ASSESSMENT OF INTRAHOSPITAL TRANSFER PRACTICE OF CRITICALLY ILL PATIENTS AT MUHIMBILI ORTHOPEDIC INSTITUTE (MOI) IN DAR ES SALAAM.

Anna Phillipo Assenga, (MD)

MMed (Anesthesiology) Dissertation

Muhimbili University of Health and Allied Sciences

October, 2021

Muhimbili University of Health and Allied Sciences

Department of Anaesthesiology

Assessment of Intrahospital Transfer Practice of Critically Ill Patients at Muhimbili Orthopedic Institute (MOI) in Dar es Salaam.

By

Anna Phillipo Assenga

Dissertation submitted in (Partial) Fulfillment for the Requirements for the Degree in Masters of Medicine in Anaesthesiology.

Muhimbili University of Health and Allied Sciences.

October, 2021

CERTIFICATION

The undersigned certifies that, they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: “Assessment of intrahospital transfer practice of critically ill patient at Muhimbili Orthopedic Institute, in Dar es Salaam”, in (partial) fulfillment of requirement for degree of Master of Medicine (Anaesthesiology) of Muhimbili University of Health and Allied Sciences

---

Dr. Frederic W. Mbanga

(Supervisor)

Date

_____

Dr. Edwin R. Lugazia

(Co-Supervisor)

_____

Date

DECLARATION AND COPYRIGHT

I, Anna Phillipo Assenga declare that this dissertation is my own original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

Signature: ……. Date: ……..……..

ACKNOWLEDGEMENTS

I would like to express my humble gratitude to the Almighty God for his abundant blessings and guidance throughout the whole period of my study. Many people in one way or another have offered their contributions in the completion of my dissertation. It is always difficult to acknowledge each one but the following deserve special thanks.

I would like to thank the Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) for sponsoring me throughout my studies. My special thanks to the Head of Department, all academic staff of the Department of Anaesthesia at MUHAS, MOI and MNH for their valuable contributions and comments during the whole process of the dissertation development and production.

My heartfelt appreciation to my supervisors Dr.Frederic Mbanga and Dr.Edwin Lugazia for their valuable advice and tirelessly going through the manuscript, correcting and offering constant encouragement throughout the whole period from proposal development to writing a dissertation report.

Great thanks to Dr.Respicious Boniface the Executive Director MOI for his permission to conduct this study. I am also grateful to Dr.Shafii for his support and positive contribution in my study.

I wish to express my sincere gratitude to my wonderful parents for their moral support throughout the period of my Master's Program. I am ever grateful and indebted to my lovely husband Emanuel Nundu and my two children Elizabeth and Phillip for all the sacrifices they made to ensure that I was able to complete this course successfully.

Finally, I would like to extend my thanks to all my relatives and friends who supported me in many different ways.

DEDICATIONS

I would like to dedicate the results of this study to my loving husband Emanuel Nundu and my children Elizabeth and Phillip. Thank you!

ABSTRACT

INTRODUCTION

Intra-hospital transfer of critically ill patients is a challenging task. Patient monitoring during intra-hospital transfer is an important safety issue. Frequent monitoring facilitates, timely interventions and improve outcome during intrahospital transfer.

MAIN OBJECTIVE

Assessment of intrahospital transfer practice of critically ill patients admitted and managed at Muhimbili Orthopedic Institute from March.2021 to May.2021

STUDY DESIGN

Prospective cross-sectional study, was conducted for a period of three months at ICU/EMD of Muhimbili Orthopedic Institute (MOI). Consecutive sampling technique was used to recruit eligible critically ill patients needing intrahospital transport during the study period. The Researcher observed and filled data in Data Extraction Form immediately after intrahospital transport process has taken place. Then data was coded, analyzed using SPSS (version 23), then findings were presented in form of tables, graphs or charts.

RESULTS

A total of 184 critically ill patients were recruited during study period, of whom 60(32.6%) were females and 124(67.4%), were males. These patients had working or provisional diagnosis of either severe head injury, hemorrhagic stroke or brain tumor. A total of 159(86.9%) of all patients were on oxygen therapy, of whom 89 (54.9%) were intubated and 74(40.4%) needed mechanical ventilation. Transport destination areas were CT Scan 82(40.6%), the MRI room 16(8.7%), the ICU 59(32.1) and the Operating Rooms 25(13.6). The study showed existence of good communication before patient transfer and a less than adequate monitoring practice of patients during transfer. But lack of dedicative emergency box, intrahospital transfer protocol and multiparameter portable monitor contributed to occurrence of adverse event such as oxygen desaturation 11(16.1%), tachypnea 54 (79.4%), tachycardia 50 (89.2%) and hypertension 50 (49.5%) which were picked after patients have reached ICU.

CONCLUSION AND RECOMMENDATIONS

Intrahospital transfer of critically ill patients involve moving patients to and from Emergency Unit/ ICU, to and from radiology suite or to and from operating theaters for diagnostic and therapeutic procedures. This study has revealed that currently intrahospital transfer of critically ill patient in our hospital faces few challenges. Transport team members use their knowledge and skills to provide smooth transport in the midst of a resource constrained environment. The non-availability of intrahospital protocols, patient preparation checklist, and standard emergency box were evident, and multiparameter portable patient monitors were inadequate (1 multiparameter monitor) for the size of the health care facility. Since the availability of these is a necessity for the early detection and intervention of any adverse event during intrahospital patient transfer I do recommend all efforts are made to put them in place.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ABBREVIATIONS

ABCDE	Airway, Breathing, Circulation, Disability, Exposure
ACLS	Advanced Cardiac Life Support
AE	Adverse Events
ATLS	Advanced Trauma Life Support
BLS	Basic Life Support
CPR	Cardiopulmonary Resuscitation
ECG	Electrocardiogram
EMD	Emergency Department
ETT	Endotracheal Tube
$ETCO_2$	End Tidal Carbon dioxide
EVD	External Ventricular Drainage
GCS	Glasgow Coma Score
HDU	High Dependency Unit
ICU	Intensive Care Unit
IHT	Intrahospital Transfer
MOI	Muhimbili Orthopedic Institute
MRI	Magnetic Resonance Image
NIBP	Noninvasive Blood Pressure
OR	Operating Room
SpO_2	Oxygen Saturation

OPERATIONAL DEFINITION

CRITICAL ILLNESS—Is a life-threatening condition with underlying pathological process, involving multiple systems such as respiratory, cardiovascular, neurological and renal.

CRITICALLY ILL PATIENT–Is defined as a patient with severe respiratory, cardiovascular or neurological derangement, reflected in abnormal physiological observations. They require quick identification and appropriate medical management.

ICU-- Provides a safe environment, staffed with highly educated and competent physicians and nurses using the most advanced medical technology and therapies for the critically ill patients.

INTRAHOSPITAL TRANSFER-- Movement of patients within the hospital premises or its campus for investigations or treatment not available at intensive care location. (E.g., CT scan-ray, theaters)

PATIENT TROLLEY-- A bed on wheels for moving patients in hospital

STRETCHER— A cart with four wheels and a flat top for the transportation of patients, usually within hospitals.

ICU BED— An ICU bed is a specially designed bed for patients in the intensive care unit. It provides life-saving support for critically ill patients.

EMERGENCY BOX—Is a box that contains resuscitative equipment, resuscitative medications needed to provide an initial assessment and to manage life-threatening conditions.

DEDICATIVE EMERGENCY BOX—Is a box that contains all necessary resuscitative equipment and drugs needed during management of life threatening conditions.

CHAPTER ONE

I.0 INTRODUCTION

I.1 BACKGROUND

Critical illness is any immediately life-threatening disease or injury. It may also be defined as life threatening condition with underlying pathological process, which may result to multiple system deterioration involving respiratory, cardiovascular, neurological or renal compromise (1). Globally, critical illness results in several million deaths each year worldwide. The global burden of critical illness is difficult to quantify but is especially high in developing countries. Therefore, critically ill patient is defined as a patient with severe respiratory, cardiovascular or neurological derangement, reflected in abnormal physiological observations. They require quick identification and appropriate medical management. The classic "A, B,C" (airway, breathing and circulation) triad of critical illness approach helps to alert health care providers that the patient's life is in danger, and actions must be quick such as oxygen therapy (facemask, laryngeal mask, endotracheal tube), and assistance with breathing (ventilation) and circulatory support. They also require close observation, continual assessment and frequent treatment modifications. These therapies and actions, carried out by doctors, nurses and other health workers, are collectively known as "Critical Care"(2).

Critical care units have been developed to provide a safe environment, staffed with highly educated and competent physicians and nurses using the most advanced medical technology and therapies for the critically ill patients. It is necessary for many if not most critically ill patients to be transferred to various departments within the hospital, to undergo diagnostic or therapeutic procedures. This has led to great frequency of intrahospital transfer from the emergency department to Radiology suite/ Operating Room/ Intensive Care Units, or from the Intensive Care Units to the Radiology suite/ Operating Rooms. In Radiology Suite, critically ill patients undergo imaging procedures such as computed tomography (CT), magnetic resonance imaging (MRI), nuclear medicine imaging, angiography, and gastrointestinal studies. (3)

During patient transfers, there was potential for patients to deteriorate i.e., accidental endotracheal tube obstruction by secretions, accidental endotracheal tube extubating, hypoxia due to exhaustion of oxygen from the cylinder, disconnection of breathing tubes from ventilator, infusion line traction or removal, interruption of inotropes, vasopressor therapy etc. All patients undergoing transfer should be managed with appropriate equipment and monitoring by staff trained in patient transfer. The standards for equipment monitoring and staffing are the same as those used for patients being managed in the EMD or ICU(4)

In most Critical Care Guideline, four components of IHT were suggested as essential for safe patient transport: "pre-transport coordination, accompanying personnel, equipment, and monitoring during transport". It has been recommended that, all critical care transports be performed by specially trained individuals, as qualified personnel in critical care can adequately cope with at-risk patients and intervene in the event of serious adverse events (AEs), such as hypoxia, hypotension, etc. as well as minor AEs. Communication with the destination specialty was essential in terms of timing, positioning and equipment requirements. Prior communication also ensures adequate time for preparation and transfer of the patients(5).

