly those with significant clinical experience. This finding aligns with previous studies, such as Frost (2022) in Lebanon, where nurses reported concerns that MEWS documentation increased their workload and disrupted their routine tasks. Similarly, Sharma et al. (2021) in India found that nurses perceived early warning systems like MEWS as additional tasks that interfered with their clinical responsibilities, leading to reluctance in adopting the tool despite its potential benefits in improving patient safety. These studies reflect broader concerns among healthcare professionals regarding the perceived time investment and workflow disruptions associated with clinical tools requiring additional documentation and monitoring.

Several studies have emphasized that negative attitudes toward MEWS are not unique to KMH. A study by McGaughey et al. (2017) in the U.K. highlighted that nurses were resistant to the implementation of MEWS due to their belief that it undermined their clinical judgment and increased their workload. Similarly, Kyriacos et al. (2019) in South Africa reported that the lack of buy-in from nurses and concerns over additional administrative tasks were major barriers to the successful implementation of early warning systems in low-resource settings. These results suggest that addressing negative perceptions requires an understanding of nurses' workload concerns and their perceptions of the tool’s relevance to patient care.

Conversely, studies have demonstrated that positive attitudes toward MEWS can be achieved through strategic interventions. A study by Moore et al. (2019) in Ethiopia highlighted a positive shift in nurses' attitudes following interprofessional collaboration and strong leadership support. In their study, the engagement of multidisciplinary teams in training sessions, coupled with encouragement from senior management, led to greater acceptance and integration of MEWS

among nurses. Similarly, Alhassan et al. (2020) in Ghana observed that positive changes in attitudes were linked to hospital leadership's commitment to patient safety and the provision of adequate training resources. Nurses who felt supported by their leadership were more likely to view MEWS as a beneficial tool and integrate it into their daily practice.

Other studies, such as Credland et al. (2018), found that organizations that actively promoted a culture of patient safety and provided continuous professional development opportunities saw improved attitudes toward early warning systems. Nurses in hospitals with structured training programs and leadership engagement were more likely to recognize the importance of MEWS in improving patient care and reducing preventable adverse events. These studies reinforce the idea that fostering positive attitudes toward MEWS requires a collaborative and supportive approach, rather than a purely instructional one.

At KMH, the negative attitudes among nurses may stem from a lack of understanding of MEWS' clinical value and its role in enhancing patient care. Many nurses perceive it as an additional burden rather than a tool that facilitates early intervention. This perception could be further compounded by the high patient volumes and staffing shortages, which make it challenging to incorporate new tools into existing workflows. As documented by Gerry et al. (2020), when healthcare facilities face resource constraints and workforce challenges, nurses may resist new systems that appear to add to their workload. Addressing these negative perceptions is crucial to improving MEWS utilization and ensuring that it is viewed as an integral component of patient safety rather than an administrative task.

The Donabedian Model highlights the importance of organizational support in shaping healthcare professionals' attitudes. According to the model, an organization's structure, which includes leadership and resources, plays a crucial role in fostering positive attitudes toward clinical tools. In the context of KMH, this implies that hospital leadership should take proactive steps to engage nurses in the process of MEWS implementation and work to make the tool a seamless part of daily routines. A study by Smith et al. (2018) found that integrating MEWS into existing electronic health record (EHR) systems helped reduce documentation workload, making it easier for nurses to adopt the tool. Implementing similar integration strategies at KMH could enhance the

acceptance and ease of using MEWS among nurses.

Additionally, hospital leadership should prioritize continuous education and training programs that emphasize the clinical value of MEWS and how it contributes to early identification and intervention. Several studies, including Tang et al. (2019) and Pimentel et al. (2021), have found that regular refresher courses and mentorship programs can positively impact nurses' attitudes and increase compliance with early warning system protocols. These educational initiatives can dispel misconceptions and help nurses recognize the direct link between MEWS utilization and improved patient outcomes.

Mentorship and peer support programs have also been identified as effective strategies to overcome resistance to clinical tools. According to Warren et al. (2021), experienced nurses who have successfully integrated MEWS into their practice can serve as mentors to their peers, offering guidance and practical insights on how to incorporate MEWS effectively into daily routines. This peer-to-peer support system can alleviate concerns about the complexity of the tool and foster a culture of shared learning at KMH.

