EVALUATION OF PRACTICE OF MORBIDITY AND MORTALITY MEETINGS AND ASSOCIATED FACTORS AMONG HEALTHCARE WORKERS AT TERTIARY TEACHING HOSPITALS IN TANZANIA

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EVALUATION OF PRACTICE OF MORBIDITY AND MORTALITY MEETINGS AND ASSOCIATED FACTORS AMONG HEALTHCARE WORKERS AT TERTIARY TEACHING HOSPITALS IN TANZANIA

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A Dissertation submitted in (Partial) Fulfillment of the Requirements for the Degree Award of Master of Medicine (Anaesthesiology) at

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October, 2024

CERTIFICATION

The undersigned certifies that she/he has read and hereby recommends for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: “Evaluation of Practice of Morbidity and Mortality Meetings and Associated Factors at Tertiary Teaching Hospitals in Tanzania” in (Partial) fulfillment of the requirement for the degree of Master of Medicine (Anaesthesiology) of the Muhimbili University of Health and Allied Sciences.

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Date:……

DECLARATION AND COPYRIGHT

I, Maynard S Mekere, declare that this dissertation is my original work. It has not been presented and will not be presented to any University for a similar or any other degree award.

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DEDICATION

I dedicate this work to my beloved parents, Rtd Brig Gen Dr. Josiah M Mekere and Mrs. Joyce Mekere, who have supported me throughout my years of studies and have been a source of motivation and strength.

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LIST OF ABBREVIATIONS

APEs	Adverse Patient Events
HCWs	Health care workers
IRB	Institutional Review Board
KCMC	Kilimanjaro Christian Medical Centre
MNH	Muhimbili National Hospital
MPDR	Maternal Perinatal Death Review
M&M	Morbidity and Mortality
MOI	Muhimbili Orthopedic Institute
SPSS	Statistical Package for the Social Science
SSA	Sub-Saharan Africa
USA	United States of America
WHO	World Health Organization

DEFINITIONS OF TERMS

Adverse patient events are unintended harm or complications brought on to the patient by healthcare providers, as opposed to a disease's complications(1).

Morbidity refers to the state of being diseased or the incidence of disease within the population(2).

Mortality refers to the state of being mortal or subject to death. It is the occurrence of death within the population or a specific group of individuals(2).

Morbidity and mortality meetings are a forum where adverse patient events are reported and discussed, enabling teams to recognize surgical and medical failure related to patient care, learn from the experience, and develop plans of action to avoid recurrence(3–6)**.**

Multidisciplinary participation involves the participation of physicians from a variety of fields, such as pharmacists, physical therapists, social workers, nurses, and midwives, in inpatient care(7)**.**

Practice of M&M meetings; as the conduct of M&M meetings at the institution and regular participation of HCWs in M&M meetings. Regular participation and regular conduct of M&M meetings were the proxy measures of the adequate practice of M&M meetings at the individual and institutional levels(8).

Regular participation; routine participation in M&M meetings on set days and at set times weekly or monthly for the past two years(9).

Regular conduct; routine conduct of M&M meetings on set days and at set times for the observed study period. Meetings are held weekly or monthly depending on the volume of cases(9).

Adequate practice; regular participation at the individual level and a score of >50% on the observation checklist collected during the meetings at an institutional level.

Adequate knowledge; a score of ≥75% on awareness and knowledge assessment questions that included characteristics and objectives of M&M meetings.

ABSTRACT

Background:

Morbidity and Mortality (M&M) meetings are among the most powerful teaching tools and cornerstones for surgical and medical training and learning. They provide a platform for healthcare organizations and trainees to discuss adverse incidents and management failures in patient care that may have led to complications or death. Studies have shown that the majority of M&M meetings are focused on maternal and perinatal care, as opposed to other medical disciplines. In Africa, healthcare practices are still inadequate, compromising the quality of care. M&M meetings, are crucial for assessing the quality of care, but there is little information regarding their existence, performance, and the practical barriers to their implementation across all medical disciplines. This study evaluated the practice of M&M meetings and the factors associated with them among healthcare workers (HCWs) at tertiary teaching hospitals in Tanzania.

Aim: To evaluate the practice of morbidity and mortality meetings and its associated factors among HCWs at a tertiary teaching hospital in Tanzania.

Methodology: This was a cross-sectional study conducted at Muhimbili National Hospital (MNH), Muhimbili Orthopedic Institute (MOI), and Kilimanjaro Christian Medical Centre (KCMC). Using consecutive sampling, 300 HCWs were enrolled in the study from June to November 2023. A total of 14 M&M meetings were observed among the three institutes using a structured observation checklist to evaluate the institutional practice. A standard questionnaire assessed HCWs' awareness, knowledge, attitude, and perception of M&M meetings. Data collection and analysis using SPSS version 26 included bivariate and multivariate analyses with independent factors identified using logistic regression models at p-values <0.05.

Results: Only eight meetings in eight of the enrolled departments from KCMC, five meetings in seven of the enrolled departments from MNH, and one meeting from MOI were observed in a period of five months. The practice of conducting M&M meetings was found to be adequate only in five of the 14 observed meetings. Most participants (96.7%) reported

having heard about M&M meetings, 80.7% of participants perceived the practice of M&M meetings as effective, and 92.8% had a positive attitude toward the practice. However, the overall knowledge was low and only 21.0% had adequate knowledge. In bivariate analyses, sex, age, cadre, years of experience, knowledge, and perception were strongly associated with the regular participation of HCWs in M&M meetings. Doctors and specialists showed a higher proportion of regular participation compared to nurses (95% CI: 1.33-5.32, p = 0.01), and (95% CI: 5.45-30.55, p= 0.00) respectively. Participants with positive perceptions had a higher likelihood of regular participation (95% CI;2.05-22.41, p=0.00). Logistic regression analysis revealed that only adequate knowledge was independently associated with regular participation (AOR= 265.58, 95% CI; 59.71-1181.13, p=0.00).

Conclusion: The study revealed a significant gap in adherence to guidelines and inadequate practice of M&M meetings. Healthcare workers who have adequate knowledge about these meetings were more likely to participate regularly. Aligning local practices with international guidelines from the World Health Organization (WHO), national or evidence based guidelines can help standardize M&M processes, promote consistency in quality improvement efforts, and ultimately contribute to enhanced patient safety and outcomes within Tanzanian healthcare settings. Furthermore, the study has highlighted the importance of educational interventions among HCWs to promote regular participation and enhance the effectiveness of M&M meetings.

Keywords: morbidity and mortality (M&M) meetings, healthcare workers (HCWs).

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Morbidity and Mortality (M&M) meetings are among the most powerful teaching tools and cornerstones for surgical and medical training and learning. They offer an avenue for the organization and trainees to discuss and look at negative incidents, and surgical and medical failures related to patient care that may have caused complications and death(5). These meetings also give an opportunity for teaching the concepts of patient safety and quality improvement, which are the current requirements for residency education. The Anesthesia Study Commission of the Philadelphia County Medical Society, established in 1940 and composed of anesthesiologists, surgeons, and internists, is one of the earliest examples of M&M meetings(10,11). Similar gatherings were soon reported in obstetrics and gynecology, surgery, neonatology, and other medical specialties(10).

According to reports, the prevalence of APEs is comparable between developed and developing nations, ranging between 3.7% and 16.6% in the former and 2.5% and 18.4% in the latter(12,13). Surgical specialties have been shown to have the highest rates of malpractice lawsuits, with up to 50 percent to 70 percent of inpatient adverse events coming from improper surgical care(13). Despite the lack of information on medical error-related deaths in underdeveloped nations, a study done in Ethiopia investigating surgical practitioners, knowledge, attitude, and experience regarding surgical malpractice, found that the rate of such deaths is fairly high(13). By 2010, countries like Tanzania, Uganda, Kenya, Malawi, Ghana, Nigeria, and South Africa had implemented reforms for auditing M&M meetings, based on WHO recommendations(14).

Healthcare institutions in high-income countries have paid a great deal of attention to the standard of care and patient safety through M&M meetings, regularly holding these meetings to uncover mistakes and improve patient care(14,15). Recently efforts regarding medical error reporting in East African countries were made though most of them concentrated on a small number of drug-related side events and maternal audits, underreporting other medical errors(16). As seen in Sub-Saharan Africa (SSA) and East

African countries, most of the M&M meetings done were for maternal and perinatal care in contrast to other medical disciplines, even though these were not frequent and were not done in all health facilities(17,18).

Morbidity and mortality meetings should have an existing guideline, a structured format crucial to achieving transparency and maximum performance, and a trained chairperson who is a senior, respected member of the department with the role of initiating open discussions, and ensuring a non-blaming climate, and making sure that the conversations are educational(11,19,20). The M&M meetings ought to be regular with a specified time and multi-disciplinary for clinicians from all relevant specializations and backgrounds (such as those in medicine, nursing, and allied health) to participate(6). Regular facility M&M meetings have been associated with greater care quality and healthier outcomes to benefit patients and healthcare professionals(14,21,23).

The implementation of M&M meetings in SSA is slowly progressing(14). A study exploring HCWs perception on the use of M&M meetings in Kenya showed that meetings are not done often, there is a lack of participation by all HCWs, with the majority of participants being doctors, and poor implementation reduces their usefulness(17). Both patients and healthcare professionals benefit immensely from M&M meetings. In low-income nations like Tanzania, these meetings are feasible, but most institutions either don't do them or do so only occasionally and do not save any records of the meetings, conversations, decisions, or corrective actions that were taken, which is an inadequate practice(18,24).

Key factors for successful M&M meetings are based on the following principles; presence of reporting systems, holding of M&M meetings regularly at the same time every week or month, a blame-free environment encouraging openness and transparency, awareness and adequate knowledge of the meetings, a positive attitude, transparency, follow-ups, and ambitious educational commitment goals. The hospital governance structure needs a method to communicate the problems, as it has been shown that M&M meetings can also be affected by institutional factors such as the availability of reporting systems and institutional support (25). Since "to err is human," mechanisms that record, lessen, or prevent errors from happening should be developed instead of criticizing healthcare professionals for them. The advancement of a “no accuse” condition through M&M

meetings where errors are openly acknowledged and discussed should now be focused on. This study aimed to evaluate the practice of M&M meetings and associated factors among tertiary teaching hospitals in Tanzania.

1.2 Problem Statement

Globally, it is estimated that hospitalizations result in 134 million adverse patient events (APEs) annually, contributing to over 2.5 million fatalities each year, while 5 million people receive low-quality care from the health system(9). Healthcare practice in Africa is still inadequate, compromising the quality of care. Limited data to show how M&M meetings are conducted in our settings, despite their importance in assessing care quality. Emerging evidence indicates that merely expanding healthcare coverage in low- and middle-income countries does not necessarily lead to better outcomes(14).