Ideal recommended equipment for IHT according to clinical condition of a patient may include; Portable Ventilator machine, Full size E Oxygen Cylinder and a Suction Machine. Drugs such as Inotropes and Vasopressors infusion pump should not be interrupted. Emergency drugs such as Atropine, Ephedrine and Adrenaline. Intubating equipment such as laryngoscopes, self-inflating bag, facemask an oropharyngeal airway and endotracheal tube (5)

Adverse Events could be; systemic arterial hypertension, systemic arterial hypotension, tachycardia, bradycardia, tachypnea, apnea, drops in oxygen saturation levels, sweating, arrhythmias, convulsion, agitation, falls, bleeding and cardiac arrest .On returning to ICU, we had to ensure all equipment's were functioning with adequate ventilation and perfusion. Events during transfer including personnel, infusions, ventilation settings and incidents were documented in the medical notes(5).

Globally guidelines have been drafted on safe intrahospital transport of critically ill patients(6). Various institutions e.g. Australian Critical Care have prepared a checklist, that facilitates safe and smooth intrahospital transport of critically ill patients(7). Practical check-list contains systematic list of final check points before and after critically ill patients are moved, and includes: i) systematic tasks to be carried out before each patient is transported, and ii) systematic patient and equipment checks (ABCDEF) to be carried out after each patient is moved, which focus on the essential points. It can be carried out quickly at the bedside, especially when the decision to transport the patient has been made in an emergency context. The adoption of this check-list by nursing and medical teams as well as hospital porters and retrieval teams (radiology, theatre) will also be a determining factor in its application and in the quality of the results. Simulation training would be appropriate for implementing and validating competency acquisition for transporting critically ill patients(8).

In South Africa, they have developed guideline on safe intrahospital transport of critically ill patients with much emphasis on adequate and appropriate training of transfer personnel as well as selection of appropriate equipment. Of utmost importance is interdisciplinary teamwork, good communication and appropriate decision-making. At the very least, the transfer should do no harm(9). In another study, guideline was renamed bundle of intervention, facilitated a decrease in the overall number of adverse events, equipment-related adverse events and the need for intervention within the first 30 minutes of arrival in ICU post intrahospital transport. A bundle of interventions should be considered for use by hospitals who regularly embark on intrahospital transport of the critically ill, especially if the institution does not have a formalized intrahospital transport protocol (10).

A study conducted on challenges faced during intrahospital transfer of critically ill patients in Kenya found that lack of portable monitors has forced transport team too really on observed clinical signs and employ needed care. Also the absence of dedicated trolley (emergency drugs, resuscitative equipment), lead to development of cardiovascular, respiratory and central nervous system instability (11).

I.2 PROBLEM STATEMENT

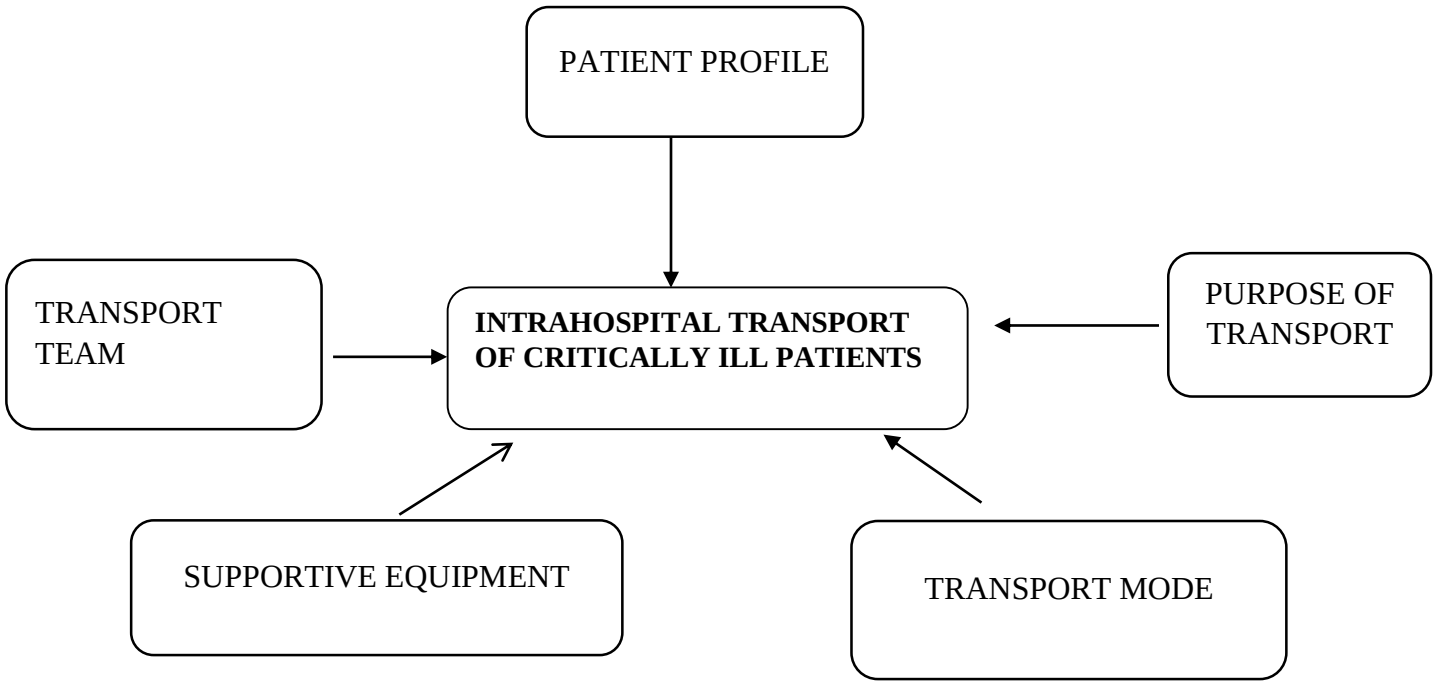
The intrahospital transfer involves the movement of patients between departments within hospital premises. It is more challenging when a critically ill patient needs transfer, to and from the ICU, to and from radiology, or to and from operating theaters.

It is associated with increased morbidity and mortality when proper measures have not been adhered to. Inadequate patient preparation, lack of multiparameter monitoring equipment, lack of resuscitative drugs, lack of resuscitative equipment, lack of good communication between departments and lack of well-trained staff in the intrahospital transfer of critically ill patients, all contribute to the occurrence of adverse events when a critically ill patient is exposed to transport. Other contributing factors include acceleration and deceleration, nausea, vomiting increase risks of aspiration, accidental breathing tube disconnection, hypoxia secondary to oxygen exhaustion from a cylinder, equipment failure, all lead to further deterioration of patient physiology.

Therefore, this study has identified obvious management gaps for proper intrahospital transfer as documented in the international guidelines. The study results will trigger the establishment of local guidelines which will blend into our settings, to ensure safe intrahospital transfer of critically ill patients.

I.3CONCEPTUAL FRAMEWORK

This conceptual framework has been designed by the researcher and has not been copied or sited from any study.



ILLUSTRATION

The Conceptual framework contains independent variables which are, patient profiles, purpose of transport, transport mode, supportive equipment and transport team which together facilitate the proper and safe intrahospital transfer of critically ill patients (dependent variable)

I.4 RATIONALE

Intrahospital transfer of critically ill patients is a daily routine practice in hospitals. To provide safe transport depends on the patient's clinical status, mode of transport used, readily available and functioning supportive equipment and the availability of a well-trained transport team. As those components contribute to the reduction of adverse events that may/may not occur when patients are transferred. Studies available in our setting looked upon interhospital transfer of referred patients. But there are no local studies done on holistic assessment in the intrahospital transfer of critically ill patients. So this study aimed to assess the practice of transfer of critically ill patients at Muhimbili Orthopedic Institute. This research was also done as partial fulfilment for Degree of Masters of Medicine in Anaesthesiology.

1.5 RESEARCH QUESTION

What is the practice of intrahospital transfer of critically ill patients at MOI?

I.6 BROAD OBJECTIVE

Assessment of intrahospital transfer practice of critically ill patients admitted and managed at Muhimbili Orthopedic Institute from March.2021 to May.2021

I.7 SPECIFIC OBJECTIVES

1. To determine clinical profile of a patient requiring intrahospital transfer during the study period at MOI.
2. To analyze transport mode during intrahospital transfer of critically ill patient
3. To determine availability of supportive equipment for intrahospital transfer of critically ill patients.
4. To analyze the constitution of transport team during intrahospital transfer of critically ill patient
5. To determine proportion of adverse events encountered by critically ill patient during intrahospital transfer

I.8 LITERATURE REVIEW

SOCIAL DEMOGRAPHIC AND CLINICAL PROFILE OF CRILICALLY ILL PATIENTS INVOLVED IN INTRAHOSPITAL TRANSFER

Critically ill patients in need of intrahospital transfers present with different demographic and clinical characteristics. This has been evidenced by finding from study done elsewhere in the world. In our settings and East Africa, we have critically ill patients, but no studies have conducted on intrahospital transfer, rather available studies were looking at interhospital transfer practices on critically ill patients. In a study done by *Meneguin et al*(12) revealed critical patients involved in intrahospital transfer, (56.1%) were males with a mean age of 57 years and a study done by *Gillman et all*(13) requited a total of 290 patients, of whom (66%) were males with mean age of 46 years. In another study done by *Gimenez et al*(14), documented 293 patients, 53% were men and median age was 66.5 years. *Winter*(15) in his study documented 37.5% as head trauma patient followed with intracerebral hemorrhage 22%. Underlying comorbidities of 91.1% of recruited patients were hypertension (20%) and diabetes (8.9%) was documented in a study done by *Gimenez et al*(14).