Furthermore, incorporating MEWS into clinical workflows through automation and simplified processes can help reduce the perception of it being a time-consuming task. Studies by O'Neill et al. (2021) indicate that streamlined processes, such as automated alerts and simplified documentation formats, can help nurses manage their workload more efficiently while still adhering to MEWS guidelines. Implementing similar workflow enhancements at KMH could improve staff perceptions and foster greater acceptance of the tool.

5.6 Conclusion

The recognition and timely treatment of patients with clinical deterioration are essential to improve their outcomes (Samani and Rattani, 2023). In these situations, a screening score that identifies patients at risk of deterioration such as MEWS is necessary (O'Neill et al., 2021. The study examined the utilization of MEWS in identifying clinical deterioration. The study revealed significant gaps in knowledge and training, with a substantial proportion of respondents demonstrating inadequate understanding of MEWS parameters, Knowledge deficits in critical

areas such as vital sign interpretation, scoring thresholds, and appropriate clinical responses could result in delayed or inappropriate interventions, leading to negative patient outcomes.

These findings highlight the importance of structured training to bridge the gaps and maintain a high level of knowledge and proficiency among nursing staff. The hospital leadership should prioritize continuous education and training programs that emphasize the clinical value of MEWS and how it contributes to early identification and intervention. Standardizing the process and ensuring that all nurses have the skills and knowledge to apply MEWS consistently can improve the overall process and lead to better clinical outcomes.

The current study findings contribute to the growing body of evidence on the use of MEWS in improving patient outcomes. The results provide valuable insights into MEWS utilization and the need for continued education and training. The study will also help healthcare professionals, educators, and policymakers to plan as they seek to optimize MEWS implementation and improve patient outcomes.

5.7 Implications of this study to Critical Care Nursing.

5.7.1 Nursing Practice

The results of this study emphasize the need to embed MEWS into routine nursing practice to improve the early identification and management of critically ill patients. Implementing MEWS in general wards can facilitate timely interventions, preventing the progression of deterioration and reducing the need for intensive care unit (ICU) admissions.

Early detection through routine MEWS assessments allows nurses to initiate prompt interventions, thereby improving patient outcomes and preventing overcrowding in ICUs, which often results in resource strain and staff burnout (Credland et al., 2018). By incorporating MEWS scores into daily patient assessments, care plans, and handovers, nurses can tailor interventions to each patient's specific needs. Regular interdisciplinary meetings can improve communication regarding MEWS findings, ensuring a cohesive approach to patient management.

Additionally, accurate and consistent documentation of MEWS assessments allows healthcare

providers to track trends in patient conditions and make data-driven clinical decisions. Creating a supportive environment that prioritizes the importance of MEWS fosters a proactive culture of care, ultimately leading to improved patient safety, reduced morbidity, and enhanced staff efficiency.

5.7.2 Nursing Education

The integration of MEWS into nursing education programs is critical for equipping nurses with the skills needed for early detection of clinical deterioration. Curriculum designers should include MEWS training as part of clinical assessment and critical care modules to ensure that future nurses are equipped to use the MEWS effectively. Practical sessions using real-life scenarios and simulation technology can enhance students' ability to apply MEWS in clinical settings. Educators should emphasize the clinical significance of MEWS parameters, thresholds, and escalation protocols. Providing ongoing training and education can help critical care nurses develop skills to implement the tool.

5.7.3 Nursing Management

Effective utilization of MEWS requires strong support and leadership from nursing management to ensure its consistent and effective application in clinical settings. Nursing managers should implement a system-wide approach that integrates MEWS into standard patient care protocols, reinforcing its importance as a vital component of early detection strategies. Regular competency assessments and periodic refresher training sessions should be advocated to maintain and enhance nurses' proficiency in MEWS application. This is crucial in addressing knowledge gaps and ensuring that nurses remain confident and competent in recognizing early signs of patient deterioration (Bryan, 2023).

Furthermore, nursing management must prioritize investment in adequate resources, such as monitoring equipment and staffing levels, to facilitate effective MEWS implementation. Adequate staffing helps prevent workload-related barriers that may hinder the proper utilization of MEWS and ensures that nurses can allocate sufficient time to conduct assessments without compromising other patient care responsibilities (McGaughey et al., 2017). Supportive supervision and regular feedback mechanisms should also be established to encourage adherence to MEWS protocols and

identify areas requiring improvement. Data derived from MEWS documentation should be systematically analyzed to detect patterns, trends, and potential areas for quality improvement in patient care. This data-driven approach enables managers to refine policies and interventions aimed at enhancing patient safety and reducing adverse outcomes.