A comprehensive study involving 26 hospitals from Africa and the Eastern Mediterranean, conducted by the World Health Organization (WHO), highlighted the current efficacy of facility-based maternal and perinatal M&M meetings in Sub-Saharan Africa (SSA) at reducing mortality and morbidity rates related to childbirth. The range of APEs per country was 2.5%–18.4%, with 83% deemed preventable(14,26). The WHO acknowledged the limited patient safety research in developing nations and emphasized the need for policies addressing their limited infrastructure and capacity(6).

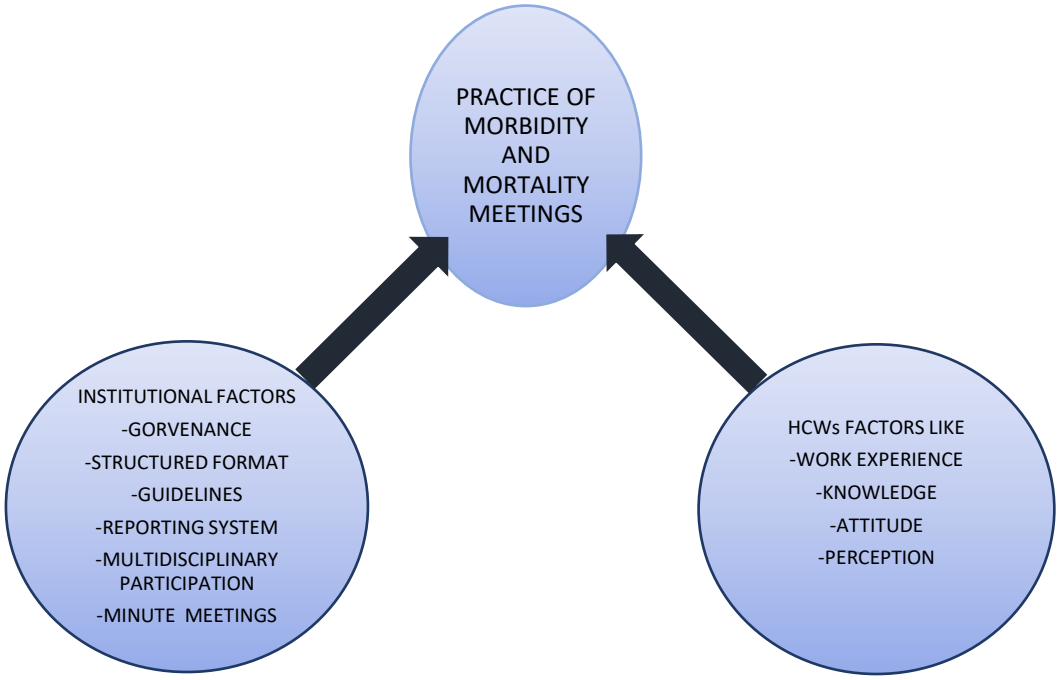
Studies conducted in Sub-Saharan Africa (SSA) and other African nations revealed that a standardized and regular practice of M&M meetings in a tertiary care setting can significantly improve care standards and may be a powerful tool for enhancing surgical care, especially in low- and middle-income countries(6,14). Additionally, a study in Malawi quantified the improvements in maternal outcomes during a period of M&M meetings on a district-wide level(27).

A recent study in Kenya exploring healthcare workers' (HCWs) perceptions of M&M meetings showed infrequent meetings, lack of regular participation from all HCWs, especially nurses, absence of observable success, and poor implementation, which reduce their usefulness(17). Factors influencing M&M meetings include institutional factors, like a reporting system, guidelines to M&M meetings, use of moderators, multidisciplinary participation, and non-organizational aspects, such as a blame-free environment,

knowledge, perception, and attitude are the factors influencing M&M meetings as seen in most studies(5,25,28,29).

The practice gap among HCWs on M&M meetings and the associated factors are not well established in our setting. Therefore, this study aims to evaluate the practice of M&M meetings and the associated factors, including knowledge and awareness, attitude, perception, and institutional factors, among tertiary teaching hospitals in Tanzania.

1.3 Conceptual Framework



Narration of Conceptual Framework

This study's objective was to evaluate the practice of morbidity and mortality meetings and associated factors in tertiary teaching referral hospitals. The outcome of the study was the practice of M&M meetings, involving the conduct, participation, and performance of such meetings in different disciplines. The conceptual framework of this study shows factors that may influence the practice of M&M meetings including HCWs factors, such as knowledge on the meetings, a blame-free environment, a positive attitude, a good perception, and institutional factors like ensuring multidisciplinary participation, the presence of a reporting system, and essential guidelines or structured presentation formats, if any(5,8,29,30).

1.4 Rationale

Morbidity and mortality meetings are effective tools for enhancing health care services. They provide an opportunity for healthcare workers to review complications and deaths with the sole purpose of learning and improving patient care. Hence, this study aimed to evaluate the scope of practice of M&M meetings in our setting, provide valuable insights, and highlight areas for improvement for effective M&M meeting practices in teaching hospitals. The results would therefore aid in forming strategies to enhance the quality and frequency of M&M meetings, promote healthcare providers' participation and engagement, and ultimately improve patient outcomes.

1.5 Study Questions

1.5.1 Broad Research Question.

What is the practice of morbidity and mortality (M&M) meetings among HCWs at tertiary teaching hospitals in Tanzania?

What are the factors associated with the practice of morbidity and mortality meetings among HCWs at tertiary teaching hospitals in Tanzania?

1.6 Objectives

1.6.1 Broad Objective

To evaluate the practice of morbidity and mortality meetings and associated factors among HCWs at tertiary teaching hospitals in Tanzania.

1.6.2 Specific Objectives

1. To evaluate the practice of morbidity and mortality meetings among HCWs at MNH, MOI and KCMC in Tanzania in relation to the standard guidelines from June to November 2023.
2. To evaluate factors associated with the practice of morbidity and mortality meetings among HCWs at MNH, MOI and KCMC in Tanzania from June to November 2023**.**

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Morbidity and Mortality Meetings

Morbidity and Mortality Meetings are often a forum where APEs are expected to be reported and discussed, empowering teams to recognize mistakes and care gaps and create plans of action to prevent future occurrences. Early in the 20th century, Massachusetts surgeon Ernest Amory Codman introduced and made publicly available data that linked patient demographics, treatment choices, and outcomes(3,6). The need to enhance medical practice through the analysis of experience was evident in Codman's work. The Philadelphia County Medical Society carried on this practice in 1935 by founding the Anesthesia Mortality Committee, the M&M meeting's forerunner at the time(3). Its goal was to promote conversation and information sharing about anesthesia-related fatalities and "other interesting anesthetic situations.

In 1940 the organization's name was changed to the Anesthesia Study Commission, and its scope of evaluation was broadened to include a wider range of subjects in addition to fatalities(3). It was made up of anesthesiologists, surgeons, and internists from various institutions and convened once a month. Such a blame-allocating system was met with intense hostility, despite being the foundation for today’s M&M meetings. The approach has been adopted by other medical specialties, including internal medicine, intensive care, and obstetrics and gynecology. M&M meetings are getting more and more inter- and trans-disciplinary linking doctors from other departments with nurses, students, and other personnel to concentrate on a shared goal of learning from medical blunders and issues.

According to the Institute of Medicine in the United States of America (USA), medical errors cause 44,000–98,800 patient deaths annually, most of which are preventable(1). The Australian Healthcare Study showed adverse patient events (APEs) resulted in 16.6% of hospital admissions, 51% of which were deemed "highly preventable," 4.9% of patients who experienced an adverse event died and 13.7% suffered permanent disability(1,19). Despite the limited information on medical error-related deaths in developing nations, a study found that the rate of such deaths is fairly high(13,31). According to the Ethiopia

study, the prevalence of adverse medical occurrences is comparable between developed and developing nations, ramging between 3.7% and 16.6% in the former and 2.5% and 18.4% in the latter(13).

Healthcare teams must regularly participate in local learning processes like ward rounds and M&M meetings to learn and improve patient safety(4). The USA, Canada, and the UK have a long history of M&M meetings, which are regarded as potent instruments for advancing patient safety globally. In 2010, the M&M meetings were required in France's oncology, surgery, anesthesiology, and intensive care departments(29,32). While it is impossible to modify human nature to err, a 1999 study by the Institute of Medicine demonstrated that errors and mistakes with large and minor repercussions, including death, frequently occur. However, it is feasible to learn from errors and prior mistakes to prevent them from re-occurring(20). The advancement of a “no accuse” condition through M&M meetings where errors are openly acknowledged and discussed is now emphasized.

2.2 Practice of Morbidity and Mortality Meetings

A study conducted in Austria suggested that for M&M meetings to be successful, there should be established guidelines, a trained facilitator, regular conferences held in a highly structured format, participation from various departments, and encouragement of open discourse without assigning blame(20). Per WHO guidelines, successful M&M meetings must select a committee of different experts (clinicians, hospital managers, and hospital representatives), and it needs to have clearly defined leadership, including a chair, presenter of cases and data, and secretary to make sure that there are excellent practice standards available(33). The German guidelines, according to Tuca et al., are quite clear that the conference leader and facilitator should not be the same person to uphold the M&M meetings values of an open environment and no finger-pointing(20). As a result, the facilitator needs to be impartial and trained for the job. It's also crucial to foster an environment that is open and non-hierarchical(20,28–30).

To attain transparency, understanding, and peak performance, studies also suggested that a highly structured approach be used(20,34,35). A well-structured selection procedure of cases is crucial in making sure that no pertinent cases are missing, increasing disclosure, and reliability, and avoiding the misuse of M&M meetings exposing colleagues(28,36,37). Discussion of the incidents in question yields short-term fixes and long-term lessons that

can prevent mistakes from happening again (20). On the contrary, there exists a difference in the structure, content, and purpose of M&M meetings, and in the extent of resident participation and perceived utility between institutes and departments(4). Studies revealed a wide range in the methodology and moderation of M&M meetings, and that modifications to the structure can affect what residents discover and encounter(38).

In a study done in the USA among surgical residents, the pre-intervention assessment revealed there was no standard presentation format among the various conferences. Residents initiated the presentation and members of the audience engaged in dialogue and posed questions, 15-20 minutes were allotted for presentation and discussion, with the entire conference lasting no longer than an hour(38). Also, studies confirmed a different approach exists among departments due to differences in frequency, duration, and number of cases discussed. They showed considerable variations in the case review approaches used in M&M meetings among the 12 different departments in the same institution(36,37). The content, structure, and objectives of M&M meetings differed among departments

During M&M meetings, a non-discriminatory atmosphere must be fostered by the chair to promote open debates without fear of reproach. To ensure a valuable resource for educational training, it is recommended by various guidelines that there be a designated person taking notes and that minutes of the M&M meetings be kept anonymous. This allows those who are absent to later educate themselves(9,20,22). To comprehend the sequence of events leading to mortality, the results of the previous sessions must be reevaluated, clinical summaries of each case presented, and a systematic case study carried out(14).