PURPOSE OF INTRAHOSPITAL TRANSFER OF CRITICALLY ILL PATIENTS

The purpose behind intrahospital transfer can either be diagnosis in the radiology suite or surgical intervention in operating theatres or medical intervention in ICU as a destination point. As documented in a study done by *Meneguin et al* (12) 369(80.4%) were sent to radiology suite, while *Gimenez* (14)et al, 57.3% of transportations had a diagnostic purpose and 42.7% for therapeutic purpose. Another study done by *Winter*(15), he documented 90% cases were sent to radiology and 9.5% case were sent to operating theaters. Study done by *Venkategowda et al*(16), patients sent for CT Scan were 67.71% and those sent for MRI were 5.6%.**Parmentier et al(17) looked on how frequently same patient is exposed to intrahospital transfer, and he found out that 128 patients underwent one transfer, 41 patients underwent two transfers, 10 patients underwent three and one patient underwent six transfers for CT Scan.**

AVAILABILITY OF EMERGENCY DRUGS AND MONITORING EQUIPMENT

All critically ill patients undergoing transfer should receive the same level of basic physiologic monitoring during transport as they had in the intensive care unit. The use of portable equipment is necessary to provide monitoring, continuous infusions and ventilation. This includes, at a minimum, continuous electrocardiographic monitoring, continuous pulse oximeter and periodic measurement of blood pressure, pulse rate, and respiratory rate as documented in a study done by *Warren et al*(18). Selected patients may benefit from capnography, continuous intra-arterial blood pressure, pulmonary artery pressure, or intracranial pressure monitoring. When available, a memory-capable monitor with the capacity for storing and reproducing patient bedside data will allow review of data collected during the procedure and transport. Equipment for airway management sized appropriately for each patient, is also transported with each patient. Basic resuscitation drugs, including epinephrine and anti-arrhythmic agents, are transported with each patient in the event of sudden cardiac arrest or arrhythmia. A more complete array of pharmacologic agents either accompanies the basic agents or is available from supplies ("crash carts") located along the transport route and at the receiving location. Supplemental medications, such as sedatives and narcotic analgesics, are considered in each specific case. An ample supply of appropriate intravenous fluids and continuous drip medications (regulated by battery-operated infusion pumps) is ensured as documented by Warren et al (18). In a study done by *Meneguin et al*(12), he documented 63.6% of cases used mechanical ventilator , 159 patients (34.6%) were on vasoactive drugs; norepinephrine (28.7%), sodium nitroprusside (2.6%) and dobutamine (1.1%).In most transports (94.3%) a carrying case containing materials and drugs for emergencies was among the included materials; 95.2% of transports had a manual resuscitator and 88.4% had a multiparameter monitor. *Winter*(15) in his study, mentioned that monitoring parameters were ECG in 27(84.5%) occasions, pulse oximeter and blood pressure in 31(97%) occasions, heart rate monitoring in 29(90.5%) and capnometry in 24 (75%) occasions.

LEVEL OF TRAINING OF THE TRANSPORT TEAM

The intrahospital transfer should be performed by specially trained individuals with appropriate skills and knowledge. Team members may include a respiratory therapist, registered nurse, or ICU Nurse. It is strongly recommended that a physician with training in airway management and advanced cardiac life support, and critical care training or equivalent, accompany unstable patients as seen in a study done by *Sao et al* (19). Early detection through continuous monitoring by staff was important in limiting the harm of an incident. Many of the human-based contributing factors identified here suggest that personnel involved may not have had adequate training. All staff involved in intra-hospital transportation should be skilled in airway management and critical care, they should also undergo specific training for patient transportation. In a study done by *Meneguin*,(12) it stated that 77.3% of the transfers were composed of physicians, nurses and nurse technicians, 18.3% of transfers were composed of nurses and nurse technicians, 2.9% of transfers were composed of nurse technicians, and 1.5% of transfers were composed of nurses. In another study done by *Lovell et al*(20) , it showed that majority of transfers 71(70%) were carried out by medical staff at the registrar level (Anaesthetics/ICU/Emergency Medicine). Senior registrars were involved in transfers 27(26%). Resident medical staff were involved in 3(3%) transfers while consultant medical staff were involved in 1(1%) transfers. Anaesthetic staff were involved in 88 (86%) transfers, ICU staff were involved in 8 (8%) transfers, emergency medicine staff were involved in 5(5%) transfers and surgical staff were involved in 1(1%) transfers. While another study observed a trend towards a reduced incidence of adverse effects if a physician was present during transport in a study done by *Smith et al*(21). And finally a study done by *Bergman*(22) showed that Transport teams had between two and four members, and 86% consisted of critical care nurse and unlicensed nurse without physicians.

ADVERSE EVENTS DURING INTRAHOSPITAL TRANSFER

Transporting critically ill patients between hospitals has been recognized as a potentially hazardous maneuver. The unforeseen events can lead to additional hemodynamic (hypo/hypertension, arrhythmias, etc.), respiratory (hypoxia, hypo/hypercapnia, etc.), neurologic (intracranial hypertension, etc.) complications and development of secondary insults (hypoxia, hypotension, intracranial hypertension, etc.) to the injured brain patients as was seen in *Meneguin et al*(12). Several other observational studies have documented adverse events relating to intra-hospital transport. A study done by *Min et all*(23), documented ECG lead failure 23%, monitor power failure 14%, combination of these two 10%, intravenous access 9% or disconnection of medication infusion 5%, and ventilator disconnections 3%, while in another study by *Lovella et al* (20), stated that the prevalence of adverse events was consistent with the literature, in which the incidence of physiological complications ranged between 6 and 68%. Another study done by *Meneguin et al*(12), recorded 103 (36%) patients who experienced complications (intracranial hypertension, oxygen saturation <90%, bronchospasm, ventilator desynchrony, hypertension or hypotension requiring intervention, and arrhythmias). His study population involved brain-injured patients, he correlated that higher injury severity scores also place individuals at a greater risk of secondary insults during transportation. Hence adequate resuscitation before transport may help reduce the number of such secondary insults. In another study by *Warren et al*(18) which followed a series of 125 intrahospital transfer from the ICU, (24%) patients were believed to be less stable on return to the ICU, 11% of transfers had multiple misadventures. Also in another study by *Sao et al* (19)that examined 254 ICU patients, demonstrated unexpected events in 139 patients, and 64% of adverse events were related to equipment issues such as oxygen probe displacement while oxygen desaturation accounted for 10.8% of recorded adverse events. Endotracheal tube malpositioning and accidental extubation were frequent incidents, with inadequate securing of the artificial airway as a contributing factor as documented in the study by *Picetti et al* (24) , where 27 patients(head injury) were transferred to the procedure room or operating theatres and observed 51% unwanted events. The majority of unwanted events were contributed by the decrease in blood pressure and oxygen saturation and increase in intracranial pressure.

CHAPTER TWO

2.0 METHODOLOGY

2.1 STUDY DESIGN

Prospective cross-sectional study.

2.2 STUDY AREA

The study was conducted at Muhimbili Orthopedic Institute (MOI) in Dar es Salaam, Tanzania. MOI is a teaching hospital for Orthopedics, Trauma and Neurosurgery for Muhimbili University Of health and Allied Sciences (MUHAS). MOI is a tertiary government referral hospital with 300 beds (18 beds ICU, 8 beds EMD, 20 beds HDU). An average of 10 casualties per day are received at the Emergency Department, of which one-third are critically ill and thus need intrahospital transfer either to the radiology suite, the operating room or the Intensive Care Unit.

2.3 STUDY DURATION

Study was conducted for a period of three (3) months from March.2021 to May.2021

2.4 STUDY POPULATION

All critically ill patients admitted at Muhimbili Orthopedic Institute during stated time period

Inclusion Criteria

i) Critically ill Patients who needed intrahospital transport from EMD/ ICU were included.
ii) Critically ill patients who needed intrahospital transport to ICU from Theater.
iii) Critically ill patients who needed more than 1 intrahospital transfer were included.

Exclusion Criteria

i) Inpatients who have developed an acute cardiorespiratory compromise and needed ICU admission.

2.5 SAMPLE SIZE ESTIMATION

Sample size was calculated using Yamane Formula for Finite Population

Yamane (1967);

$n = \frac{N}{1+N(\propto^2)}$ $n = \frac{180}{1+180(0.05)^2}$ $n = \frac{180}{1.45}$ n = 12 n = 124 +36

= 160

Where; N = 180

$\propto$ = 5% (margin of error)

20% non-response == 36

Minimum Sample size 160

2.6 SAMPLING TECHNIQUE

A Consecutive sampling technique was used to recruit eligible critically ill patient needing intrahospital transport from ICU/EMD to radiology suite/ operating theater.

2.7 DATA VARIABLES

A) INDEPENDENT VARIABLES

i) Patient clinical profile ie age, sex, diagnosis, comorbidities, GCS, Oxygen therapy, spontaneous/controlled ventilation, inotrope/vasopressor infusion.

ii) Purpose of transfer such as diagnostic(radiology), or surgical (operating rooms) or medical management(ICU)

iii) Supportive Equipment ie oxygen therapy, ventilators, resuscitative equipment, resuscitative drugs and monitoring devices

iv) Mode of transfer such as patient trolley or ICU bed

v) Constitution of transport team ie physician, critical care nurses ,nurse anaethetist, registered nurse or health attendant

B) DEPENDENT VARIABLES

Intrahospital Transfer of Critically ill patients

2.8 DATA COLLECTION

Researchers had observed the intra-hospital transfer process and filled in observed events in data extraction form at the end of the procedure.

2.9 INVESTIGATION TOOLS

A data extraction form was used.

It contained four (4) Parts

PART A--- Patient demographic such as age, sex, registration number

PART B--- Pre- transport Phase ie diagnosis, cormobities, clinical status, transport destination, accompanying personnel, availability of emergency box.

PART C --- Transport Phase ie monitoring, Continuity of medication? Occurrence of adverse events?

PART D --- Post-transport Phase ie patient condition and vital readings.

This tool was drafted by principle investigator, and validation done by experts, but validation coeffient was not done. Validated tools found did not answer research questions.

2.10 DATA MANAGEMENT

Data entry and cleaning was done by Microsoft Excel, then exported to Statistical Package for Social Sciences (SPSS) version 23 for coding and analysis.

2.11 DATA ANALYSIS

The study contains both categorical and quantitative variables. Categorical variables include sex, clinical diagnosis, comorbidities, presence/absence of oxygen, destination area, transport team members, monitored/not monitored, presence/absence emergence box, and adverse events. All these have been summarized in a frequency distribution table. Bar charts and graphs were used for ease and for further statistical analysis. Quantitative variables in the study include: age, disease severity by Glasgow coma score and composition of transport team members. Mean and standard deviation were employed, Chi-square test used to check association and the level of significance used was p= 0.001. Power of study is 80%

The data extraction form that were filled out were given an identification number before entering into the computer using software Statistical Package for Social Sciences (SPSS) version 23 for analysis. The association between the dependent variable and independent variable was determined using univariate analysis.

2.12 ETHICAL CONSIDERATION

Ethical Clearance was obtained from MUHAS Research and Ethical Committee and Research and Publication Committee at MOI. Consent to participate in this study was obtained from relatives or guardians of critically ill patients as appropriate. In order to maintain patient confidentiality, patients were identified by a study reference number linked to the registration number on their files. The researcher will observe intrahospital transfer of critically ill patients as being done in the study area, and in case of adverse events, he/she will participate in its management.