5.7.4 Nursing Research

The study highlights the critical role of nursing research in addressing existing gaps in the utilization and effectiveness of MEWS in clinical practice. Future research should focus on evaluating the effectiveness of different training modalities, such as simulation-based learning, in enhancing nurses' ability to apply MEWS accurately and confidently. Simulation-based training has been shown to improve clinical decision-making skills and increase nurses' confidence in managing patient deterioration (O'Neill et al., 2021).

Additionally, research should assess the impact of MEWS utilization on key patient outcomes, including morbidity, mortality rates, and hospital length of stay, to generate evidence supporting its broader adoption in diverse healthcare settings. Understanding how MEWS influences patient care processes and outcomes can provide valuable insights into its effectiveness in improving clinical practice.

Research should also investigate barriers to MEWS implementation in resource-limited settings, such as high nurse-to-patient ratios, equipment shortages, and resistance to change. Identifying these challenges can inform targeted interventions that address the unique needs of different healthcare environments (Sharma et al., 2021). Longitudinal studies are particularly important in evaluating how sustained training efforts impact the long-term integration of MEWS into nursing workflows and whether continuous education efforts result in improved compliance and patient outcomes over time.

Collaboration between nursing researchers, healthcare facilities, and policymakers is essential in generating evidence-based recommendations that optimize the implementation of MEWS. Such collaborations can lead to the development of tailored interventions and policy frameworks that support the sustainable integration of early warning systems into routine nursing practice.

5.8 Recommendations

1. **To the Ministry of Health:** the researcher recommends the development and dissemination of comprehensive national guidelines for the implementation of the Modified Early Warning Score (MEWS) across all healthcare settings. These guidelines should prioritize consistency and standardization to effectively facilitate the identification and management of patients at risk of clinical deterioration. Additionally, it is advisable to establish, and fund tailored training programs for nursing personnel to enhance their understanding and competency in utilizing MEWS. These programs should encompass both theoretical knowledge and practical application within clinical environments, thereby equipping nurses to respond promptly to early warning indicators.

To support the successful implementation and ongoing sustainability of MEWS, it is imperative to allocate adequate resources, including financial investments and staffing. This will ensure that healthcare facilities are well equipped with the necessary tools and training to adhere to these established standards. By committing to these initiatives, we can significantly improve patient safety and overall healthcare outcomes. and skill. This can be done by allocating sufficient resources to support MEWS implementation and sustainment.

2. **To Schools of Nursing**: Incorporate MEWS into curricula ensuring students are equipped with the knowledge and skill to use MEWS effectively Incorporating practical sessions and simulation-based learning will allow nurses to develop confidence in applying MEWS in real-life clinical scenarios. Additionally, mandatory refresher courses should be implemented to ensure continuous competence and to keep nurses updated with best practices related to MEWS. The development of easily accessible educational materials, such as guidelines, posters, and digital resources, can further reinforce the importance of MEWS and encourage its consistent application in daily nursing practice.

3. **To Hospital Management**: There is a need to develop and implement hospital policies and guidelines for MEWS use, ensuring consistency and standardization. The provision of training and education for nurses and other healthcare professionals can address knowledge

gaps and misconceptions. The hospital management needs to incorporate quality improvement initiatives such as tracking MEWS usage and impact on patient outcomes and identify areas for further research and improvement. Adequate resource allocation including sufficient staffing levels and monitoring equipment is necessary to support nurses in conducting timely assessments without adding to their workload. Additionally, management should implement monitoring and evaluation frameworks to track MEWS utilization rates and identify areas for improvement. Fostering a culture of patient safety through interdisciplinary collaboration and encouraging teamwork in MEWS implementation will promote a proactive approach to early detection and intervention, ultimately leading to better outcomes.