Studies have demonstrated that routine M&M meetings improve patient outcomes and care quality, indicating that regular meetings may be more significant than more frequent M&M meetings(32,39). The Swiss Patient Safety Foundation also thinks that the minimum period for holding such meetings should be monthly conferences (20,29). Other studies conducted in SSA and other African nations revealed that a standardized and regular practice of M&M meetings in a tertiary care setting in a developing country permitted a considerable improvement in the standard of care and may be a powerful tool for the improvement of surgical care, especially for low- and middle-income nations(6,14). A recent study review done in Kenya, aimed at exploring HCWs' perception of the use of M&M meetings showed

that they are not done often and there was a lack of regular participation of all HCWs such as nurses, absence of observable success, and poor implementation reducing their usefulness(17). The nursing team's limited participation in meetings with other professions and the strained interactions between doctors and nurses were other findings(17). Similar findings were found in other studies conducted in Tanzania and Sudan, where the majority of participants and decision-makers at M&M meetings were doctors(14,17).

2.3 Factors Associated with the Practice of Morbidity and Mortality Meetings

The social and individual level factors for successful M&M meetings remain unclear in our country. Institutional factors, like a structured approach to M&M meetings, use of moderators, participation of all staff, and non-organizational aspects, such as a blame-free environment, knowledge, perception, and attitude are the factors influencing M&M meetings as seen in most studies(6,24,28). A study conducted in the Netherlands to investigate obstacles and enablers of effective M&M meetings showed that individual, social, and staff motivation were believed to be factors in M&M meetings' success rather than organizational factors(30).

Lack of knowledge could be a significant barrier to the effective utilization of analytical methods such as M&M meetings in healthcare settings(29). Research conducted across several African countries, including Malawi, Nigeria, Tanzania, Botswana, and Uganda, consistently reveals a lack of knowledge and understanding among hospital staff regarding the importance and objectives of M&M meetings(14). A qualitative study done in Tanzania on assessing barriers to conducting effective M&M meetings specifically identified inadequate knowledge of M&M meeting objectives among participants, despite recognizing obstetric M&M meetings as potentially beneficial(28). Similarly, a study in Uganda investigating factors influencing the conduct of maternal and perinatal M&M meetings found a strong association between knowledge of M&M meeting objectives and the actual conduct of these meetings ($p < 0.001$)(8).

Most of the respondents agreed or strongly agreed that M&M meetings were valuable, educational, and contributed to improving patient outcomes in a study done in the USA examining trainees’ perspectives and experience with M&M meetings(4). Another study done in the USA that examined faculty and resident opinions regarding the role of M&M

meetings showed significantly more positive attitudes for HCWs toward M&M meetings(5). Results from a study done in Malawi to assess HCWs' perception of M&M meetings showed that positive attitude towards M&M meetings has been an important contributor to the quantifiable improvements in maternal outcomes that were previously reported to have resulted from the implementation of M&M meetings in the district(40). However, a study done in Uganda showed there was no difference in participation and the conduct of M&M meetings between HCWs who reported that the M&M meetings added to their jobs or caused them inconveniences and those who did not(8).

In research conducted in the USA, factors such as exhaustion, fear of unfavorable reporting outcomes (blame), busyness, and a lack of perceived usefulness were seen as impediments(4). A study done in Kenya on the perception of HCWs on M&M meetings discovered shortcomings in the conduct of M&M meetings such as hierarchy and power dynamics, poor implementation of recommendations, and blame environment demotivated HCWs from attendance and participation in the meetings(17). Another study done in Malawi discovered that when an open discussion is promoted and finger-pointing is fenced off, HCWs in Thyolo believed that participation in M&M meetings has the potential to improve care and reduce maternal mortality and morbidity(40). Similarly, results of a Ugandan study showed that HCWs were more likely to attend M&M meetings if they perceived that meetings improved maternal and infant care ($p=0.04$)(8).

A study done in the USA to examine the trainees' perspective and experience with M&M meetings discovered that residents learn about APEs in several non-formal ways like (by word of mouth) from other coworkers, few of them learned about APEs through formal methods, such as M&M meetings, QI meetings, and risk management meetings (4). Informal methods were shown to not permit monitoring or assessment, both of which are necessary to allow transparency and open discussion in M&M meetings(4). Another study done in SSA that was consistent with the other literature showed that M&M meetings can also be affected by organizational and institutional factors where lack of a reporting system and institutional support provided an unfavorable environment for collaborative teamwork(14).

A study in Kenya showed that M&M maternal and perinatal meetings were not done often due to weak structural and organizational capacities like a low number of recorded deaths or an inadequate reporting system, incomplete death certificates, inadequate data use, fear of being held accountable for negative results and a lack of evidence of response to data findings(17). Lack of institutional support, a lack of material resources, inadequate employee commitment, and inadequate knowledge of the objective of M&M meetings were cited as contributing factors to the poor implementation of M&M meetings in Tanzania and Kenya(17,24).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Design

This hospital-based analytical cross−sectional study design used quantitative methods to evaluate the practice of morbidity and mortality meetings and associated factors at tertiary teaching hospitals in Tanzania as done in other studies(8,18,41).

3.2 Study Area

The study sites were the three tertiary teaching hospitals, Kilimanjaro Christian Medical Center Hospital, Muhimbili National Hospital, and Muhimbili Orthopedic Institute. These hospitals were purposefully selected to maximize diversity across the following characteristics: type of ownership (including public MOI and MNH while KCMC is both public and private); tertiary teaching referral hospitals; with surgical specialties, KCMC and MNH with all the major departments and, traumatology and neurosurgery covered by MOI.

Kilimanjaro Christian Medical Center Hospital (KCMC) is one of the recognized referral hospitals in Tanzania, which is located in the northern part of Tanzania's mainland and it serves patients from the Kilimanjaro region (main catchment area), nearby regions including Arusha, Tanga, and Manyara, and other regions of Tanzania. It employs about 1200 people, of whom 135 are medical doctors and specialists, 460 are registered and licensed nurses, and the others are staff members who assist operations.

Muhimbili National Hospital (MNH) is a national referral Hospital, Research Center, and University Teaching Hospital with 3000 employees of which 300 are doctors and specialists, 900 are registered and enrolled nurses and the rest are supporting operations employees. It has 29 departments, 107 units, and 14 operating rooms performing an average of 170 procedures per week.

Muhimbili Orthopedic Institute (MOI) is autonomous with the main objective of providing primary, secondary, and tertiary care of preventive and curative health services in the fields of Orthopedics, Traumatology, and Neurosurgery, as well as being a role model for efficient hospital management in Tanzania. Muhimbili Orthopedic Institute (MOI) is the biggest referral facility for orthopedic and trauma care in Tanzania, with 770 employees of

which 104 are doctors and specialists, 251 nurses are registered and enrolled, and the remaining staff members work in supporting operations.

3.3 Study population

The study population included all the healthcare workers who were available during the study period who provided written informed consent and agreed to participate in the study.

3.4 Sampling Procedure and Technique

A consecutive sampling technique was used selecting every eligible participant who meets the inclusion criteria until the required sample size is achieved. A purposive sampling technique was used to obtain the required number of heads of the departments representing institutional support and crosscheck the observation checklist in the study.

3.5 Sample size estimation

The following formula will be used in determining the sample size:

$$n = \frac{Z^2 P(1-P)}{E^2}$$

Where;

n = Sample size

Z = Standard normal deviation, set at 95% (1.96)

P = proportion of the conferences were conducted every month (79.6%) in a study done in Ethiopia

e = Marginal error, set at 5%

Sample size, n = $\frac{1.96^2 \times 79.6(100-79.6)}{5^2}$ = 249

Adjust 10% for non-response

N = n / (1 - (z/100))

N = 249 / (1 – (10/100)) = 277

All the M&M meetings were conducted at the tertiary teaching hospital and a minimum of 277 healthcare workers were involved in the study. Proportional sampling was then used to ensure representation from different departments and roles, including nurses, medical doctors, and specialists. This method yielded a minimum of 155 HCWs from MNH, 70 from KCMC, and 52 from MOI

3.5.1 Inclusion criteria

Healthcare professionals who consented to participate in the study

3.5.2 Exclusion criteria

Healthcare professionals who were not available during the study period

3.6 Variables

The **dependent variable** was the practice of morbidity and mortality meetings.

Independent variables of interest were:

- Knowledge
- Perception
- Attitude
- Institutional factors

Sociodemographic covariates included age, sex, cadre, level of education, and years of experience.

3.7 Data collection tools and techniques.

Data was collected for five months in different settings using a questionnaire and an observation checklist. The study had two arms, one arm was to assess the awareness, knowledge, perception and attitude of HCW's about the conduct M&M meetings using the standard questionaire, and the other was to observe the actual practice of M&M meetings in the hospitals being studied using an observation checklist. All consented study participants were provided with a standard questionnaire extracted from different studies (Tanzania study 2010, Uganda study 2016, Swiss study 2018, Austria study 2021) that captured demographic characteristics such as age, sex, professional level, years of work experience, and factors influencing M&M meetings like knowledge, attitude, and perceptions of HCWs on the practice of meetings(8,18,20,29).

The standard questionnaires both in paper and online google forms were given to all HCWs in major and surgical departments at MOI, MNH, and KCMC by the principal investigator or a trained research assistant during working hours (daytime). The study participants were required to answer provided questions on the same day, and the investigator or research assistant collected all filled questionnaires and checked for completeness. The questionnaires included multiple choice questions and closed-ended questions to assess awareness and knowledge of M&M meeting practices, attitudes, and perceptions. The

collected questionnaires were marked (knowledge questions) by the principal investigator; each correct response scored 1 point, and the sum of points were computed to get a percentage score. A score of ≥75% was regarded as adequate knowledge and <75% as inadequate knowledge(42). Closed-ended questions with responses on a Likert scale of strongly agree (1), agree (2), disagree (3), and strongly disagree (4), with percentages used to represent the results. The category was classified into a positive attitude and perceived effective if the mean score was 50% and above, negative attitude and perceived not effective if the mean score was less than 50%(43).

All M&M meetings conducted during the study period at the tertiary teaching hospital were observed through an observation checklist extracted from NSW government guidelines, the Operational Guide for Facility-Based Audit and Review of Pediatric Mortality, WHO draft guidelines, and other studies to evaluate the practice of M&M meeting(9,9,23,33). Two research assistants one at KCMC and another at MNH were used for data collection. These assistants were residents who received training on how to observe the practice of M&M meetings using a standardized checklist. This checklist guided the researchers in evaluating the meetings' performance against established standards. The heads of departments were given to crosscheck for the observation checklist addressing institutional factors like the presence of guidelines. One point was given for a correctly done task and zero points for a task that was not done well based on standard practice. The sum of points was converted into a percentage to get the final score for each observed meeting. A score of ≥50% was regarded as adequate practice and a score of <50% was regarded as inadequate practice(43).