CHAPTER THREE

3.0 RESULTS

Results

In a study period of 3months, a total of 184 critically ill patients who fulfilled inclusion criteria and were recruited. A total of 124 patients were males (67.4%) and 60 patients were females (32.6%). Age of participants ranged from 1 – 82 years, with most participants (27.2%) falling in >50 years category and the least 9.2% falling in ≤10 years category, while the mean age was 38.01 years with standard deviation of 19.42 years.

Table 1: Socio-demographic characteristics of study patients

Variable	Frequency	Percent
Gender		
female	60	32.6
male	124	67.4
Age (in years)		
≤10	17	9.2
11-20	40	10.3
21-30	25	21.7
31-40	33	13.6
41-50	50	17.9
>50	43	27.2
Age mean (SD)		**38.01 ± 19.42 years**

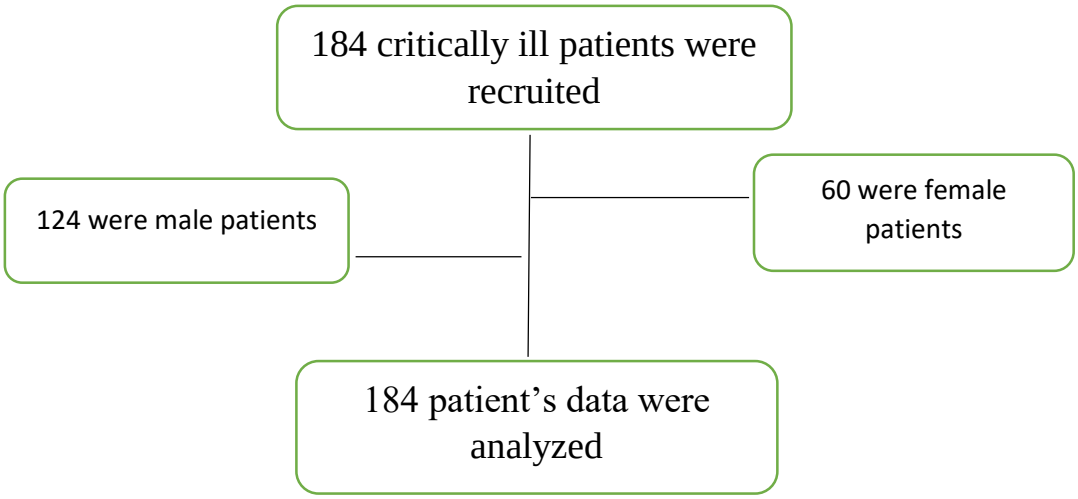


Diagram 1; Patient Flow diagram

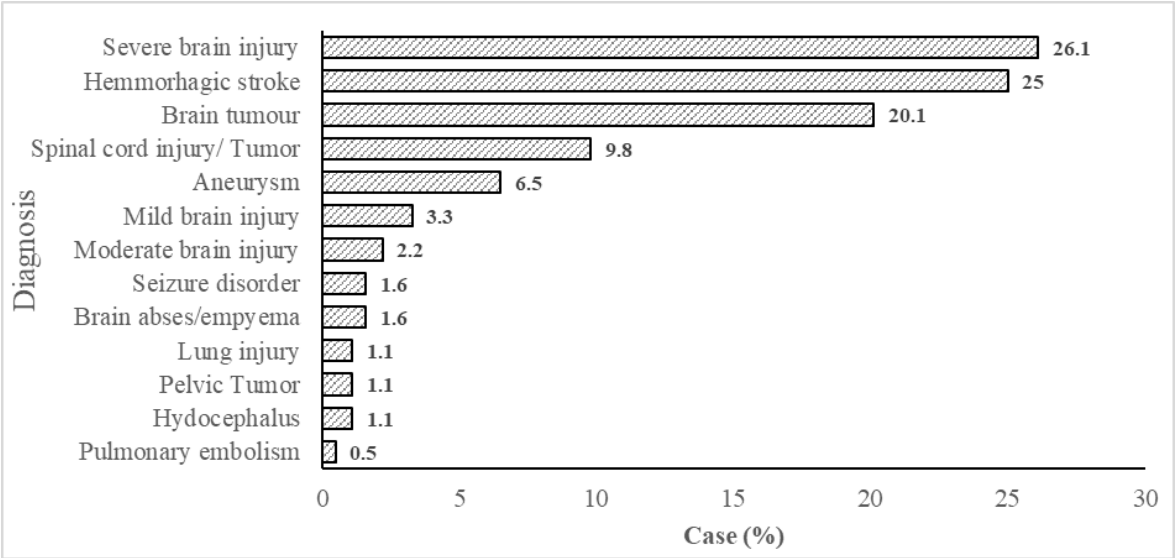


Figure 1: Clinical diagnosis of patients

Represents commonest clinical diagnosis of critically ill patients who underwent intrahospital transfer during the study period. Top three clinical diagnosis were severe head injury, hemorrhagic stroke and brain tumor with 26.1%, 25%, 20.1% respectively

Table 2: Clinical profile of patients who underwent intrahospital transfer

Variable (n=184)	Frequency	Percent
Comorbidities		
yes	64	34.8
no	120	65.2
Comorbidities		
hypertension	50	76.9
diabetes	7	10.8
chronic sinusitis	1	1.5
biliary atresia	1	1.5
pulmonary tuberculosis	2	3.1
heart disease	4	6.2
Oxygen therapy		
yes	159	86.9
no	25	13.1
Oxygen therapy via		
endotracheal tube	89	54.9
face mask	67	41.4
nasal prong	6	3.7
Breathing		
Spontaneous ventilation	95	51.6
Manual Ventilation	15	8.2
Mechanical Ventilation	74	40.2
Glasgow Coma Score		
severely	74	40.2
moderate	90	48.9
mild	20	10.9

Table 2 above shows underlying comorbidities of critically ill patients in which a total of 64(34.8%) had comorbidities such as Hypertension 50(76.9%) as top most. Among 184 patients, 159 (86.9%) were on oxygen therapy, where by 89 (54.9%) via endotracheal tube, and 67(41.4%) via facemask. Those patients who were on oxygen therapy, spontaneous breathing patients were 95(51.6%) while 15(8.2%) were manually ventilated and 74(40.2%) were mechanically ventilated. Extent of impaired consciousness (GCS) were as follows; severe 74(40.2%) while moderate 90(48.9%) and mild 20(10.9%).

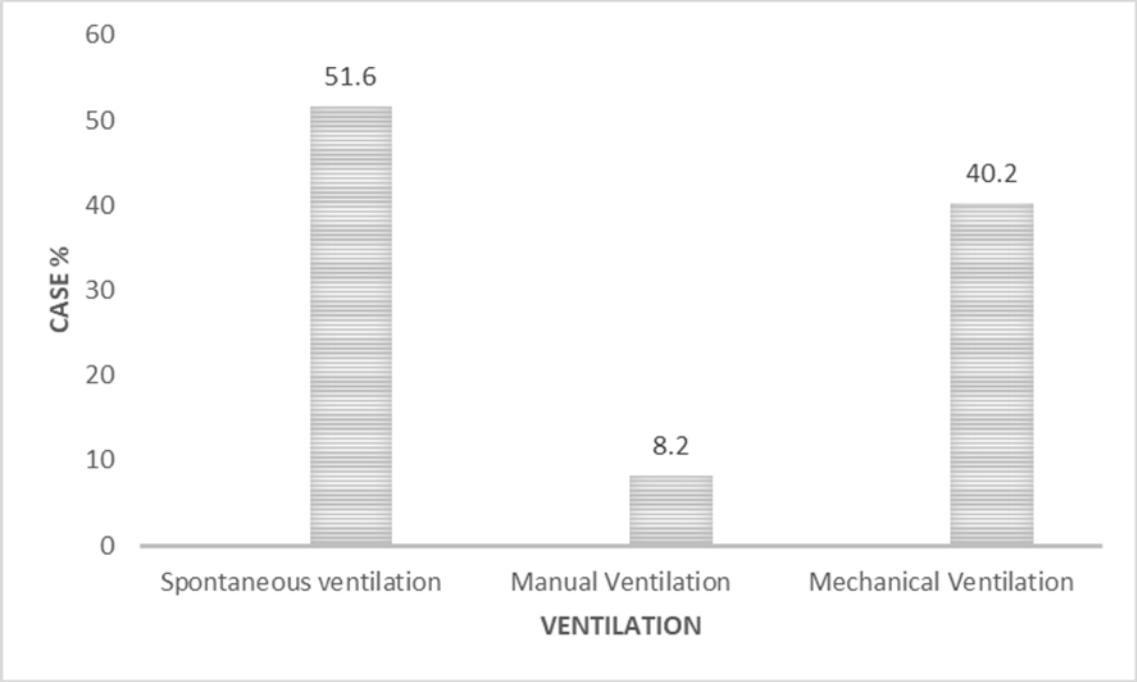


Figure 2: Mode of Ventilation

Critically ill patients involved in intrahospital transfer, 51.6% were ventilating spontaneously, 40.2% were on mechanical ventilation and 8.2% were ventilated manually.

Table 3: Transport mode during intra hospital transfer of critically ill patients

Variable (n=184)	Frequency	Percent
Patient Trolley		
Stretcher	70	38.0
ICU bed	114	62.0
Patient trolley has protective rails?		
yes	133	72.7
no	50	27.3
Tilting ability of patient trolley?		
yes	120	65.2
no	64	34.8
Transport destination		
CT scan	82	44.6
MRI	16	8.7
X-ray	2	1.1
Theater	25	13.6
ICU	59	32.1
who made transport decision		
specialist	177	96.7
resident	4	2.2
causality officer	2	1.1
Communication done to receiving end		
yes	182	98.9
no	2	1.1

Table 3 above shows, 184 critically ill patients underwent intrahospital transfer during the study of whom 70 (38%) used stretcher and 114 (62%) used ICU beds as the means of transport. The highest number 82 (44.6%) were transferred to CT scan, followed by ICU 59 (32.1%), MRI 16(8.7%) as destination point, as decided by specialist 177 (96.7%), after communication with destination area 182 (98.9%).

Table 4: Patients monitoring

Monitoring	Frequency	Percent
yes	181	98.4
no	3	1.6
Total	184	100

Table 4 shows 181 (98.4%) of critically ill patients were monitored as they continued with supportive therapy while 3 (1.6%) were not monitored during intrahospital transfer.