5.9 Plan for dissemination and utilization of results

Results will also be presented to the study respondents and the Critical Care Association of Zambia to provide evidence that will contribute to improving healthcare outcomes and practices through the utilization of MEWS. Thereafter, a bound copy of the study will each be submitted to the School of Nursing Sciences, UNZA Medical Library, Main Library to serve as reference material to other researchers. A bound copy will also be submitted to the administration of the KCM hospital to provide evidence of the outcome of results that will inform policy development at the hospital. A meeting will also be held with management and staff at KCM Hospital to allow them to ask questions about the results of the study and set the pace for integrating the results into practice.

Another copy in digital format (Article) will be prepared for online publication. Upon completion of the study, the findings will be utilized to enhance healthcare outcomes and practices at KMH through the effective use of MEWS. The results will provide critical evidence to inform and improve clinical practices, contributing to better patient monitoring and early intervention strategies.

The insights gained from the study will support the development of policies and protocols at KMH, aimed at optimizing the use of MEWS by ward nurses. A meeting with KMH management and staff facilitated the integration of the study findings into everyday clinical practice, ensuring that the benefits of early detection and intervention are fully realized, ultimately leading to improved

patient outcomes and reduced mortality rates. Additionally, the results were shared with other hospitals and healthcare institutions to benchmark MEWS utilization practices thereby facilitating the exchange of best practices and collaborative efforts to enhance patient care across different settings. Furthermore, the findings were used to help hospital management allocate resources more effectively to improve MEWS utilization and overall patient care.

5.10 Strengths of the study

One major strength of this study is its specific focus on the utilization of the Modified Early Warning Score (MEWS) in general ward settings at KMH. Unlike many studies that concentrate on critical care units such as the ICU, this study provides valuable insights into how MEWS can be effectively integrated into routine ward-based nursing care. By assessing MEWS utilization in general wards, the study contributes to the understanding of how early detection of patient deterioration can reduce ICU admissions and prevent complications, ultimately improving patient safety and outcomes. This focus is particularly important in resource-limited settings, where ICU capacity is often constrained, and early intervention at the ward level can help optimize resource utilization and alleviate the burden on critical care services.

Another notable strength of this study is the rigorous approach taken to analyze MEWS utilization through a combination of descriptive and inferential statistical methods. The use of chi-square and logistic regression analyses ensures a robust examination of associations between the study variables, knowledge and attitudes and MEWS utilization. The descriptive analysis provides a clear overview of MEWS usage patterns among ward nurses, while the inferential analysis offers insights into the statistical significance of relationships between key variables. This dual approach enhances the reliability and validity of the findings, allowing for more precise conclusions and actionable recommendations for improving MEWS implementation in clinical practice.

The study's high response rate of 93.1% further strengthens its credibility by minimizing the risk of nonresponse bias. A high response rate ensures that the study findings accurately reflect the views and experiences of the target population, thereby enhancing the generalizability of the results to similar healthcare settings. Additionally, the use of a structured questionnaire ensures systematic and comprehensive data collection, capturing essential aspects of MEWS utilization,

such as documentation practices and perceived challenges. This structured approach ensures that data is collected uniformly across all respondents, improving the consistency and comparability of the results.

Furthermore, the study's focus on a single healthcare institution, KMH, allows for in-depth, context-specific insights that are particularly relevant to resource-limited environments. The findings provide a clear picture of the current state of MEWS utilization in general wards and highlight practical opportunities for improvement that can be implemented within similar A healthcare settings in Zambia and beyond. The results of this study can inform targeted interventions that address unique challenges faced in ward settings, such as staff workload, documentation practices, and adherence to early warning protocols, ultimately leading to better patient outcomes and reduced ICU admissions.

Overall, the study's focus on ward-based MEWS utilization and its robust analytical approach complements each other to produce reliable results. The emphasis on real-world application in general wards demonstrates the feasibility of scaling MEWS beyond critical care units, while the strong methodological framework ensures that the findings are well-supported and applicable for guiding evidence-based improvements in clinical practice.

5.11 Limitations

Despite its strengths, the study has several limitations that should be considered when interpreting the findings. One notable limitation is its cross-sectional design, which captures data at a single point in time. This design does not allow for the establishment of causal relationships between variables, making it difficult to determine whether factors such as knowledge or attitudes directly influence MEWS utilization. To mitigate this limitation, the study employed a robust statistical analysis approach, including logistic regression, to identify associations between variables. However, future longitudinal studies are recommended to track changes over time and provide stronger evidence of causality.