3.8 Data Processing and Analysis

The Statistical Package for Social Science (SPSS) version 26 was used for data collection, storage and analysis after the semi-structured questionnaires had been coded. Descriptive analysis was used to summarize study variables. For categorical variables, frequency tables and proportions were used. For continuous variables, measures such as the mean, and standard deviation, were reported. The bivariate analysis identified the social demographic and associated factors of interest using Chi-square tests at p-values of < 0.05 for inclusion into the multivariate analysis. Multivariate analyses using logistic regression models determined the independence of associated factors and potential confounders by regressing

associated factors identified to be significant in the bivariate analyses on the practice of M&M meetings. In this model, adjusted odds ratios (AOR) were presented for items with significant variations (p-value < 0.05) with respective 95% confidence intervals.

3.9 Plan for dissemination of the results

The Muhimbili University of Health and Allied Science (MUHAS) archive would retain a copy of the dissertation for future reference. The study's results would also be shared at MUHAS scientific meetings. A manuscript would be written and submitted to a peer-reviewed journal for publication. In appreciation for their cooperation in this study, a copy would be provided to Muhimbili National Hospital, Muhimbili Orthopedic Institute, and Kilimanjaro Christian Medical Center Hospital.

3.10 Ethical consideration

The MUHAS Senate Research and Publications Committee provided the ethical clearance for the study to be conducted at MNH, MOI, and KCMC. The permission to conduct the study was sought from the MNH, MOI, and KCMC directorates of research services. Participants' involvement in this study was fully voluntary, and it was not anticipated that it would have any unfavorable consequences for them. Each healthcare professional who was interested in taking part in the study was asked to give their informed consent. Each participant's submitted information was well stored, and privacy was upheld by maintaining anonymity.

CHAPTER FOUR

4.0 RESULTS

This chapter explains the results of the in-depth analyses of the collected data. The chapter starts by presenting the results of the research questions. It displays the findings regarding the practice of morbidity and mortality meetings and associated factors among HCWs in KCMC, MNH, and MOI.

4.1 Socio-demographic characteristics of the participants

The study included 300 healthcare workers, of whom 168 (56%) were enrolled at MNH, 70 (23.3%) at KCMC, and 62 (20.7%) at MOI, with a mean age of 33.8 years (SD = 6.0). Among the participants, 168 (56%) were females, 107 (35.7%) were medical doctors, 35 (11.7%) were medical specialists, and 144 (48.0%)% were clinical nurses. Of the 300 participants, 201 (67%) had a degree as their level of education, and most of the participants, 37.7%, had more than six years of experience (Table 1).

Table 1; Socio-demographic characteristics of health care workers at the three Tertiary Teaching Hospitals in Tanzania, *2023 (N=300)*

Variable	Frequency (%)			TOTAL (%)
Hospital	MNH	KCMC	MOI	
	168 (56.0)	70 (23.3)	62 (20.7)	300
Sex				
Male	73 (55.3)	30 (22.7)	29 (22.0)	132 (44.0)
Female	95 (56.5)	40 (23.8)	33 (19.6)	168 (56.0)
Age group (in years)				
Mean (SD)= 33.8 (6)				
20-29	110 (52.1)	63 (29.9)	38 (18.0)	211 (71.3)
30-39	50 (66.7)	5 (6.7)	20 (26.7)	75 (25.3)
40+	7	1	2	10 (3.3)
Cadre				
Nurses	74 (51.4)	29 (20.1)	41 (28.5)	144 (48.0)
Doctors	60 (56.1)	33 (30.8)	14 (13.1)	107 (35.7)
Specialist	24 (68.6)	4 (11.4)	7 (20.0)	35 (11.7)
others	10 (71.4)	4 (28.6)	0	14 (4.7)
Level of education				
Diploma	31 (52.5)	12 (20.3)	16 (27.1)	59 (19.7)
Degree	108 (53.7)	54 (26.9)	39 (19.4)	201 (67.0)
Masters	29 (72.5)	4 (10.0)	7 (17.5)	40 (13.3)
Years of experience (years)				
<1	10 (52.6)	7 (36.8)	2 (10.5)	19 (6.3)
1-3	27 (38.0)	27 (38.0)	17 (23.9)	71 (23.7)
4-6	56 (57.7)	23 (23.7)	18 (18.6)	97 (32.3)
>6	75 (66.4)	13 (11.5)	25 (22.1)	113 (37.7)

4.2 Practice of morbidity and mortality meetings at Tertiary Teaching Hospitals in Tanzania with standard guidelines from June to November 2023

Regular participation and the conduct of M&M meetings were used as a proxy measure of the practice of M&M meetings among HCWs at a tertiary teaching hospital. The practice by conduct of M&M meetings was adequate in only 5 (35.7%) observed meetings (Figure 1) and by regular participation 62 (20.7%) participants as reported in Figure 2. Among the three institutes studied for over five months, 14 M&M meetings were observed, involving 8 meetings in 8 of the enrolled departments from KCMC, 5 meetings in 7 of the enrolled departments from MNH, and 1 meeting from MOI (Table 2). Notably, MOI conducts a single, comprehensive meeting that combines all departments. Nine of the observed meetings were held regularly, either weekly or monthly, with KCMC demonstrating the highest frequency of regular meetings compared to MNH and MOI. The number of attendees ranged predominantly from 21 to 30 in most meetings, and only five of the meetings had multidisciplinary participation.

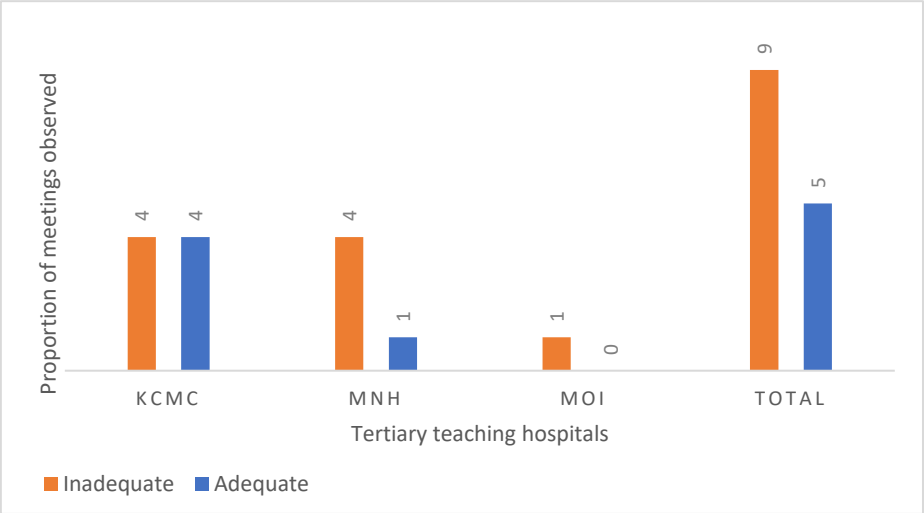


Figure 1; Practice of M&M meetings by conduct at tertiary teaching hospitals in Tanzania

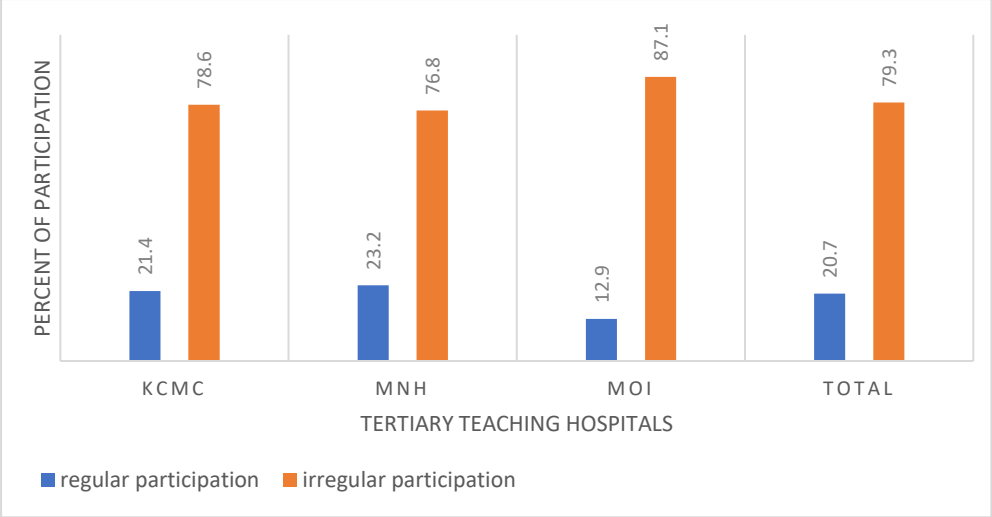


Figure 2; Practice of M&M meetings by regular participation at tertiary teaching hospitals in Tanzania

In four of the M&M meetings, one case was presented, while in the other four meetings, two to three cases were discussed. In the remaining meetings observed, five or more cases were discussed. Most of the M&M meetings were observed to last more than 60 minutes. Open discussion for each case lasting less than 19 minutes was observed in 8 of the meetings, whereas others were observed for longer durations. Concerning role allocation during M&M meetings, the most common model was using “one chairperson who also moderates, and one or more other persons present” which was seen in 9 of the observed meetings, with most of the presenters being residents (Figure 3). Only 2 of the observed meetings reported to have a trained moderator. Among the 14 meetings observed and interviewed, only 2 had the use of guidelines to conduct the meetings, and all of the observed M&M meetings had no incidence reporting system.

Table 2; Practice of morbidity and mortality meetings at Tertiary Teaching Hospitals in Tanzania with standard guidelines from June to November 2023, N=14.