Table 5: Monitoring Devices

MONITORING DEVICE	CASES	FREQUENCY
STAND-ALONE PULSE OXIMETER	182	98.92
MULTIPARAMETER PORTABLE MONITOR	2	1.08
TOTAL	184	100

Table 5 above, the most common monitoring device used during intrahospital transfer of critically ill patients was a stand-alone pulse oximeter in 182 (98.92%) cases, while the portable Multiparameter Monitoring device was used in only 2 (1.08%) cases.

Table 6: Presence of emergency box during intrahospital transfer of critically ill patients

Patient Trolley (n=184)	Presence of Emergency box				Total
	Yes (%)		No (%)		
Stretcher	7	10.00	63	90.00	70
ICU bed	17	14.91	97	85.09	114
Total	24	13.04	160	86.96	184

Table 6 above shows that the emergency box was present in a total of 24 (13.04%) intrahospital transfers, where it was present on 7 occasions when a patient was transferred on a stretcher and 17 occasions when a patient was transferred to an ICU bed. But on 160 (86.96%) occasions, the emergency box was unavailable (both stretcher and ICU Bed).

Table 7: Contents in Emergency Box

	Emergency box contents	Presence of Emergency box				Total
Stretcher	Bag valve mask	5	31.25	11	68.75	16
	Laryngoscope	2	14.29	12	85.71	14
	Stethoscope	6	22.22	21	77.78	27
	emergency drugs	3	15.79	16	84.21	19
	definitive airway	3	20.00	12	80.00	15
	Airway Adjuncts	0	0.00	2	100.00	2
		yes		**no**		
ICU Bed	Bag valve mask	15	30.00	35	70.00	50
	Laryngoscope	14	29.79	33	70.21	47
	Stethoscope	16	25.81	46	74.19	62
	emergency drugs	13	27.66	34	72.34	47
	definitive airway	12	31.58	26	68.42	38
	Airway Adjuncts	1	50.00	1	50.00	2

Table 7 above shows the contents inside the emergency box during intrahospital transfer of critically ill patients. The emergency box contained fewer pieces of resuscitation equipment/ drugs (Stethoscope 6 cases, bag valve mask 5 cases, and laryngoscope 2 cases) as found on cases that used a stretcher, compared to the emergency box found on cases that used ICU Bed (Stethoscope 16 cases, bag valve mask 15 cases and Laryngoscope 14 cases).

Table 8: Accompanying personnel involved during intrahospital transfer of critically ill patients.

no. of accompanying personnel	Frequency	Percent
one	0	0
two	73	39.7
three	104	56.5
four	6	3.3
five	1	.5
Total	184	100.0

Table 8 shows accompanying personnel involved during intrahospital transfer of critically ill patients, where 104 (56.5%) cases which involved three accompanying personnel, followed by 73 (39.7%) cases which involved two accompanying personnel

Table 9: Involvement of Health Practitioners in Intrahospital Transport according to carder

Health Practitioners	No. of Intra hospital transports	Percent
Nurses		
Registered Nurse	172	35.46
Critical care Nurse	10	2.06
Nurse anaesthetist	51	10.52
Health attendant	153	31.55
Physician		
Consultant	6	1.24
Resident Doctor	2	0.41
Medical Officer	91	18.76
Intern Doctor	0	0.00
Total	**485**	**100.00**

Table 9 above shows involvement of Health Practitioners in Intrahospital Transport. It shows that where registered nurses 172 (35.46%) and health attendants 153 (31.55%) are highly involved during intrahospital transfers, followed by medical officers were 91 (18.76%) intrahospital transfers and nurse anaesthetist were 51 (10.52%) intrahospital transport.

Table 10: Proportion of adverse events encountered by critically ill patients who underwent intrahospital transfer

Adverse effect	Frequency	Percent
Respiratory system	58	34.31
Cardiovascular	57	33.72
Hemodynamic	50	29.58
Gastrointestinal	0	0.00
Access	1	0.59
Equipment failure	3	1.77
Vascular Access Disconnection	0	0.00
Agitation	0	0.00
Seizures/Convulsions	0	0.00
Fall	0	0.00
Total	169	100.00

Table 10 depicts adverse events experienced by critically ill patients who underwent intrahospital transfer during the study period, with respiratory 57 (34.31%), cardiovascular 56 (33.72%), and hemodynamic instability 50 (29.58%) being the most common. experienced by critically ill patients.

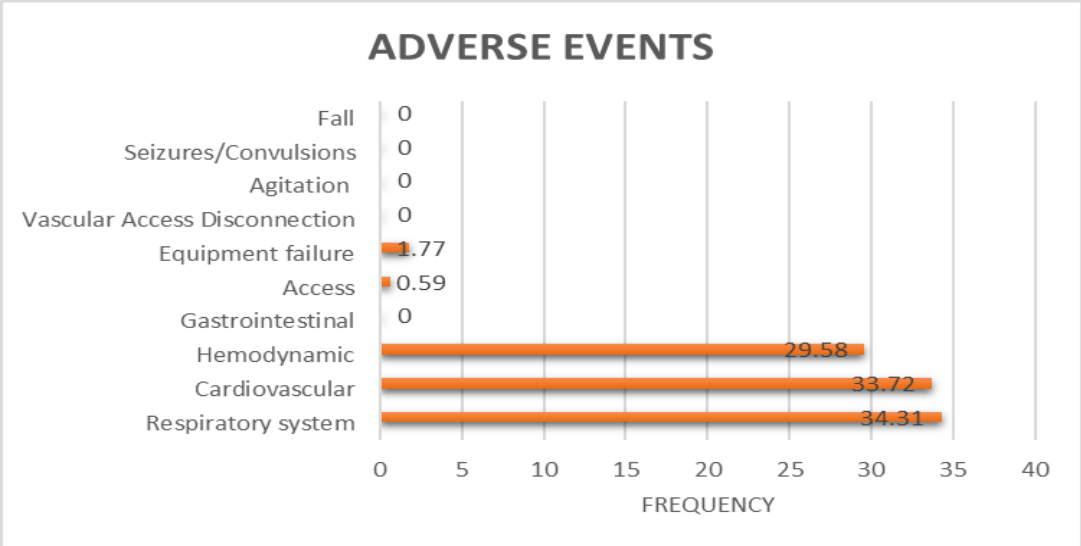


Figure 3: Adverse Events

Representations of adverse events encountered by critically ill patients who underwent intrahospital transfer during study period.

Table 11: Specific adverse events encountered by critically ill patients who underwent intrahospital transfer during study period

Adverse event	Frequency	Percent
Respiration		
oxygen saturation <90%	11	16.18
Dislodged endotracheal tube	3	4.41
Tachypnea	54	79.41
Cardiovascular		
Bradycardia	3	5.36
Tachycardia	50	89.29
Arrhythmias	1	1.79
Asystole	1	1.79
Hemodynamic		
Hypotension	13	12.87
Hypertension	50	49.50
Dislodged peripheral IV line	1	0.99
Equipment failure		
O2 depletion from cylinder	3	100.00

Table 11 above show specific adverse events encountered by critically ill patients which are, tachypnea 54(79.41%), tachycardia 50 (89.29%) and hypertension 50(49.50%) while the least adverse events included Asystole1 (1.79%).

CHAPTER FOUR

4.1 DISCUSSION

This study aimed to assess intrahospital transfer practices for critically ill patients at Muhimbili Orthopedic Institute (MOI) for a period of three (3) months. A total of 184 critically ill patients were recruited, including 124 (67.4%) males, and 60 (32.6%) females. The mean age was 38.73 years with a standard deviation of 18.99 years. The results are consistent with values obtained in a study done by *Gimenez* (14) , documented 293 patients, 53.9% of whom were men, with a median age of 66.5 years, while *Meneguin* in his study(12) he documented 262 critically ill patients, of whom 56.1 percent were men with a mean age of 57 years, has been also shown in a study *Gillman* (13), where 290 patients, of whom 66% were men with a median age of 46 years. Also in this study, it was found out that, top three most common clinical diagnoses were severe head injury (26.1%), hemorrhagic stroke (25%) and brain tumor (20.1%). The same patient clinical working diagnosis was found in a study done by *Winter* (15), such as head trauma as the most common diagnosis (37.5%), followed by intracerebral bleed (22%).In our setting, head trauma secondary to road traffic accident is very common as documented in the other studies(25). Underlying comorbidities were hypertension (76.9%) and diabetes mellitus (10.8%). Similar comorbidities were found in a study done by *Gimenez* (14), 91.1% of patients had underlying comorbidities, as hypertension (20%) being most frequent, and followed by diabetes mellitus (8.9%).

Critically ill patients present with physiological derangements which may necessitate airway and ventilation management. From this study, it was found that 162 (88%) of study participants were on oxygen therapy, of whom 89 (54.9%) were intubated. Similar patient physiologic status was found in a study done by *Bergman* (22), 80% of patients were intubated while *Venkategowda* (16) in his study, 59 (23.22%) of patients were intubated (17). Also in a study done by *Meneguin*,(12), 76.3% of patients were intubated (13) and study done by *Winter* (15), 27 patients were intubated. The results are almost similar, the reason behind this is study participants were critically ill patients in need of airway and ventilation support.

Transport destination areas as found from this study were 100 (54.4%) radiology suite, 25 (13.6%) operating theaters and 59 (32.1%) ICU. Similar destination area was documented in a study done by *Meneguin* (12), where by 369 (80.4%) were sent to the radiology suite, while *Gimenez* in his study(14), 57.3% of the transportation had a diagnostic purpose and 42.7% were therapeutic. Also in a study done by *Winter*(15), destination areas were CT scanner (78%), MRI (12%), and operating theatre (9.5%).The results are similar as part of the management plan of critically ill patients involves investigations (radiology image), then followed with either medical (ICU) or Operating theater (surgical intervention).

According to the findings of this study, the sole decision makers were 117 (96.7%) specialists. Probably they wanted to know the clinical progress of their patients and aid in their management plans, such as medical or surgical interventions.