Another limitation is the potential for social desirability bias, as respondents may have over-reported positive behaviors or attitudes toward MEWS due to the nature of self-reported data. This

could lead to an overestimation of MEWS utilization rates. To address this challenge, the study assured participants of confidentiality and anonymity, encouraging honest responses without fear of repercussions. Additionally, the inclusion of an objective measure—cross-checking MEWS documentation in patient files—helped to validate self-reported data and reduce the impact of response bias.

The study's focus on ward nurses at Konkola Mine Hospital presents another limitation, as the findings may not be fully generalizable to other healthcare settings with different resource availability, staff demographics, or organizational cultures. To mitigate this challenge, the study provided detailed contextual information about KMH, allowing readers to compare findings with similar settings and adapt the insights to their institutions where applicable. Future multi-center studies involving a diverse range of hospitals are recommended to enhance generalizability.

Lastly, the study does not account for external factors such as institutional policies, workload pressures, or resource availability that might influence MEWS utilization. These unmeasured variables could provide additional insights into the challenges faced in implementing MEWS effectively. To partially address this, use of regression analysis can account for potential factors that may influence the relationship between. Further research incorporating qualitative methods and stakeholder interviews could provide a more comprehensive understanding of these contextual factors. Despite these limitations, the study offers valuable insights into MEWS utilization in ward settings and highlights key areas for improvement, contributing to the broader goal of enhancing patient safety and early detection of clinical deterioration.

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Zheng, K., Bai, Y., Zhai, Q. R., Du, L. F., Ge, H. X., Wang, G. X., and Ma, Q. B. (2022). Correlation between the warning symptoms and prognosis of cardiac arrest. World journal of clinical cases, 10(22), 7738–7748. https://doi.org/10.12998/wjcc.v10.i22.7738

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APPENDICES

APPENDIX A: RESPONDENT INFORMATION SHEET

Study Title: UTILIZATION OF MODIFIED EARLY WARNING SCORE AMONG WARD NURSES AT KOKOLA MINE HOSPITAL, CHILILABOMBWE, ZAMBIA.

Dear Respondent

My name is Regina Mutolwa Kanyenda a Critical Care Nursing Master student at the University of Zambia, School of Nursing Sciences. As a partial fulfillment of this program, it is required to undertake research in any area of benefit to the provision of quality health care and to contribute to the scientific body of knowledge that will be beneficial to the entire society.

This study is aimed at the Utilization of Modified Early Warning Scores by ward nurses in general wards at Konkola Mine Hospital in Chililabombwe District. I hereby seek your permission to participate in this study.

Purpose of the Study: The purpose of this study is to explore and understand the utilization of the MEWS among ward nurses at Konkola Mine Hospital in Chililabombwe, Zambia. Your participation will help generate valuable insights that could improve patient monitoring and care.

Participation

Your participation in this study is purely voluntary. Consent to participate does not violate your rights to withdraw at any point should you wish to do so. If you wish to withdraw from the study, please notify the researcher or contact the person indicated on this consent form.

Confidentiality

Please, take note that it is not required of you to write your names or initials on the questionnaire. Serial numbers will be used so that the study respondents may not be identified at all. All information obtained will be kept in the researcher's file and no one will have access to it.

Risks and benefits

There are no risks involved or direct benefits to you in this study.

Who to Contact?

If you have any questions, you may ask them now or later, even after the study has started. If you wish to ask questions later, you may contact Ms. Regina Mutolwa Kanyenda on +260961943510 or email ginazec@gmail.com OR you may contact the Chairperson at University of Zambia Biomedical Research Ethics Committee Mr S. Munsaka on +260977925304 or email unzarec@unza.zm or s.munsaka@unza.zm.

APPENDIX B: INFORMED CONSENT

The researcher has described to me the research process, risks, benefits involved, and my rights regarding this study. I understand that my decision to participate in this study will not alter my usual practice as a nurse. In the use of this information, my identity will be concealed. I am aware that I may withdraw at any time. I understand that by signing this form, I do not waive any of my legal rights but merely indicate that I have been informed about the research study in which I am voluntarily agreeing to participate. A copy of this form will be provided to me.

I accept to take part in answering these questions voluntarily to help facilitate the accuracy and validity of this study. I have read and understood the information provided above.

Name of participant……Signature of participant …….Date (DD/MM/YY) ……

Name of Witness……...Signature of Witness……
Date (DD/MM/YY) ……

Name…….....Signature of Interviewer ……
Date (DD/MM/YY) ……...