	KCMC n=11 (%)	MNH n=7 (%)	MOI n=1 (%)	Total
Conduct of M&M meetings				
Yes	8 (57.1)	5 (35.7)	1 (7.1)	14 (100.0)
Frequency of M&M meetings				
Regularly (weekly/monthly)	7 (77.8)	2 (22.2)	0 (0.0)	9 (64.3)
Rarely/irregular	1 (20.0)	3 (60.0)	1 (20.0)	5 (35.7)
Multidisciplinary participation				
yes	2 (40.0)	2 (40.0)	1 (20.0)	5 (35.7)
Is the moderator trained?				
yes	1 (12.5)	1 (20.0)	0 (0.0)	2 (14.3)
Use of any guidelines to conduct M&M meetings?				
Yes	1 (12.5)	1 (20.0)	0 (0.0)	2 (14.3)
Presence of an incidence reporting system				
No	11 (100)	7 (100)	1 (100)	19 (100)
Structure				
A chairperson, moderator, and presenter 1 person	1 (100.0)	0 (0.0)	0 (0.0)	1 (7.1)
A chairperson also moderates and 1 other person present	3 (33.3)	5 (55.6)	1 (11.1)	9 (64.3)
A chairperson, moderator, and presenter by 3 different persons	4 (100.0)	0 (0.0)	0 (0.0)	4 (28.6)
Duration				
46-60mins	3 (75.0)	1 (25.0)	0 (0.0)	4 (28.6)
>60mins	5 (50.0)	4 (40.0)	1 (10.0)	10 (71.4)
Time per case				
≤19min	4 (66.7)	1 (16.7)	1 (16.7)	6 (42.9)
20-29min	3 (60.0)	2 (40.0)	0 (0.0)	5 (35.7)
30-44min	1 (50.0)	1 (50.0)	0 (0.0)	2 (14.3)
≥45min	0 (0.0)	1 (100.0)	0 (0.0)	1 (7.1)
Time per case for open discussion				
≤19min	4 (50.0)	3 (37.5)	1 (12.5)	8 (57.1)
20-29min	1 (100.0)	0 (0.0)	0 (0.0)	1 (7.1)
30-44min	3 (75.0)	1 (25.0)	0 (0.0)	4 (28.6)
≥45min	0 (0.0)	1 (100.0)	0 (0.0)	1 (7.1)
Number of cases discussed per M&M meetings				
1 case	2 (50.0)	2 (50.0)	0 (0.0)	4 (28.6)
2-3 cases	1 (25.0)	2 (50.0)	1 (25.0)	4 (28.6)
4-5 cases	2 (100.0)	0 (0.0)	0 (0.0)	2 (14.3)
More than 5 cases	3 (75.0)	1 (25.0)	0 (0.0)	4 (28.6)

MNH= Muhimbili National Hospital, KCMC= Kilimanjaro Christian Medical Center, MOI= Muhimbili Orthopedic Institute

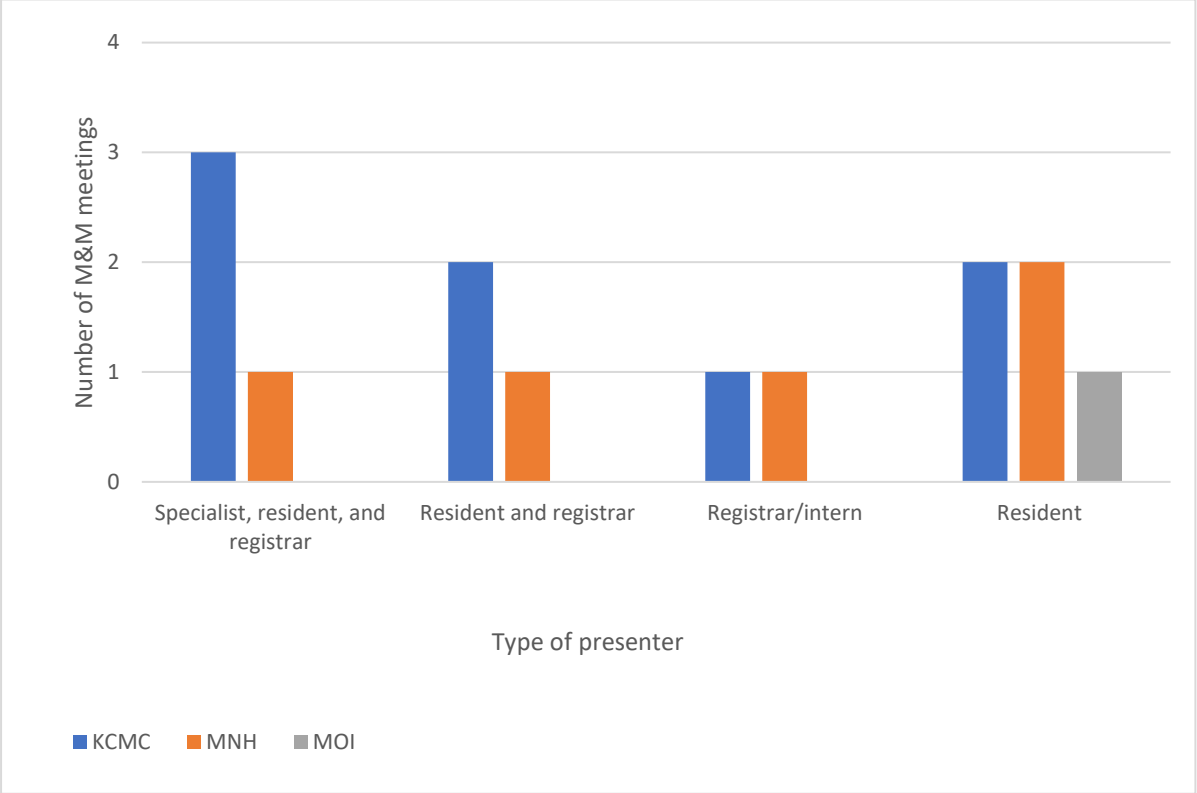


Figure 3; M&M meeting presenter

4.3 Level of Awareness and knowledge among Health workers on the practice of M&M meetings

Most of the participants (96.7%) reported that they had heard about M&M meetings. Only 63 (21.0%) of the 300 participants had adequate knowledge overall. When asked about the main objectives and characteristics of M&M meetings, only 90 (30.0%) were correct on the main objectives and 129 (43.0%) on the characteristics of M&M meetings. Only 139 (46.3%) participants had it correct when asked about the supposed role allocation in an M&M meeting, as summarized in Table 3.

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Table 3; Knowledge and awareness among Healthcare workers on morbidity and mortality meetings at tertiary teaching hospitals in Tanzania 2023 (N=300)

Response category	Frequency	Percentage
Q: How is the supposed role allocation in an M&M meeting handled?		
Correct	139	46.3
Incorrect	161	53.7
Q: What are the objectives of M&M meetings?		
Correct	90	30.0
Incorrect	210	70.0
What are the characteristics of M&M meetings?		
Correct	129	43.0
Incorrect	171	57.0
Overall awareness of HCWs on M&M meetings		
Yes	290	96.7
No	10	3.3
Overall knowledge for HCWs on M&M meetings		
Adequate	63	21.0
Inadequate	237	79.0

KEY: M&M (morbidity and mortality) meetings, HCWs (Healthcare workers)

4.4 The attitude of Healthcare workers toward the practice of M&M meetings

Overall, 269 (92.8%) of participants had a positive attitude towards the practice of M&M meetings (Figure 4). Participants were asked 4 questions to assess their attitude towards the practice of morbidity and mortality meetings. A great proportion of participants 276 (92%) agreed when asked, “Are you interested in attending or implementing M&M meetings in the near future?”. The majority, 274 (91.3%), agreed that M&M meetings are important to their careers, and 272 (90.7%) participants agreed that M&M meetings are valuable and educational. Nevertheless, only (46%) agreed to have adequate training and opportunities in M&M meetings. The results are displayed (figure 5).

4.5 Healthcare workers' perception towards the practice of M&M meetings

Overall, 234 (80.7%) of the participants perceived the practice of M&M meetings as effective (Figure 4). The majority of the participants, 271 (90.3%) perceived that M&M meetings are effective for improving patient safety and standard of care. About 9 out of ten (89.7%) HCWs agreed that M&M meetings enhance departmental functioning and teamwork. On the success of the meetings in reaching their objectives, 181 (60.3%) of respondents agreed and 119 (39.7%) disagreed. Interestingly, 259 (86.3%) of participants said that M&M meetings were important for their training, and majority 173 (57.7%) expressed that conducting these meetings does not add to their workload.

Of the 300 participants, 240 (80.0%) agreed there is a follow-up on the recommendations for improvements highlighted from M&M meetings, and only 121 (40.3%) agreed that M&M meetings are conducted with an open discussion without blaming. Lastly, participant satisfaction with the current state of M&M meetings appears evenly split, with 149 (49.7%) agreeing and 151 (50.3%) expressing disagreement. The results are displayed (figure 5).

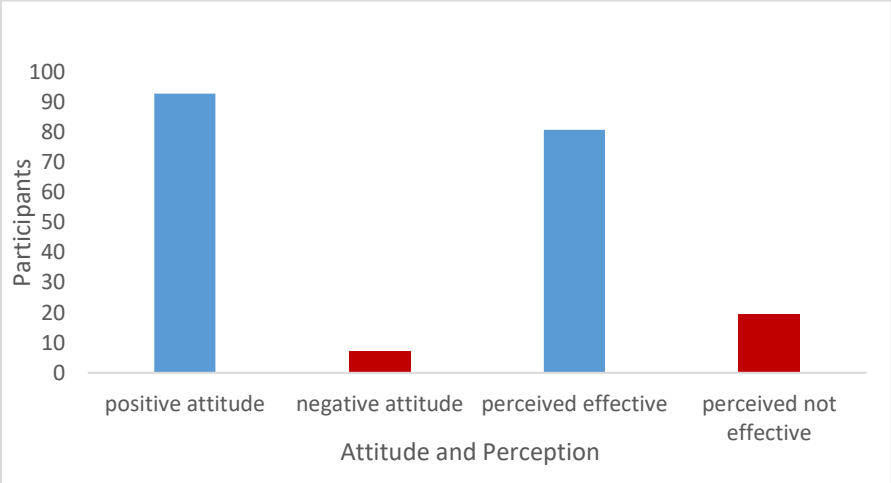


Figure 4; Overall attitude and perception among healthcare workers on morbidity and mortality meetings at tertiary teaching hospitals in Tanzania, 2023.

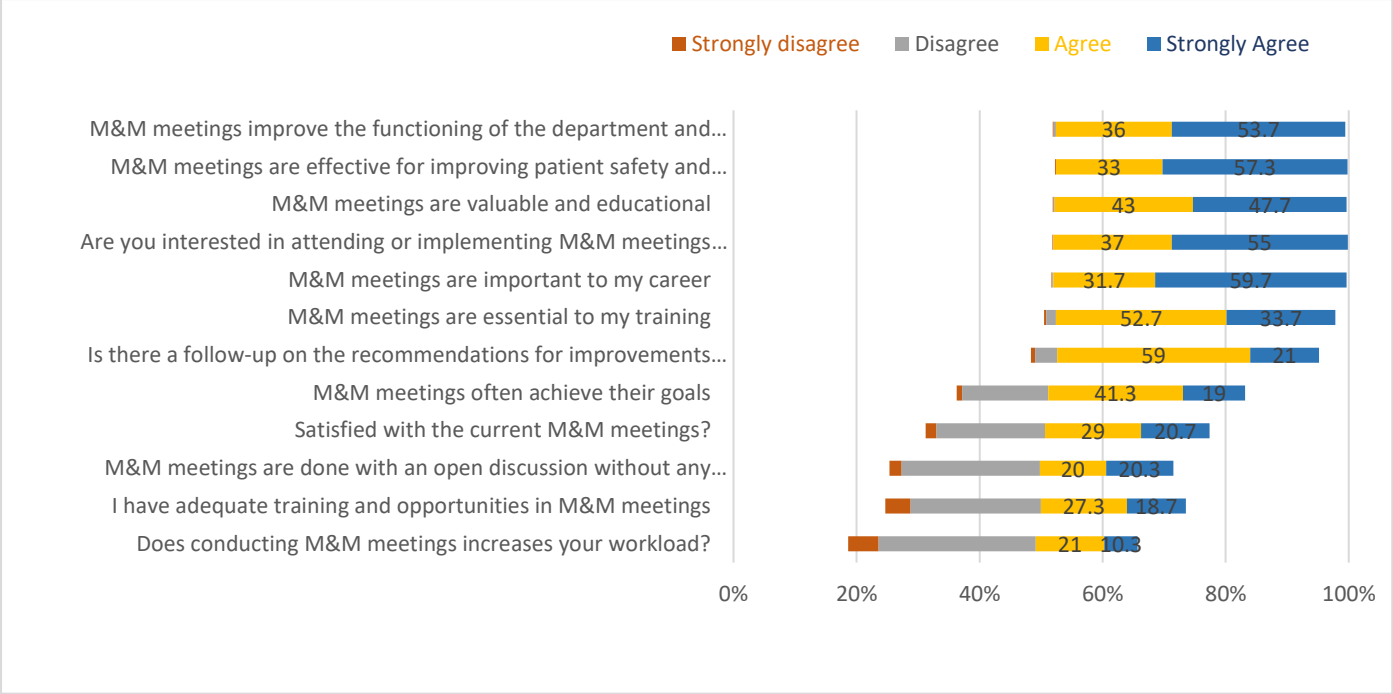


Figure 5; Health care worker's attitude and perception of morbidity and mortality meetings at tertiary teaching hospitals in Tanzania, 2023 (N=300).