It was also found that good communication across the departments, as seen in this study 182 (98.7%), contributes to safe intrahospital transport. First, the receiving unit is aware of incoming patient status. Secondly, the receiving unit will prepare required monitoring devices and supportive equipment as per the patient's physiological status. As for radiology, staff will prioritize his/her procedure without delay instead of the critically ill patient waiting in a queue in a non-favorable

Critically ill patients are on cardio-respiratory support. They should continue with this support even when exposed to intrahospital transfer, hence continuous monitoring is mandatory. This study found that 182 (98.92%) critically ill patients were on continuous monitoring through stand-alone pulse oximetry 176 (98.8%). Also a study done by *Winter*(15), monitoring was done by using ECG monitoring in 27 (84.5%) occasions, pulse oximetry and blood pressure monitoring in 31 (97%) occasions, heart rate monitoring in 29 (90.5%) occasions and capnometry monitoring in 24 (75%) of intrahospital transfers. Parameters monitored by stand-alone pulse oximeter are oxygen saturation and pulse rate only. Only 2 cases (1.08%) were monitored using multiparameter monitoring devices. Other parameters such as ECG, Respiratory rate, Blood pressure and temperature were not monitored during transfer, rather above mentioned parameters were obtained when patient returned to ICU or reached Operating

Theater. As a result, critically ill patients suffered a prolonged period of cardiorespiratory or hemodynamic instability without quick intervention. Studies done from cited articles, has showed that morbidity and mortality can range from 6%-- 84% in poorly monitored patients during intrahospital transport.

The emergency box was present in 24 (13.04%) transfers compared to 160 (86.94%) transfers. In a study done by *Meneguin* (12), (94.3%) transfers had a carrying case containing materials and drugs for emergencies. Several resuscitative equipment and drugs (such as a self-inflating bag with facemask) which are supposed to be included in the emergency box were missing, and as a result, the transport team members were unable to quickly intervene when patients developed adverse events such as desaturation and tachypnea. The emergency box found on cases transferred using stretcher had fewer resuscitation equipment (Stethoscope 6 cases, bag valve mask 5 cases, and laryngoscope 2 cases), compared to the emergency box found on cases transferred using ICU bed (Stethoscope 16 cases, bag valve mask 15 cases and Laryngoscope 14 cases). And these were evidenced in the occurrence of adverse events as many patients transferred using stretcher developed adverse events compared to patients transported using ICU bed. The reason behind this was the lack of a dedicated emergency box both in ICU/ Emergency Unit/ Operating Theater that can be incorporated during patient transfer.

Intrahospital transfer of critically ill patients necessitates the participation of dedicated transport team members. Transport team members should have skills and knowledge of intrahospital transfer of critically ill patients, the ability to monitor and depict adverse events and its management. So, 104 (56.5%) transfers had a composition of three team members while 71 (38.6%) transfers had a composition of two members, while only 1 (0.5%) intrahospital transfer involved five transport team members. The findings are comparable to a study done by *Gimenez* (14), whereby 17 transfers (11.9%) had one professional involved, in 117 transfers (81.8%) had two professionals involved, and in 9 transfers (6.3%) had three professionals involved, and frequently constituted by a nursing assistant, supervising nurse, and doctor. In another study done by *Meneguin* (12) , he stated that 77.3% of transport team members were physicians, nurses, and nurse technicians, and 18.3% were nurses and nurse technicians. Another study by

Bergman (22), he documented that transport teams had between two and four members, and 86% consisted of critical care nurses and unlicensed nurses without physicians. Also, *Winter* (15) documented in his study that the most common accompanying staffing present were two registered nurses and a registrar (31%), while 26 transfers (81.25%) were accompanied by a doctor at a registrar level or higher. Globally, the guidelines recommend intrahospital transport team members should have a trained anaesthesia provider and critical care nurse and health attendant. Hence Standards concerning the criteria and composition of transport team members were adhered to in our settings.

Successful transfer of critically ill patients needs to maintain patients' stable vital signs and hemodynamics. More than one adverse event may have occurred during a single transportation. In this study, 169 adverse events are documented with cardio-respiratory systems (68%). being mostly affected. Specific adverse events that occurred during transfers were tachypnea 54 (79.4%) cases, tachycardia 50 (86.9%) cases and hypertension 50 (86.1%) cases, hypoxia 11 (16.1%) cases. In addition, *Gillman* (13) in his study, he reported 66 adverse events in 290 patient transfers, while *Gimenez* (14), in his study, he documented 86 adverse events in (39.9%) transportation performed. Physiological alterations occurred in 44.1% of adverse events, with alterations in heart rate being the most frequent change events found. In a study done by *Parmentier-Decrucg l*(17), he recorded 120 intrahospital transfers with one or more adverse events such as oxygen desaturation 23 (8.8%) and hemodynamic instability 3 (5%).Higher rates of adverse events in our settings compared to other studies, reason behind being lack of dedicative resuscitative drugs in every intrahospital transfer

4.2 STUDY LIMITATION AND MITIGATION

There was a risk of missing information, due to failure to recall/record events which occurred during intrahospital transfer, especially in circumstances of adverse events. . Also this study was not able to assess resuscitative ability of transport team members. Sample size calculation has to rely on the prevalence of intrahospital transport in the study area rather than using prevalence from previous studies. The reason behind being Intrahospital transport of the critically ill patient in tertiary hospitals in developing countries is in infantry stage, compared to developed countries.

CHAPTER FIVE

5.1 CONCLUSION

Intrahospital transfer of critically ill patients is an important link to patient management progress. As a result of this study, it has been discovered that intrahospital transfer has several flaws.

Lack of dedicative multiparameter monitoring devices, lack of resuscitative drugs, and lack of resuscitative equipment have led transport team members to depend on clinical observation, which contributed to inadequate monitoring and delayed intervention. This lead to, the patient's physiology deteriorating, and contributed to morbidity and mortality.

5.2 RECOMMENDATIONS

The smooth and safe intrahospital transfer of critically ill patients is dependent on proper patient preparation, continuous multiparameter monitoring, and well-trained transport personnel. Composition of transport team members should conform to Standard guidelines such as anaesthesiologists, anaesthetist and critical care nurses. I recommend that an intrahospital transfer protocol that reflects our settings should be formulated by using International Guideline. Good inter-departmental communication was observed, which is a positive sign and should be encouraged and sustained. Oxygen saturation and pulse rate were only monitored parameters while heart rate, ECG Waveform, Capnography, intermittent blood pressure and temperature parameters were not monitored during intrahospital transport; therefore, I recommend continuous monitoring with a multiparameter device during intrahospital transfer in accordance with standard guidelines. Composition of emergency box was inconsistent among cases involved during intrahospital transport. Lack of dedicative emergency box during patient transfer contributed to delay intervention, hence I also recommend the dedicative emergency box should be readily available and regularly restocked. Further studies are needed to address shortcomings encountered during intrahospital transfer of critically ill patients.

REFERRENCES

1. A. Valentin. ICU Management and Practice:Safe transport of critically ill patients. ISICEM. 2016;16(2):72–4.

2. Manda-Taylor L, Mndolo S, Baker T. Critical care in Malawi: The ethics of beneficence and justice. Malawi Med J. 2017;29(3):268–71.

3. Walter SM. Quality Management - The role of intensive care registries. ICU Manag Prat. 2016;16(4).

4. Lahner D, Nikolic A, Marhofer P, Koinig H, Germann P, Weinstabl C, et al. Incidence of complications in intrahospital transport of critically ill patients – experience in an Austrian university hospital. 2007;412–6.

5. Guideline :Intra hospital transfer of ICU patient,May 2015. :1–8.

6. Australasian College for Emergency Medicine. Emerg Med. 1994;6(3):245–6.

7. Williams P, Karuppiah S, Greentree K, Darvall J. A checklist for intrahospital transport of critically ill patients improves compliance with transportation safety guidelines. Aust Crit Care [Internet]. 2020;33(1):20–4. Available from: https://doi.org/10.1016/j.aucc.2019.02.004

8. Fanara B, Manzon C, Barbot O, Desmettre T, Capellier G. Recommendations for the intra-hospital transport of critically ill patients. Crit Care. 2010;14(3).

9. Ben Abraham R, Segal E, Perel E. Transport of critically ill patients. Harefuah. 1996;130(7):474–8.

10. Geldenhuys L, Wise R, Rodseth R. The impact of a bundled intrahospital transfer protocol on the safety of critically ill patients in a South African metropolitan hospital system. South African J Anaesth Analg. 2020;26(3):139–48.

11. S OK. A Cross-sectional Study on Challenges of Intrahospital Transport of Critically Ill

Patients to Kenyatta National Hospital Critical Care Units. 2014;

12. Meneguin S, Alegre PHC, Luppi CHB. Characterization of the intrahospital transport of critically ill patients. ACTA Paul Enferm. 2014;27(2):115–9.

13. Gillman L, Leslie G, Williams T, Fawcett K, Bell R, McGibbon V. Adverse events experienced while transferring the critically ill patient from the emergency department to the intensive care unit. Emerg Med J. 2006;23(11):858–61.

14. Gimenez FMP, Camargo WHB De, Gomes ACB, Nihei TS, Andrade MWM, Valverde MLDAFS, et al. Analysis of Adverse Events during Intrahospital Transportation of Critically Ill Patients. Crit Care Res Pract. 2017;2017.

15. Winter MW. Intrahospital transfer of critically ill patients; a prospective audit within Flinders Medical Centre. Anaesth Intensive Care. 2010;38(3):545–9.

16. Venkategowda PM, Rao SM, Mutkule DP, Taggu AN. Unexpected events occurring during the intra-hospital transport of critically ill ICU patients. Indian J Crit Care Med. 2014;18(6):354–7.

17. Parmentier-Decrucq E, Poissy J, Favory R, Nseir S, Onimus T, Guerry MJ, et al. Adverse events during intrahospital transport of critically ill patients: Incidence and risk factors. Ann Intensive Care. 2013;3(1):1–10.

18. Warren J, Fromm RE, Orr RA, Rotello LC, Mathilda Horst H. Guidelines for the inter- and intrahospital transport of critically ill patients. Crit Care Med. 2004;32(1):256–62.

19. São F De, Escola P, Medicina P De, Mazza BF. Safety in intrahospital transportation : evaluation of respiratory and hemodynamic parameters . A prospective cohort study.

20. Lovell MA, Mudaliar MY, Klineberg PL. Intrahospital transport of critically ill patients: Complications and difficulties. Anaesth Intensive Care. 2001;29(4):400–5.

21. Smith I, Fleming S CA. Mishaps during transport from the intensive care unit. Crit Care

Med 1990;18:278-81.