Contact Information: If you have any questions or concerns about the study, please contact:

- **Researcher:** Regina Mutolwa Kanyenda, Email: ginazec@gmail.com, Phone: +260961943510
- **Research Supervisor:** Dr. Ruth Wahila, Email: ruth.wahila@unza.zm, Phone: +260975971620

If you have any further questions, please contact the University of Zambia Biomedical Research Ethics Committee chairperson;

Prof. Sody Mweetwa Munsaka, BSc., MSc., PhD Tel: +260977925304 E-mail: s.munsaka@unza.zm

APPENDIX C: DATA COLLECTION TOOL

THE MEWS UTILIZATION ASSESSMENT TOOL

(Adapted from La Thanh and Nuong, 2022)

QUESTIONNAIRE

SECTION A: RESPONDENTS SOCIODEMOGRAPHIC CHARACTERISTICS

1. How old are you?
   a) 20- 29
   b) 30-39
   c) 40 and above
2. What is your gender?
   a) Male
   b) Female
3. What is your work experience?
   a) 1-2 years
   b) >2 years
4. What is your level of education?
   a) Diploma
   b) Bachelors
5. Have you undergone MEWS training?
   a) Yes
   b) No

SECTION B: UTILIZATION

6. Do you actively use the MEWS tool in inpatient wards for identifying and monitoring clinical deterioration?
   a) Documented (Yes)
   b) Not documented (No)

SECTION C: KNOWLEDGE OF THE MEWS

No:	QUESTIONS	Fully Understand	Partially Understand	Have Some Understanding	Do Not Understand
7.	Do you know which vital signs are typically included in calculating a patient's MEWS score?				
8.	Are you aware of the common symptoms that might indicate a need to assess a patient's MEWS score?				
9.	How confident are you in interpreting MEWS scores to determine patient risk levels?				
10.	How much do you understand about the action nurses should take when a patient's MEWS score is elevated?				
11.	Do you understand how changes in a patient's MEWS score can impact their treatment plan?				

SECTION C: ATTITUDE TOWARDS MEWS

No:	QUESTIONS	STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE
12.	MEWS-S is time-consuming				
13.	MEWS is increasing the workload of nurses disproportionately				
14.	The use of MEWS-S is unnecessary in attentive and well-trained nurses				
15.	MEWS-S should not be systematically used in all wards as it is not very effective in recognizing the deterioration of a patient's general condition.				

APPENDIX D: AUTHORIZATION LETTER

THE UNIVERSITY OF ZAMBIA
SCHOOL OF NURSING SCIENCES
OFFICE OF THE ASSISTANT DEAN POSTGRADUATE

Tel: +260 211 252453
Fax: +260 211 252453
Website: www.unza.zm
Email: dean-nursingscience@unza.zm

School of Nursing Sciences Building
University Teaching Hospitals
P.O Box 50110
Lusaka, Zambia

9th May, 2024

The Chairperson,
UNZABREC,
The University of Zambia,
Ridgeway campus,
Lusaka

Dear Sir/Madam,

RE: PROPOSAL SUBMISSION FOR ETHICAL REVIEW: REGINA MUTOLWA KANYENDA

Regina Mutolwa Kanyenda presented her research proposal entitled, **"Utilization of Modified Early Warning Scores among Ward Nurses at Konkola Mine hospital, Chililabombwe, Zambia"**, to the School of Nursing Sciences Graduate Proposal Presentation Forum. The Supervisor has confirmed that the corrections and recommendations to the research proposal have been attended to.

This serves as a supporting letter for the student to submit the proposal for ethical review to UNZABREC.

Yours faithfully,

Marjorie Kabinga-Makukula (PhD)
ASSISTANT DEAN -Postgraduate

Cc: Head, Department of Basic and Clinical Nursing Sciences
File

APPENDIX E: UNZABREC APPROVAL LETTER

UNIVERSITYOFZAMBIA

BIOMEDICALRESEARCHETHICSCOMMITTEE

Telephone: +260 977925304 Ridgeway Campus Telegrams: UNZA, LUSAKA P.O. Box

50110 Telex: UNZALU ZA 44370 Lusaka, Zambia
Fax: + 260-1-250753 E-mail: unzarec@unza.zm
Federal Assurance No. FWA00000338IRB00001131 of IORG0000774NHRAR-REC No

2021-05-0002

21st July, 2024

Your REF. No. 5380-2024

Ms. Regina Mutolwa Kanyenda,
University of Zambia,
School of Nursing
Sciences, P.O Box 50110,
Lusaka.