4.6 Bivariate analysis of factors associated with regular participation of healthcare workers in morbidity and mortality meetings:

Regular participation in M&M meetings was used as a proxy measure of the practice of M&M meetings among HCWs at a tertiary teaching hospital. Table 4 summarizes the results of bivariate and multivariate analysis of factors associated with the practice of M&M meetings among HCWs at tertiary teaching hospitals in Tanzania.

In bivariate analyses, sex, age, cadre, years of experience, knowledge, and perception were significantly associated with the participation of HCWs in M&M meetings. Healthcare workers at KCMC and MNH had no significant difference in the proportion of regular participation compared to participants from MOI (UOR 1.84; 95% CI; 0.72-4.70) and (UOR 2.04; 95% CI: 0.89-4.65) respectively. Male participants had a significantly higher proportion of regular participation compared to female participants (UOR 4.17; 95% CI;2.27-7.66).

Additionally, participants aged 40+ had a significantly higher proportion of regular participation compared to participants aged less (UOR 4.64; 95% CI: 2.00-10.76). Doctors and specialists had a significantly higher proportion of regular participation compared to nurses (UOR 2.66; 95% CI: 1.33-5.32, p = 0.01), and (UOR 12.9; 95% CI: 5.45-30.55)

respectively. Participants with greater than 6 years of experience had a significantly higher proportion of regular participation compared to participants with less than a year of experience (UOR 9.86; 95% CI;1.27-76.63).

There was a significant difference in the proportion of regular participation among HCWs with adequate knowledge of M&M meetings compared to participants with inadequate knowledge (UOR 164.25; 95% CI;60.55-445.52). Furthermore, participants with positive perceptions had a higher likelihood of regular participation compared to those with negative perceptions (UOR 6.78; 95% CI;2.05-22.41).

4.7 Multivariate analysis of factors associated with regular participation among the study participants:

The observed factors; sex, age, cadre, years of experience, knowledge, and perception were significantly associated with regular participation in bivariate analysis at $p<0.05$. In the adjusted analysis, only adequate knowledge was independently associated with regular participation (AOR 265.58; 95% CI; 59.71-1181.13).

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Table 4; Bivariate and multivariate analysis of sociodemographics and factors associated with the regular participation in morbidity and mortality meetings at tertiary teaching hospitals in Tanzania, 2023

	Regular participation N=62(%)	UOR (95% CI)	P-value	AOR (95% CI)	P-value
Site					
KCMC	15 (21.4)	1.84 (0.72-4.70)	0.20		
MNH	39 (23.2)	2.04 (0.89-4.65)	0.09		
MOI	8 (12.9)				
Sex					
Male	44 (33)	4.17 (2.27-7.66)	0.00	3.20 (1.02-10.04)	0.05
Female	18 (10.7)				
Age					
20-29	12 (14.8)				
30-39	29 (16.9)	1.17 (0.56-2.42)	0.68	0.26 (0.02-4.17)	0.34
40+	21 (44.7)	4.64 (2.00-10.76)	0.00	1.40 (0.06-32.66)	0.83
Cadre					
Nurse	15 (10.4)				
Doctors	26 (23.6)	2.66 (1.33-5.32)	0.01	0.53 (0.14-2.02)	0.35
Specialist	21 (60)	12.9 (5.45-30.55)	0.00	0.86 (0.11-6.54)	0.88
Level of education					
Diploma	5 (8.5)				
Degree	33 (16.4)	2.12 (0.79-5.70)	0.14		
Masters	24 (60)	16.2 (5.32-49.32)	0.00		
Years of experience					
<1	1 (5.3)				
1-3 years	8 (11.3)	2.29 (0.27-19.50)	0.45	0.21 (0.002-16.86)	0.49
4-6	13 (13.4)	2.79 (0.34-22.67)	0.34	2.44 (0.02-272.03)	0.71
>6	40 (35.4)	9.86 (1.27-76.63)	0.03	1.89 (0.02-243.53)	0.80
Knowledge					
Adequate	54 (85.7)	164.25 (60.55-445.52)	0.00	265.58 (59.71-1181.13)	0.00
Inadequate	8 (3.5)				
Awareness					
Yes	62 (21.4)				
No	0				
Perception					
Effective	59 (25)	6.78 (2.05-22.41)	0.00	2.39 (0.28-20.36)	0.43
Not effective	3 (4.7)				

CHAPTER FIVE

5.0 DISCUSSION

Morbidity and mortality (M&M) meetings serve as vital platforms for healthcare professionals to review clinical cases, identify areas for improvement, and enhance patient care outcomes(44). Our study aimed to evaluate the practice of M&M meetings and associated factors at tertiary teaching hospitals in Tanzania.

5.1 The practice of morbidity and mortality meetings

Adherence to standard guidelines in the conduct of M&M meetings is crucial for ensuring their effectiveness. When conducted properly, these meetings can decrease mortality and promote patient safety(8,45). However, our findings revealed inadequate practice among participating hospitals and a concerning gap in adherence to guidelines. The practice by conduct of M&M meetings was adequate in only 5 (35.7%) observed meetings and by regular participation 62 (20.7%) participants. Poor participation may be attributed to poor feedback on past M&M meetings, poor communication among staff and heads of department and fear of blame and embarrassment. Similarly, a study done in Uganda on assessing the factors influencing the conduct of M&M meetings revealed that only 34.8 % (23/66) reported to have ever participated in an M&M meeting(8). The majority of respondents voiced the loss of motivation to conduct M&M meetings when recommendations are not being implemented.

Among the 14 meetings observed and interviewed, only 2 had the use of guidelines to conduct the meetings. Other studies have also highlighted limitations in the practice of M&M meetings, noting that they were often conducted without following established guidelines (14,17,29). Additionally, a study conducted in Tanzania found that, although maternal and perinatal M&M meetings were a standard healthcare policy, their scope was limited, and when they were held, they were not standardized(18). This highlights the need to enhance the quality of M&M meetings to improve care processes, as demonstrated in a study done in the USA(39).

This study found that the frequency of M&M meetings at tertiary teaching hospitals was low, with some institutions holding the meetings regularly while others did not. The poor conduct of these meetings could be attributed to a lack of institutional support and poor

communication between department heads and staff, leading to frequent postponements. Studies have shown that regular meetings may be more beneficial than simply having a higher frequency of M&M meetings, as regularity allows for the timely review of clinical cases and the implementation of corrective actions(29). A study conducted in Sub-Saharan Africa and other African nations revealed that a standardized and regular practice of M&M meetings in a tertiary care setting in a developing country significantly improved the standard of care(6,14). This suggests that M&M meetings can be a powerful tool for enhancing surgical care, particularly in low- and middle-income nations.

The observed predominant model of role allocation was having one chairperson who also moderates, with one or more other persons present was seen in 9 of the observed meetings. This model may impact on the diversity of perspectives and expertise brought to discussions and was seen as insufficient in some studies. Guidelines and various studies recommend that different individuals should be responsible for coordination, moderation, and presentation(20,21,23,32). Additionally, only 2 of the observed meetings reported having a trained moderator. German and Swiss guidelines highlight that trained facilitators are the gold standard for M&M meetings and essential for creating an open, non-hierarchical atmosphere(20).

Regular and multidisciplinary participation of healthcare workers in M&M meetings is essential for fostering a culture of continuous learning and quality improvement. This involves not only attendance but also active participation in open discussions that aim to identify and analyze potentially modifiable factors linked to observed morbidity and mortality(17,41). Our study found low rates of regular participation (20.7%) across different hospitals, with factors such as study site, sex, age, cadre, years of experience, knowledge, and perception influencing regular participation.

We observed limited multidisciplinary participation in only 5 of the meetings, where doctors and specialists had a significantly higher proportion of regular participation compared to nurses (UOR 2.66; 95% CI: 1.33-5.32, p = 0.01), and (UOR 12.9; 95% CI: 5.45-30.55) respectively. Similar to findings from other studies conducted in Tanzania, Ethiopia, and Kenya, there was a lack of regular participation by nurses, where the majority of participants and decision-makers at M&M meetings were doctors(17,28,41). Since

nurses provide a significant portion of healthcare at these hospitals, increasing their involvement in M&M meetings is crucial for enhancing the quality of care(17,40).

5.2 Factors associated with the practice of morbidity and mortality meetings

5.2.1 Knowledge and awareness among healthcare workers on morbidity and mortality meetings

Despite the high awareness of M&M meetings, only a small proportion (21%) of healthcare workers demonstrated adequate knowledge of M&M meeting's objectives, characteristics, and role allocation. Notably, healthcare workers with adequate knowledge of M&M meetings were significantly more likely to participate regularly, underscoring the importance of education and training initiatives in promoting engagement. Similar studies showed that a lack of knowledge could be a reason for underutilizing such analytical techniques in reducing morbidity and mortality and enhancing patient care (8,29,40,46).

This lack of understanding may impede the quality and outcomes of M&M meetings, highlighting the need for targeted educational interventions among all HCWs and standardized protocols(8,46). The absence of knowledge and training regarding M&M meeting techniques was identified as an impediment to successful M&M meetings, emphasizing the need for regular training of HCWs on M&M meeting methodology as seen in different studies(28,46).

5.2.2 Attitude among healthcare workers on morbidity and mortality meetings

Healthcare workers had an extraordinarily positive attitude about morbidity and mortality (M&M) meetings; 92.8% of them expressed positively, indicating that they recognize the value and relevance of these sessions. The high levels of agreement on the importance of M&M meetings for career development, interest in attending or implementing them, and their educational value highlight their vital role in professional growth and knowledge acquisition in the healthcare sector.

