ASSESSMENT OF FACILITATORS AND CHALLENGES IN IMPLEMENTING SAFETY TRANSFER OF CRITICALLY ILL PATIENTS AT SELECTED REFERRAL HOSPITALS IN RWANDA

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DECLARATION

I declare that this Dissertation contains my own work except where specifically acknowledged

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Signed……..

Date…17th / june /…2019……..

DEDICATION

I dedicate this dissertation work to:

To the God Almighty;

To my dear husband and children;

To my dear mother who passed away in this period of study, may her soul rest in peace.

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Glory be to God Almighty for His love, mercy and kindness in my life from the beginning of the program till this present time. All glory and honor unto His Name.

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ABSTRACT

Background: critically ill patients are often transferred from different hospitals or from scene

to tertiary care hospitals for better outcome, However adverse effect may arise during the transportation and worsen the patient health status. Even though mitigation like equipment and drugs necessary for cardiac and respiratory support, personnel skills and better organization in inter-hospital and pre-hospital transfers may increase patient safety and survival rate during pre and inter- hospital transfer and after admission in referral settings

Aim of this study was to assess facilitators and challenges in pre and inter -hospital transfer; regarding critically ill patients safety.

Method: Quantitative Research approach using descriptive cross sectional research design has been adopted in a period of 2 months involving nurses, non-physician and physicians who accompanied critically ill patients during transfer to tertiary care.

Data analysis: Data collected has been analyzed; descriptively: including frequency and percentages have been calculated; chi-square Pearson test has been used to test associations among variables like education level and monitoring vital signs of patients during transfer using the Statistical Package For Socio Science SPSS version 21. The results are presented in the form of tables and graphs.

Results: This study reviled that in 120 participants enrolled in study 69.1 % of participants were registered nurses 58.3 % working in district hospitals and 35.8% of them were working in ambulance services and emergency department and 35.0 % didn't receive any training regarding BLS, ACLS or another training regarding emergencies and critical care. Monitoring patient vital signs as important facilitator in transfer about 56.3% of health care providers did not be able to monitor Blood pressure during transfer and 51.7 % didn't be able to monitor SPO2, and 76.6% did not document vital signs during transfer.

Conclusion: Even much have been done to improve pre and interhospital in Rwanda, There is still a gap in facilitators regarding staffing such as lack of training related to emergencies and critical care which may help health care providers to acquire more knowledge and skills in continuation of care during pre and interhospital transfer

Key words: Facilitators, challenges, critically ill patients, transfer, pre-hospital, inter-hospital, Safety, referral hospitals.

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LIST OF ACRONYMS, SYMBOLS AND ABBREVIATIONS

AACCN: American Association of Critical Care Nurse

ACLS: Advanced Cardiac Support

BLS: Basic Life Support

BP: Blood Pressure

CO2: Carbon Dioxide

CNS: Central Nerve System

CHUK: Centre Hospitaliere Universitaire de Kigali

CMHS: College of Medicine and Health Sciences

ETT: Endotracheal Tube

GCS: Glasgow Coma Score

ICUS: Intensive Care Unities

ICU: Intense Care Unity

IRB: Institutional Research Board

MICU: Mobile Intensive Unity

MOH: Ministry Of Health

NCDS: Non Communicable Diseases

PHTLS: pre-hospital trauma life support

PALS: Pediatric Advanced life support

RMH: Rwanda Military Hospital

SAMU: Service d' Aide Medicale d' Urgence

SPSS: Statistical Package for Social Science

SPO2: Peripheral Capillary Oxygen Saturation

WHO: World Health Organization

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CHAPTER ONE: INTRODUCTION

This chapter covers background, problem statement, research question, objectives and significance of the study.

1.1 Background

There was an estimated of 58772 million of critically ill patients worldwide (Adhikari *et al.*, 2010 :2)Inter-hospital transfer in the United State of America in 32 Tertiary care centers in 2015 revealed approximately 247,000 patients that are transferred every year. An average of 28% are transferred to intensive care unit), suggesting that lives of 4000 patients have been saved in a year, by being transferred to another more qualified hospital (Herrigel *et al.*, 2016:414).

In Saudi Arabia among 7658 patients admitted in ICU from 1999 to 2010, 8% were transferred from other hospital for ICU admission and 35,3% of them are admitted in ICU from Emergency department (Rishu *et al.*, 2013:4).

Inter-hospital in developing countries as reflected in study done in Jamaica in 2008 revealed that 40.2% were from Road traffic accident, 27.1% were from falls and 26.2% were from assault However several problems with transfer process have been reported like poor documentation of vital signs at referring hospital and lack of appropriate resources. like suctioning devices which were only present in 50% of ambulance and 68,9% of critically ill patient were only accompanied by nurses (Crandon *et al.*, 20012:389).