22. Bergman LM, Pettersson ME, Chaboyer WP, Carlström ED, Ringdal ML. Safety hazards during intrahospital transport: A prospective observational study. Crit Care Med. 2017;45(10):e1043–9.

23. Min HJ, Kim HJ, Lee DS, Choi YY, Yoon M, Lee D, et al. Intra-hospital transport of critically ill patients with rapid response team and risk factors for cardiopulmonary arrest: A retrospective cohort study. PLoS One. 2019;14(3):1–13.

24. Picetti E, Antonini MV, Lucchetti MC, Pucciarelli S, Valente A, Rossi I, et al. Intra-hospital transport of brain-injured patients: A prospective, observational study. Neurocrit Care. 2013;18(3):298–304.

25. Boniface R, Lugazia ER, Ntungi AM, Kiloloma O. Management and outcome of traumatic brain injury patients at muhimbili orthopaedic institute dar es salaam, Tanzania. Pan Afr Med J. 2017;26:1–7.

APPENDICES

APPENDIX 1: CONSENT FORM (ENGLISH VERSION)

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
DIRECTORATE OF RESEARCH AND PUBLICATIONS MUHAS
INFORMED CONSENT FORM
ID-NO…….....

Consent to Participate in a Study

Greetings! My name is Dr. Anna Assenga; I am working on this research with the objective of determining continuity of care during intrahospital transfer of critically ill patients at MOI.2020.

Purpose of the study

The study is conducted in partial fulfillment of the requirements for the degree of Master of Medicine in anaesthesia of MUHAS. This study is aiming to determine continuity of care when critically ill patients are transferred between departments within the hospital either for diagnostic or therapeutic purposes.

You are being asked to participate in this study as health practionner participating in transferring critically ill patients. Kindly requesting to give true and clear information for betterment of the results that could lead to better intervention and recommendations for future.

What Participation Involves

If you agree to join the study, you will be interviewed in order to answer some of the questions present in questionnaire paper.

Confidentiality

I assure you that all the information collected from you will be kept confidential. Your name will not be written on any questionnaire or in any report/documents that might let someone identify you. Your name will not be linked with the research information in any way. All information collected on forms will be entered into computers with only the study identification

number. Confidentiality will be observed and unauthorized persons will have no access to the data collected.

Right to Withdraw and Alternatives

Taking part in this study is voluntary. You can stop participating in this study at any time, even if you have already given your consent. Refusal to participate or withdrawal from the study will not involve penalty.

Benefits

The information you provide will help to create awareness on intrahospital transport of critically ill patients.

Whom to Contact

If you have any questions about this study or you want more information's about your rights as a participant, please contact

1. Principal Investigator
   Dr. Anna Assenga Resident Anaesthesia Department
   Phone no: 0717 421236, Email address; assenga_anna86@yahoo.com

2. Dr. Frederic Mbanga, my supervisor, department of Anaesthesia
   Phone no: +255 754288644

3. Dr. Bruno Sunguya, Chairperson of SENATE Research and Publication Committee
   MUHAS P.O.Box 650001 Dar es Salaam, Telephone: 255 22 2152489

I ……..... have read the contents in this form. My questions have been answered. I agree to participate in this study.

Signature of participant……

Signature of Research Assistant……...

Date of signed consent……..…

APPENDIX 11: INFORMED CONSENT FORM (SWAHILI VERSION)

CHUO KIKUU CHA SAYANSI ZA AFYA MUHIMBILI
KURUGENZI YA TAFITI NA UCHAPISHAJI
FOMU YA RIDHAA
Namba ya utambulisho:.....

Ridhaa ya kushiri kwenye utafiti

Habari! Ninaitwa Dr Anna Assenga nafanya utafiti wenye lengo la kutathmini namna wagonjwa mahututi wanavyosafirishwa kutoka idara moja kwenda idara nyingine ndani ya hospitali

Madhumuni ya Utafiti

Utafiti huu unafanyika katika kutimiza sehemu ya matakwa ya shahada ya uzamili ya matibabu kitengo cha usingizi (Anaesthesia) Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili. Unaombwa kushiriki katika utafiti huu ili tuweze kupata matokeo ambayo namna wagonjwa mahututi wanaposafirishwa kutoka wodi walizolazwa kwenda idara nyingine ili wafanyiwe vipimo au upasuaji. Matokeo ya utafiti yataweza kutumika kama mwongozo wa tafiti zinginezo zijazo na pia yatasaidia kuboresha huduma za ganzi.

Jinsi ya kushiriki

Kushiriki kwenye utafiti huu ni hiari. Endapo Utakubali kushiriki katika utafiti huu, utasajiliwa Ili kuweza kujibu baadhi ya maswali toka kwenye dodoso lililo andaliwa Na utajaza form ya ridhaa ya kushiriki...

Haki ya kujitoa katika Utafiti

Ni hiari kushiriki katika huu utafiti.Una uhuru wa kujitoa katika huu utafiti muda wowote hata kama ulisharidhia kushiriki hapo awali. Kukataa kushiriki au kujitoa kushiriki hakutahusisha adhabu yoyote,

Usiri

Taarifa zote zitakazo kusanywa kupitia dodoso zitaingizwa kwenye ngamizi kwa kutumia namba za utambulisho .Kutakuwa na usiri na hakuna mtu yeyote asiye husika atakaye pata taarifa zilizokusanywa. Uhuru wa kushiriki na haki ya kujitoa.

Faida

Hamna faida ya moja kwa moja utaakayoipata kwa kushiriki katika huu utafiti. Ila ushiriki wako utasaidia katika kuleta maboresho na kuwapatia wagonjwa mahututi huduma stahiki pale wanasafirishwa kutoka idara moja kwenda nyingine kwa ajili ya huduma mbalimbali.

Nani wa kuwasiliana naye

Kama una maswali kuhusia na utafiti huu,tafadhali wasiliana nasi:

1. Mtafiti mkuu wa utafiti huu,
   Dkt.Anna Assenga , Mwanafunzi, Idara ya usinginzi na ganzi
   Namba ya simu +255717421236: assenga_anna86@yahoo.com

2. Dkt. Frederic Mbanga, msimamizi wa utafiti kutoka idara ya usingizi na ganzi
   Namba ya simu +255754288644

3. Dkt. Bruno Sunguya, Mwenyekiti wa Bodi ya Utafiti MUHAS S.L.P 65001 DSM
   Namba ya simu +255 0222152489

Mimi.....

Nimesoma maelezo ya fomu hii, nimeielewa na nimekubali kushiriki katika utafiti huu.

Sahihi ya mshiriki……

Sahihi ya mtafiti msaidizi……

Tarehe ya kutia sahihi kwenye utafiti.....

APPENDIX III: QUESTIONNAIRE

INTRAHOSPITAL TRANSPORT OF CRITICALLY ILL PATIENTS

ENGLISH VERSION

PART A. PATIENT DEMOGRAPHIC

(PUT {√} FOR THE CORRECT OPTION)

1. Registration No…….
2. Age …….
3. Gender

    a) Female……. b) Male……

PART B

PRE-TRANSPORT PHASE

4. Clinical Diagnosis…….

5. Cormobidities

    a) Yes …….. b) No ……..

6. If qn 5 is yes, what are they…….

EVALUATION OF THE PATIENT

AIRWAY

7. Oxygen Therapy

    a) Yes ……..... b) No ……

8. If qn 7 is YES, via

    a) Endotracheal Tube ……. b) Facemask ……..

    c) Nasal Prong …….

BREATHING

9. Breathing

a) Spontaneous Ventilation……b) Mechanical Ventilation…….

c) Manual Ventilation……

CIRCULATION

10. IV Access

a) Peripheral Venous Access…….. b) Central Venous Access…….

c) Both ……

DISABILITY

11. Level of Consciousness (GLASGOW COMA SCORE)

MOTOR	No Response	1	
	Extension	2	
	Abnormal Flexion	3	
	Withdraw	4	
	Localizes	5	
	Obeys Commands	6	
VERBAL	No response	1	
	Sound only	2	
	Words	3	
	Confused	4	
	Oriented	5	
EYE	Remained closed	1	
	Open to pain	2	
	Open to speech	3	
	Spontaneous	4	
TOTAL SCORE			

EXPOSURE

12.Presence of

a) Nasogastric Tube…… b) Chest Tube Drain …….

c) EVD …… d) Urethral Catheter …….

e) None……

13. Immobilization devices

a) Cervical Collar……. b) Thomas Splint……..

c) None…….

14. Transport Destination

a) CT Scan ……. b) MRI …… c) Xray……..

d)Theater ……e) ICU…….

15. Who made transport Decision?

a) Specialist…… b) Resident……. c) Casualty Officer……

16. Communication done to receiving end

a) Yes……..b) No……..

17. Patient trollet used

a) Stretcher……b) ICU bed …….

18. Patient Trolley has side rails for protection?

a) Yes …… b) No …….

19. Tilting ability of patient trolley?

a) Tilting…… b) Non-tilting ……

20. Accompanying Personnel

Nurse; a) Registered Nurse…….. b) Critical Care Nurse……..

c) Nurse Anaesthetist…… d) Health Attendant …….

Physician; a) Consultant…….. b) Resident Doctor…….

c) Medical Officer….. d) Intern Doctor……

21. Received formal training on intrahospital transport of critically ill patients?

Nurse a) Yes….. b) No……

Physician a)Yes …… b) No ……

22. Presence of Emergency Trolley

a) Yes……. B) No….

23. Does Emergency Trolley have the following?

a. Bag Valve Mask; Yes…… No…….
b. Laryngoscope; Yes ….. No…..
c. Stethoscope; Yes……. No…..
d. Basic Resuscitation Drugs; Adrenaline…… Atropine….. Ephedrine…..
e. Definitive Airway; Endotracheal tube; yes…..No…….
f. Airway Adjuncts; Oropharyngeal Airway……. Nasopharyngeal Airway….
    i. Supraglottic Devices…….
g. Others; specify…….

PART C: TRANSPORT PHASE

24. Patient Monitored

a) Yes…… b) No ……

25. Monitoring Devices present?

a) Pulse Oximeter…….b) Portable Multiparameter Monitor ……

26. Continuity of Medications?

a) Yes …….. b) No…….

27. Ifqn27 is yes

a) Fluid ……..b) Blood…… c) Vasopressor/ Inotropes ……..
d) Sedatives……. e) Muscle Relaxants…….. f) Others……

28. Transport Complication

a) Yes ……..b) No …….