Our study revealed that having a positive attitude wasn’t significantly associated with the practice of M&M meetings, unlike other studies which showed that a favorable attitude toward M&M meetings is crucial for their implementation(29,40). Additionally, a significant proportion of participants (54.0%) highlighted a need for more training and opportunities concerning M&M meetings, presenting a notable challenge. To fully realize

the advantages of M&M meetings and ensure they accomplish their intended goals of promoting learning and quality improvement in healthcare settings, this gap must be closed.

5.2.3 Perception among healthcare workers on morbidity and mortality meetings

The perception of M&M meetings among healthcare workers appears largely positive, with 80.7% of participants perceiving them as effective, statistically significant in association with regular participation. Similar studies showed that HCWs perceived the effectiveness of M&M meetings(29,40). This perception is reinforced by the overwhelming agreement on the effectiveness of M&M meetings in increasing patient safety, boosting departmental functioning, and promoting teamwork.

Furthermore, (59.7%) of participants perceived a lack of open discussion and the presence of a blaming-environment raising important considerations. These findings could lead to the demotivation of HCWs from attendance and regular participation in the meetings. A study with similar findings done in Kenya revealed that efforts were observed to encourage and establish a blame-free environment during the M&M meetings; however, individuals faced reprimands before or after the meetings, which hindered HCWs' capacity to admit faults, take responsibility for them, and learn from errors(17). Several studies have shown that when open dialogue is promoted and finger-pointing is avoided, healthcare workers (HCWs) are more encouraged to participate regularly. This environment allows them to systematically assess challenges, advocate for potential improvements, and provide clear educational messages during M&M meetings(5,40).

Although a significant majority (80.0%) agreed on the importance of following up on recommendations for improvement, participants are evenly divided (49.7%) in their opinions regarding the current status of M&M meetings. This highlights the need for further research into the factors influencing satisfaction and potential areas for improvement. Overall, these findings highlight both the perceived benefits and areas for improvement in the implementation and conduct of M&M meetings within healthcare settings.

5.2.4 Institutional factors

Furthermore, the study revealed the absence of reporting systems for adverse patient events (APEs) in all of the institutions, which hinders the surveillance mechanisms crucial for evaluating outcomes, as observed in another study(4). According to the WHO, the primary purpose of patient safety reporting systems is to learn from experience(33). Within the institutions, reporting medical errors should lead to an in-depth assessment and open discussion to identify system and human failures, and efforts should be made to avoid recurrence. A study conducted in the Netherlands examining barriers and facilitators to successful M&M meetings showed that reporting systems were appreciated for their value, but a lack of response was considered a barrier to encouraging reporting behavior(30). It is important to note that reporting alone does not improve safety; it is the response to reports that leads to change.

5.3 Study limitations and mitigation

This study took place in three tertiary teaching hospitals MNH, MOI, and KCMC, and the results obtained cannot be used to generalize other teaching tertiary hospitals. Because of the heterogeneity of M&M meeting models and the reported implementation, comparisons across the institutions should be made cautiously. For example, MOI conducted only one meeting that combined all departments during the study period, compared to KCMC and MNH where every department conducted its meetings. Also, lack of a strong representation from one meeting conducted in MOI due to reports of previous meetings having been held routinely prior to the study period.

It was difficult to estimate an accurate response rate to our online surveys, as this often included inactive accounts and some lack of response. This limitation was mitigated by the in-person surveys, where the research assistant physically ensured a high response rate in the majority of the participants. Although we were unable to recruit HCWs from all departments within the institution during our study period, we believe we have recruited a representative sample of the institution, including a variety of medical and surgical specialties.

In addition, information bias by HCWs interviews was likely because they would want to prove that the M&M meetings are well conducted. However, they were able to share their perception like the meetings were not done in an open discussion and often involve blaming. While we are unable to directly link the practice of M&M meetings to measurable clinical outcomes, the significant increase in documented recommendations and guideline changes serve as a strong proxy for potential improvement in patient safety.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The study revealed a significant gap in adherence to guidelines and inadequate practice of M&M meetings, with HCWs who have adequate knowledge about these meetings being more likely to participate regularly. Our study highlights the need for targeted interventions by training HCWs regularly to improve the quality of the practice of M&M meetings at tertiary teaching hospitals in Tanzania. Aligning local practices with international guidelines from the World Health Organization (WHO), and national or evidence-based guidelines can help standardize M&M processes, promote consistency in quality improvement efforts, and ultimately contribute to enhanced patient safety and outcomes within Tanzanian healthcare settings.

6.2 Recommendations

The health facilities should ensure that M&M meetings are conducted regularly and implement the recommendations to prevent further morbidity and mortality. The institutions should encourage multidisciplinary participation during the meetings. If multidisciplinary participation is not possible, the meeting should include the clinical team and other HCWs who provided medical services to the patient and also people who were not involved in the care of the patient to guarantee an unbiased opinion. Since nurses provide a considerable part of healthcare at the hospitals, getting more of them involved in M&M meetings is essential to boosting improvements in patient safety. Since the study found that adequate knowledge was significantly associated with higher participation in M&M meetings, hospitals can enhance training programs for healthcare workers (HCWs) on the purpose, process, and importance of M&M meetings. This will improve HCWs' understanding of how M&M meetings can be used to enhance patient safety and reduce adverse events, leading to higher participation and better outcomes.

Similarly, there is a need to create a blame-free environment where HCWs can openly report errors and gaps in care without the fear of being blamed. By enhancing adherence to guidelines, promoting regular participation, and addressing systemic barriers, healthcare institutions can optimize the effectiveness of M&M meetings and ultimately improve patient outcomes. Future work will need to focus on validating surrogate measures of M&M meetings in relation to clinical outcomes. Furthermore, we aim to evaluate the educational benefit of our M&M meetings to residents through a self-reported form assessing satisfaction and perceived knowledge obtained.

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APPENDICES

Appendix I: A Questionnaire

ON AWARENESS, KNOWLEDGE, ATTITUDE, AND PERCEPTION OF MORBIDITY AND MORTALITY(M&M) MEETINGS

CIRCLE YOUR ANSWER AND FILL ON THE SPACES PROVIDED

Name of health facility …….. Q no……

Date of interview…….

PART 1

SN	QUESTIONS	ANSWERS
	DEMOGRAPHICS	
1	Sex	1. Male 2. Female
2	Age	Date of birth (YEAR) …… Age in complete years …….
3	What is your cadre?	1. Midwife 2. Assistant nursing officer/enrolled nurses 3. Nursing officer 4. Assistant clinical officer 5. Clinical officer (CO) 6. Assistant medical officer (AMO) 7. Medical Doctor (MD) 8. Medical specialist 9. Consultant 10. Professor 11. Others……..
4	Level of education?	1. Certificate 2. Diploma 3. Advanced Diploma 4. Degree 5. Masters 6. PhD
5	Department?	1. Surgery 2. Anaesthesiology and critical care 3. Internal medicine 4. Peadiatrics 5. Obstetrics/gynaecology

		6. Orthopedic and trauma 7. Others ……
6	Years in the department?	1. <1year 2. 1-3 years 3. 4-6 years 4. >6 years
7	years of experience?	1. <1year 2. 1-3 years 3. 4-6 years 4. >6 years
KNOWLEDGE		
8	Are you aware of Morbidity and Mortality meetings?	1. Yes 2. No
9	How many times have you attended Morbidity and Mortality (M&M) meetings for the past 2 years	1. Once 2. More than once 3. Regularly 4. never
10	In your experience, how is the supposed role allocation in an M&M meeting handled?	1. A chairperson, moderator, and presenter 1 person 2. A chairperson also moderates and 1 other person present 3. A chairperson and another person are present, and no moderator 4. A chairperson, moderator, and presenter by 3 different persons
11	Remember at least one action implemented in the hospital because of the M&M meeting recommendations?	1. Yes 2. No
12	Are you aware of the main objectives of Morbidity and Mortality meetings?	1. Yes 2. No
13	What are the objectives of M&MCs? **(circle T for TRUE or F for FALSE**)	1. Increasing knowledge to specialists and residents only T/F 2. Learning about rare diseases T/F 3. Preventing the recurrence of errors by allocating blame T/F 4. Improving collaboration and teamwork T/F 5. Identifying problems in the process and punishing those at fault T/F

14	What are the characteristics of M&MCs? **(circle T for TRUE or F for FALSE**	1. Should be multidisciplinary participation T/F 2. Should not always have a guideline T/F 3. Should always have a structured format T/F 4. Anyone can be a chairperson; they do not necessarily have to be trained T/F. 5. Should be more frequent than regular T/F			
ATTITUDE					
SN	**Question**	**Strongly agree**	**Agree**	**Disagree**	**Strongly disagree**
15	M&M meetings are important to my carrier				
16	Are you interested in attending or implementing M&M meetings in the near future?				
17	I have adequate training and opportunities in M&M meetings.				
18	M&M meetings are valuable and educational.				
PERCEPTION					
19	M&M meetings are effective for improving patient safety and standard of care				
20	M&M meetings improve the functioning of the department and teamwork				
21	M&M meetings often achieve their goals				
22	M&M meetings are essential to my training				
23	Does conducting M&M meetings increase your workload?				
24	Is there a follow-up on the recommendations for improvements highlighted from M&M meetings				
25	M&M meetings are done with an open discussion without any blaming				
26	Satisfied with the current M&M meetings				
INSTITUTIONAL FACTORS					
27	What is the type of improvement measures taken after M&M meetings?	a) Systemic involving the whole hospital/countrywide			

		b) Local involving department changes only c) Individuals involving changes in HCW behaviors d) None
28	Is there an incidence reporting system for adverse patient events?	1. Yes 2. No
29	If NO (question 28 above) Where have you heard about adverse events of a patient?	1) Word by mouth 2) Through phone 3) Through morning meetings 4) Through QI or risk management meetings 5) Others……..
30	Presence of a member representing the institutional governance? Director or any other representative.	1. Yes 2. No
31	Presence of a member representing the quality assurance team?	1. Yes 2. No
32	Is there any special invitation for affiliated physicians and specialists from outside the hospital	1. Yes 2. No
33	Use of any guidelines to conduct M&M meetings? Name it if YES…….	1. Yes 2. No

APPENDIX II: OBSERVATION CHECKLIST ON PRACTICE OF M&M MEETINGS

Name of health facility ……..
Department…….……
Conduct M&M meetings……

Date of conduct…….
Venue …….