Dear Sir/Madam,

RE: UTILIZATION OF MODIFIED EARLY WARNING SCORE AMONG WARD NURSES AT KONKOLA MINE HOSPITAL, CHILILABOMBWE, ZAMBIA (REF. NO. 5380-2024)

The above-mentioned research proposal was presented to the Biomedical Research Ethics Committee on 17th July 2024. The proposal is **approved**. The approval is based on the following documents that were submitted for review:

a) Study proposal!

b) Questionnaires

c) Participant Consent Form

APPROVAL NUMBER: REF. No. 5380-2024.This number should be used on all correspondence, consent forms, and documents as appropriate.

APPROVAL DATE: 18th July 2024 ii. TYPE OF APPROVAL: Standard iii.EXPIRATION DATE OF APPROVAL: 17th July, 2025

iv. After this date, this project may only continue upon renewal. For purposes of renewal, a progress report on a standard form obtainable from the UNZABREC Offices should be submitted one month before the expiration date for continuing review.

v. **SERIOUS ADVERSE EVENT REPORTING**: All SAEs and any other serious challenges/problems having to do with participant welfare, participant safety and study integrity must be reported to UNZABREC within 3 working days using standard forms obtainable from UNZABREC.

vi. **MODIFICATIONS**: Prior UNZABREC approval using standard forms obtainable from the UNZABREC Offices is required before implementing any changes in the Protocol (including changes in the consent documents).

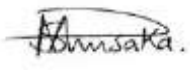
vii. **TERMINATION OF STUDY**: On termination of a study, a report has to be submitted to the UNZABREC using standard forms obtainable from the UNZABREC Offices.

viii. **NHRA:** You are advised to obtain final study clearance and approval to conduct research in Zambia from the National Health Research Authority (NHRA) before commencing the research project.

ix. **QUESTIONS**: Please contact the UNZABREC on Telephone No. +260977925304 or by e-mail on unzarec@unza.zm.

x. **OTHER**: Please be reminded to send in copies of your research findings/results for our records. You are also required to submit electronic copies of your publications in peer-reviewed journals that may emanate from this study. Use the online portal: unza.rhinno.net for further submissions.

Yours sincerely,

7 

Prof. Sody Mweetwa Munsaka, BSc., MSc., PhD

APPENDIX F: AUTHORIZATION LETTER

CHAIRPERSON

Tel: +260977925304

E-mail: s.munsaka@unza.zm

NATIONAL HEALTH RESEARCH AUTHORITY
Lot No. 18961/M, off Kasama Road, Chalala, P.O. Box 30075, LUSAKA
Tell: +260211 250309 | Email: nhrasec@nhra.org.zm | www.nhra.org.zm

NHRA-1483/19/08/2024 **24thOctober2024**

The Principal Investigator,
Ms. Regina Mutolwa Kanyenda,
University of Zambia, School of Nursing Sciences, P.O Box 50110, Lusaka.,
Dear Ms. Regina Mutolwa Kanyenda,

Re: Request for Authority to Conduct Research

The National Health Research Authority Is in Receipt of Your Request for Authority to Conduct Research Titled **"UTILIZATION OF MODIFIED EARLY WARNING SCORE AMONG WARDNURSESATKONKOLA MINE HOSPITAL, CHILILABOMBWE, ZAMBIA"**

I wish to inform you that following submission of your request to the Authority, our review of the same and in view of the ethical clearance, this study has been **approved** on condition that:

1. The relevant Provincial and District Medical Officers where the study is being conducted are fully appraised.
2. Progress updates are provided to NHRA bi-annually from the date of commencement of the study.
3. The final study report is cleared by the NHRA before any publication or dissemination within or outside the country.
4. After clearance for publication or dissemination by the NHRA, the final study report is shared with all relevant Provincial and District Directors of Health where the study was being conducted, University leadership, and all key respondents.

Yours sincerely,

National Health Research Authority

Prof Victor Chalwe,

Acting Director/Chief Executive Officer