ADVERSE EVENTS DURING INTRAHOSPITAL TRANSFER		YES	NO
RESPIRATORY SYSTE	O2 saturation < 90%		
	Dislodged Endotracheal Tube		
	Bradypnea		
	Tachypnea		
	Dislodgement of Chest Drain		
CARDIOVASULAR	Bradycardia		
	Tachycardia		
	Arrhythmias		
	Asystole		
	CPR		
	Death		
HEMODYNAMIC	Hemorrhage		
	Hypotension		
	Hypertension		
GASTROINTESTINAL	Vomiting		
	Dislodged of NGT		
GENITOURINARY	Dislodged Urethral Catheter		
ACCESS	Dislodged Peripheral IV Line		
	Dislodged Central Venous Catheter		
SEDATION	Agitation		
NEUROLOGIACL	Seizure		
EQUIPMENT FAILURE	Portable Ventilator		
	Portable Monitor		
	Infusion Pump		
	Stretcher/Bed		
	O2 Depletion from cylinder		
MEDICATION	Discontinuation of Sedative Therapy		
	Discontinuation of Vasoactive Therapy		
FALL	Stretcher/ Bed		

PART D: POST TRANSPORT

29. Patient situation post transport

a) Stable……. b) Unstable ……..

30. Patient Vitals

a) Heart Rate……b) Respiratory Rate …….

b) Oxygen Saturation…….d) Blood pressure…….

APPENDIX IV: DODOSO

SWAHILI VERSION

SEHEMU A. DEMOGRAFIA YA MGONJWA

(WEKA ALMA YA {√} KWENYE JIBU SAHIHI)

1. Namba ya Usajili…….
2. Miaka …….
3. Jinsia
    a) Kike …….. b)Kiume ……..

SEHEMU B
KABLA YA KUMSAFIRISHA MGONJWA

4. Ugonjwa unao msumbua ……..

5. Je, anaugonjwa/magonjwa mengine yanayomsumbua?

    a)Ndio …….b) Hapana ……

6. Kama swali la 5 jibu ni ndio, ni magonjwa gani hayo? …….

TATHMINI YA MGONJWA
NJIA YA HEWA

7. Tiba ya Oksijeni
    a) Ndio ……. b) Hapana ……..
8. Kama swali la 7 jibu ni ndio, anapata kupitia
    a) Endotracheal Tube…… b) Barakoa……
    c) Nasal Prongs…….

UPUMUAJI

9. Mgonjwa;
    a) Ana pumua mwenyewe…….b) Anasaidiwa na mashine kupumua……
    c) Anasaidiwa kupumua kwa Self-inflating Bag……..

MZUNGUKO WA DAMU

10. Mshipa wa damu

a) Pembezoni…… b) Kati …….

ULEMAVU

11. Level of Consciousness (GLASGOW COMA SCORE)

MOTOR	No Response	1	
	Extension	2	
	Abnormal Flexion	3	
	Withdraw	4	
	Localizes	5	
	Obeys Commands	6	
VERBAL	No response	1	
	Sound only	2	
	Words	3	
	Confused	4	
	Oriented	5	
EYE	Remained closed	1	
	Open to pain	2	
	Open to speech	3	
	Spontaneous	4	
TOTAL SCORE			

MFICHUO

12. Umewekewa

a) Mpira wa Chakula…….b) Chest Tube Drain……..

c) EVD ……. d) Mpira wa Mkojo……

e) Hamna……

13.Vitu vya kuzuia kutingishika

a) Kola Shingo…….. b) Thomas |splint…….c) Hamna……..

14. Anapelekwa wapi?

a) CT Scan……. b) MRI……..c) Xray……..d) ICU……

e) Chumba cha upasuaji…….

15.Nani ametoa agizo la mgonjwa kusafirishwa?

a) Daktari bingwa……b) Daktari bingwa mwanafunzi ……

c) Daktari wa casualiti …….

16. Mmefanyamawasilianonaidaramnapompelekamgonjwa?
a) Ndio……b) Hapana…….

17.Namnayakumpelekamgonjwa
a) Machela …… b) Kitanda cha ICU……

18. Machela/ Kitanda cha ICU ina kingo za kumkinga mgonwa?
a) Ndio…….b) Hapana…….

19.Machela/ Kitanda cha ICU kina uwezo wa kubadili umbile lake i.e. CPR position
a) Ndio……. b) Hapana …….

20. Timu iliyotumika kumsafirisha mgonjwa?
Nesi; a)Nesi……. b) Nesi wa ICU…….
c) Nesi wa Usingizi…….d) Mhudumu wa afya……..
Daktari; a) Daktari Bingwa……b) Daktari bingwa mwanafunzi…….
c) Daktari……. d) Daktari mwanafunzi

21. Ulipatiwa elimu rasmi ya namna ya kusafisisha wagonjwa mahututi?
Nesi; a) Ndio……. b) Hapana……
Daktari; a) Ndio……b) Hapana…….

22. Uwepo wa 'Emergency Trolley'
a) Ndio…… b) Hapana……

23.'Emergency Trolley" inavituvifuatavyo..

a. Bag Valve Mask; Ndio…… Hapana……..
b. Laryngoscope; Ndio…… Hapana……
c. Stethoscope; Ndio……Hapana…….
d. Basic Resuscitation Drugs; Adrenaline…… Atropine….. Ephedrine…..
e. Definitive Airway; Endotracheal tube; Ndio…….Hapana……
f. Airway Adjuncts; Oropharyngeal Airway……. Nasopharyngeal Airway….
g. Supraglottic Devices…….
h. Others; specify…….

SEHEMU C; WAKATI WA KUMSAFIRISHA MGONJWA

24.Mgonjwa anakuwa monitored wakati wa kimsafirisha

a) Ndio…….b) Hapana…….

25.Unatumia niniku-monitor mgonjwa?

a)Pulse Oximeter……b) Portable Multiparameter Mashine……

26.Anaendelea kutumia dawa?

a)Ndio……. b)Hapana…….

27. Kama jibu la swali la 27nindio, anatumia infusion ipi?

a) Dripu…….b) Damu…….c) Vasopressor/ Inotropes……..

d) Sedatives……..e) Muscle Relaxants…….f) Nyinginezo……..

28. Matatizoyoyotewakatiwakumsafirishamgonjwa?

a) Ndio…….b) Hapana ……..

ADVERSE EFFECTS DURING INTRAHOSPITAL TRANSFER		**YES**	**NO**
RESPIRATORY SYSTEM	O2 saturation < 90%		
	Dislodged Endotracheal Tube		
	Bradypnea		
	Tachypnea		
	Dislodgement of Chest Drain		
CARDIOVASULAR	Bradycardia		
	Tachycardia		
	Arrhythmias		
	Asystole		
	CPR		
	Death		
HEMODYNAMIC	Hemorrhage		
	Hypotension		
	Hypertension		
GASTROINTESTINAL	Vomiting		
	Dislodged of NGT		
GENITOURINARY	Dislodged Urethral Catheter		
ACCESS	Dislodged Peripheral IV Line		
	Dislodged Central Venous Catheter		
SEDATION	Agitation		
NEUROLOGIACL	Seizure		
EQUIPMENT FAILURE	Portable Ventilator		
	Portable Monitor		
	Infusion Pump		

	Stretcher/Bed		
	O2 Depletion from cylinder		
MEDICATION	Discontinuation of Sedative Therapy		
	Discontinuation of Vaso-active Therapy		
FALL	Stretcher/ Bed		

SEHEMU D; BAADA YA KUMSAFIRISHA MGONJWA

29.Mgonjwa yupokatikahaligani?

a) Nzuri…….b) Mbaya …….

30. Baadayakumuwekamgonjwakatikamashinezaku-monitor,isharamuhimuza

a) Kiwango cha MapigoyaMoyo……
b) Kiwango cha kupumua ……..
c) Oksijeni Saturation …….
d) Shinikizo la Damu ……..

APPENDIX V: 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 AND PUBLICATIONS

Ref. No.DA.282/298/01.C/ Date: 25/02/2021

MUHAS-REC-02-2021-497

Anna Phillipo Assenga
MMed Anesthesiology,
School of Medicine
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: ASSESSMENT OF INTRAHOSPITAL TRANSFER PRACTICE OF CRITICALLY ILL PATIENTS AT MUHIMBILI ORTHOPEDIC INSTITUTE (MOI) IN DAR ES SALAAM

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: 25/02/2021
EXPIRATION DATE OF APPROVAL: 24/02/2022

STUDY DESCRIPTION:
Purpose:
The purpose of this prospective analytical study is to assess intrahospital transfer practice of critically ill patients admitted and managed at Muhimbili Orthopedic Institute from November 2020 to January 2021

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-%20234.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 material transfer agreement (MTA) from NIMR, if research materials (samples) will be shipped to a foreign country,
8. 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)
9. The PI is required to ensure that the findings of the study are disseminated to relevant stake holders.
10. 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/.

Dr. Bruno Sunguya
Chairman, MUHAS Research and Ethics Committee

Cc: Director of Postgraduate Studies

Muhimbili University of Health and Allied Sciences
DIRECTOR
Research &
Publications
Box 65001

APPENDIX VI: PERMISSION LETTER CONDUCT RESEARCH FROM MOI

P.O. Box 65474; DAR ES SALAAM, TANZANIA, MUHIMBILI COMPLEX
Executive Director: +255-022-2153359
General lines: +255-022-2151298/2152937/2152938
FAX: +255-022-2151744
E-Mail: info@moi.ac.tz
Website: www.moi.ac.tz
OFFERING SERVICES IN ORTHOPAEDICS, NEUROSURGERY AND TRAUMATOLOGY

MOI/PF.0879/39 19th May, 2021

Director Postgraduate studies
MUHAS
P O BOX 65001
DAR ES SALAAM

1. RE: REQUEST TO CONDUCT A RESEARCH

2. Reference is made to your letter dated 1st March, 2021 with reference No: **HD/MUH/T.02/2018** regarding the above subject matter.

3. On behalf of the Management I would like to official inform you that your request for Dr. Anna Phillipo Asenga to collect data titled Assessment of Intra-Hospital Transfer Practice of Critically ill Patients at **MOI** has been approved. Therefore very kindly you are requested to inform her to start data collections.

4. On the arrival you should come and see the undersigned person for more information.

5. it's my hope that you will extend enough cooperation regarding this matter.

With regards,

Abdallah Mbuguni
For: Executive Director

Cc: Dean School of Medicine, MUHAS