No	list	YES	NO
1	Multidisciplinary participation (nurses and/or midwifery staff, attendants, specialists, residents, doctors, and other relevant employees, such as pharmacists and allied health professionals		
2	Presence of a chairperson		
3	Is the moderator trained?		
4	Summary of the last meeting discussed		
5	Presence of a structured format to conduct M&M meetings		
6	Use of any guidelines to conduct M&M meetings?		
7	Incidence reporting system		
8	Frequency of M&M meetings (tick one)		
	Weekly		
	Monthly		
	Quarterly/ Rarely		
	Irregular		
9	STRUCTURE (tick one)		
	A chairperson, moderator, and presenter 1 person		
	A chairperson also moderates and 1 other person present		
	A chairperson and another person are present, and no moderator		
	A chairperson, moderator, and presenter by 3 different persons		
10	Presenter? (Fill the boxes)		
	1. Specialist/Consultant		
	2. Resident		
	3. Registrar/intern		
	4. Specialist and resident		
	5. Resident and registrar		
	6. Specialist, resident and registrar		
11	Duration		
	1. < = 30 min		
	2. 31–45 min		
	3. 46–60 min		

	4. >60 min		
12	Time per case (choose one)		
	a) ≤19min		
	b) 20-29min		
	c) 30-44min		
	d) ≥45min		
13	Time per case for open discussion(choose one)		
	a) ≤19min		
	b) 20-29min		
	c) 30-44min		
	d) ≥45min		
14	Number of cases discussed per M&M meetings (choose one)		
	a) 1 case		
	b) 2-3 cases		
	c) 4-5 cases		
	d) More than 5 cases		
15	Number of attendees (choose one)		
	1. 3-10		
	2. 11-20		
	3. 21-30		
	4. >30		
16	The case discussion focus on(choose one)		
	a) Medical management		
	b) System issues		
	c) Both		
	d) No response		
17	Minutes meeting recorded		
18	Identified person or council for follow up		

APPENDIX III: CONSENT FORM (ENGLISH VERSION)

ID NO……...

AUTHORIZATION TO PARTICIPATE IN THE RESEARCH

Study title: **EVALUATION OF PRACTICE OF MORBIDITY AND MORTALITY MEETINGS AND ASSOCIATED FACTORS AT TERTIARY TEACHING HOSPITALS IN TANZANIA**

My name is Dr. Maynard S. Mekere, and I am a second-year anesthesia resident at MUHAS. I will perform a study as the primary investigator for this project to evaluate the practice of morbidity and mortality meetings and associated factors influencing the practice, among healthcare workers at teaching tertiary hospitals in Tanzania.

What is involved in this study?

If you agree to take part in this research, you will be asked to complete a questionnaire.

What are the dangers of participating in this research?

There are no dangers associated with participating in this study, however, it may require spending more time completing questions.

Benefits

You will help improve the practice of Morbidity and Mortality(M&M) meetings at your institute and enhance the quality of patient care by learning from obvious medical errors.

Quitting the study

You are always free to decide not to participate in this study for any reason.

New details

You will be informed as soon as new details about this study are made available.

Confidentiality

The researcher will be the only person with access to any private information gathered throughout the research. To protect confidentiality, participants will be recognized by a special study identification number.

Concerning the expenses of the study

There won't be any extra costs for taking part in this study.

Will you be paid to take part in this study?

You won't be compensated for taking part in this study.

How can someone be contacted regarding this study?

If you need to report an issue linked to the study or if you have any questions about it, you can call Dr. Maynard S Mekere (0758372009), the Principal Investigator for this study. You can speak with the Muhimbili University of Health and Allied Sciences' Director of Publication and Research if you have inquiries concerning your rights as a participant. Research and Publication Committee, P.O. Box 65001, Dar es Salaam, Telephone number 222152489

CONSENT

I reviewed the research information you provided above, and I was allowed to ask questions. I have been provided a copy of this permission form that has been signed and I hereby consent to participate in this study.

SIGNATURE

Health Care Workers initials…….... Signature……. Date ……

Researcher's name …… Signature……Date……

Appendix Iv: Ethical Clearance Letter

UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

OFFICE OF THE DIRECTOR – RESEARCH, PUBLICATIONS AND INNOVATION

Ref. No.DA.282/298/01.C/1710 Date: 09/06/2023

MUHAS-REC-06-2023-1710
MAYNARD SAMUEL MEKERE,
School of Medicine,
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: EVALUATION OF PRACTICE OF MORBIDITY AND MORTALITY MEETINGS AND ASSOCIATED FACTORS AT TERTIARY TEACHING HOSPITALS IN TANZANIA.

Reference is made to the above heading,

I am pleased to inform you that the Chairman has on behalf of the University Senate, approved ethical clearance of the above-mentioned study, on recommendations of the Senate Research and Publications Committee meeting accordance with MUHAS research policy and Tanzania regulations governing human and animal subjects research.

APPROVAL DATE: 02/06/2023
EXPIRATION DATE OF APPROVAL: 02/06/2024

STUDY DESCRIPTION:
Purpose:
The purpose of this analytical cross-sectional study is to evaluate the practice of morbidity and mortality meetings and associated factors at teaching tertiary hospitals in Tanzania.

The approved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided:
https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%2014532.pdf and in the MUHAS archives.

The PI is required to:

1. Submit bi-annual progress reports and final report upon completion of the study.
2. Report to the IRB any unanticipated problem involving risks to subjects or others including adverse events where applicable.
3. Apply for renewal of approval of ethical clearance one (1) month prior its expiration if the study is not completed at the end of this ethical approval. You may not continue with any research activity beyond the expiration date without the approval of the IRB. Failure to receive approval for continuation before the expiration date will result in automatic termination of the approval for this study on the expiration date.
4. Obtain IRB amendment (s) approval for any changes to any aspect of this study before they can be implemented.
5. Data security is ultimately the responsibility of the investigator.
6. Apply for and obtain data transfer agreement (DTA) from NIMR if data will be transferred to a foreign country.
7. Apply for and obtain data transfer agreement (DTA) from NIMR if data will be transferred to a foreign country.
8. Apply for and obtain material transfer agreement (MTA) from NIMR, if research materials (samples) will be shipped to a foreign country,
9. Any researcher, who contravenes or fail to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine as per NIMR Act No. 23 of 1979, PART III section 10 (2)
10. The PI is required to ensure that the findings of the study are disseminated to relevant stake holders.
11. PI is required to be versed with necessary laws and regulatory policies that govern research in Tanzania. Some guidance is available on our website https://drp.muhas.ac.tz/.

8th June 2023

Dr. Kasusu Nyamuryekung'e.
Chairman, MUHAS Research and Ethics Committee



Appendix V: Permission Letter At Kcmc Hospital

UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – POSTGRADUATE STUDIES

In reply quote;
Ref. No. HD/MUH/T.05/2021

09th June, 2023

The Executive Director,
Kilimanjaro Christian Medical Centre,
P. o. Box 3010
KILIMANJARO.

Re: INTRODUCTION LETTER

The bearer of this letter is Maynard Samuel Mekere (HD/MUH/T.05/2021), a student at Muhimbili University of Health and Allied Sciences (MUHAS) pursuing MMed. Anaethesiology.

As part of his studies he intends to do a study titled: **"Evaluation of Practice of Morbidity and Mortality Meeting and Associated Factors at Tertirary Teaching Hospitals in Tanzania."**

The research has been approved by the Chairman of University Senate.

Kindly provide him the necessary assistance to facilitate the conduct of his research.

We thank you for your cooperation.

Ms. Victoria Mwanilwa
For: DIRECTOR, POSTGRADUATE STUDIES

c.c. Maynard Samuel Mekere

9 United Nations Road; Upanga West; P.O. Box 65001, Dar Es Salaam: Tel. G/Line: +255-22-2150302/6; Ext. 1015; Direct Line:+255-22-2151378;Telefax:+255-22-2150465;E-mail:dpgs@muhas.ac.tz;Web:https://www.muhas.ac.tz

Appendix VI: Permission letter at moi hospital

UNITED REPUBLIC OF TANZANIA
MINISTRY OF HEALTH

MUHIMBILI ORTHOPAEDIC INSTITUTE (MOI)

Ref.PA. 382/401/01/56 **15th June 2023**

Muhimbili University of Health and Allied Sciences

Dar -es Salaam

Tanzania.

RE: APPROVAL FOR CONDUCTING RESEARCH STUDY

Reference is made to your letter with reference number HD/MUH/T.05/2021 dated on the 01st June, 2023 for conducting research study about. ***"Evaluation of Morbidity and Mortality Meeting Practice and association Factors at Tertiary Teaching Hospitals in Tanzania "***

On behalf of the Management I would like to officially inform you that, your permission has been granted for your student **Maynard Samuel Mekere** to conduct study at Muhimbili Orthopaedic Institute (MOI).

It's my hope that your stay at MOI will be fruitful. For any clarification contact CRTM +255713764522.

Dr. Joel J Bwemelo, CRTM

For: MOI Executive Director

Cc: Director of Post Graduate studies

Cc: Supervisor

Muhimbili Orthopaedic Institute (MOI), Upanga West Plot No. 1048/2, Kalenga Street, P. O. Box 65474 - Dar es Salaam; Telephone Number +255 -022-2151298/2152937/2152938 Fax: +255 -022-2151744
Website: www.moi.ac.tz, info@moi.ac.tz.

Appendix VI: Permission Letter at MNH Hospital

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH

MUHIMBILI NATIONAL HOSPITAL

In reply please quote;

Ref. No.: MNH/CRTCU/Perm/2023/422 **Date: 26th June 2023**

Head of Department,-
- Internal Medicine
- Paediatrics and Child Health,
- Obstetrics and Gynaecology
- Anaesthesia
- Surgery
- ENT
- Urology
- Psychiatry and Mental Healht

Muhimbili National Hospital

RE: PERMISSION TO COLLECT DATA AT MNH.

Name of Student	**Maynard Samuel Mekere**
Title	**"Evaluation of Morbidity and Mortality Meeting Practice and Associated Factors at Tertiary |Teaching Hospitals in Tanzania".**
Institution	Muhimbili University of Health and Allied Sciences
Supervisors	Dr. Edwin Lugazia (MUHAS)
Co - Supervisor	Dr. Raymong Oyugi (MNH)
Period	26th June, 2023 to 30th September, 2023

Approval has been granted to the above mentioned student to collect data at MNH. **A final study report should be lodged with Clinical Research, Training and Consultancy Unit.** Dissemination of study findings to MNH stakeholders shall be overseen by **Dr. Raymond Oyugi** (MNH) Co – supervisor.

Upanga West, Kalenga Street, Plot No. 1048/3, P.O. BOX 65000, Dar es Salaam, Tanzania.
Telephone: +255-22-2151367-9, Telephone: +255-22-2151351-2
Email: info@mnh.or.tz, Website: www.mnh.or.tz

Kindly ensure that the student abide to the ethical principles and other conditions of the research approval.

Sincerely,

Dr. Jessie Mbwambo
Head of Clinical Research, Training and Consultancy Unit

c.c DSS, DMS
c.c **Dr. Raymond Oyugi**
c.c **Maynard Samuel Mekere**

HEAD, TEACHING, RESEARCH & CONSULTANCY UNIT
P. O. Box 65000
DAR-ES-SALAAM
MUHIMBILI NATIONAL HOSPITAL