In in Low Income Countries (LICS), in pre and inter-hospital transfer most critically ill patients suffer from communicable diseases which have not been able to be treated at primary and secondary level and Non communicable disease which are nowadays increasing in LICS such as cardiovascular disease, cancer, respiratory illness, which cause 80% of premature death before sixtieth anniversary and two- third cause of disability from Non Communicable Disease (Jr and Donilon, 2017) although NCDS often create the need critically ill patients being referred for intensive and specialized care (Jr and Donilon, 2017:28-44).

Appropriate pre hospital trauma care service in developing countries is one target which may contribute to decrease mortality caused by injuries; the World Health Organization (WHO) estimation of 5.8 million death every year from injury, 90% of which occurring in developing

countries and a high proportion of these death occurs even the patient reaches the hospital and are aged between 14 and 44 years which is an economically productive age group. Lack of medically appropriate care is attributable to 30% of deaths at site and 80% of the remaining patients died in one hour of injury (golden hour) Although most of the deaths are caused by failure of airway management ,absence of respiratory assistance or continuing blood loss that may be prevented with appropriate pre-hospital and adequate hospital emergent care (Anand, Singh and Kapoor, 2012:67)

According to WHO many fatal injuries may be prevented or their severity reduced by adequate pre-hospital trauma care (WHO, 2010).

Pre and inter -hospital in Sub-Saharan Africa study in Malawi for effect of direct transfer of trauma patient to tertiary care from 2008 to 2012 revealed that 50,059 trauma patients, 6,578 patients transferring from referring facilities and 43,481 transported from the scene (Boschini *et al.*, 2017)

Direct transport of trauma patients from a scene to a tertiary care hospital confers a survival advantages although pre-hospital care is a critical aspect of trauma care which is inadequate in most Low Income Countries (LICS) (Boschini *et al.*, 2017:4)

A comparative study by Mock et al in sub-Saharan in 2012 demonstrate that worse pre-hospital outcome in severely injured patient in Kumasi, Ghana(51%) compared to Mexico city (40 %) and Seattle, Washington (21%.) The worse outcome in Ghana and Mexico was attributable to poor pre-hospital care independent of in hospital care.(Mould-millman, Sasser and Wallis, 2013:1305)

In Rwanda like other low income countries, shortage of specialized health care providers and specialized service and lack of ICUS at secondary level in district hospitals this create the need to transfer patients at tertiary level referral hospitals and ground ambulance are mostly used for transport and health care providers accompanying patients (Kearney *et al.*, 2016)

Pre -hospital care in Rwanda, revealed that 1668 trauma patients were transferred by pre-hospital service to university teaching hospital from December 2012 to February2015 (Mbanjumucyo *et al.*, 2016:194-195)

According to pre-hospital service report in Rwanda (SAMU) in 2015; 6511 patients have been transferred by SAMU of whom 3,336 patients were trauma cases, 2049 patients were medical emergencies and 1,126 patients were obstetrical cases. However resources available to manage these cases have not been explored.

In a study done in 3 Rwanda district hospital cited by Theoneste in 2016 in1227 injured patients were treated where 23.0% of them were recommended of referral to tertiary care (Nkurunziza *et al.*, 2016)

Pre and interhospital transfers save lives although they are expensive in term of logistics challenging and have risk (Lyphout *et al.*, 2018) There is association between risk of physiological deterioration , adverse events and the transport process it's self as revealed by Lyphout et al The prevalence of adverse event is relatively to the longevity of transfer time, to the pre transfer severity of patients illness , injury or to experience of medical escort (Lyphout *et al.*, 2018;22-24)

Adverse events are mostly cardio vascular or respiratory event .The most cardiovascular event are hypertension and hypotension, Bradycardia and tachycardia and arrhythmias, with incidence varying from 9% to 36%.Respiratory event are often inadequate ventilation, SPO2 desaturation ranging from 0 to 15%, including loss of intravenous access however availability of equipment and personnel skills in critical care and good planning for each transport can reduce these complications and maximize optimal benefit to the patients (Droogh *et al.*, 2015:3)

Considerations of cost efficiency and research findings indicating that there is improved outcomes for patients result from specialist services and medical technology resources which are centralized in specialized centers and tertiary hospitals during the past few decade, result from this evolution, the need of patients transfers between hospitals has increased; this demand is expected to continue to increase as the establishment of high volume of specialized treatment centers is expected to grow in the near future (Lyphout et al., 2018)

Pre and inter-hospital transport create significant risk to critically ill patients mostly those with multiple organ failure, Castro suggested that specialized retrieval team is best in transfer of, but the composition, training and assessment of these team is still a matter to debate (Castro, 2017)

1.2 Problem statement

Transfer of patients from hospitals or from scene of accident at a referral center for more advanced and better care is most practice worldwide, studies have shown transferring critically ill patients to specialized centers may be associated with improved outcomes (Rishu et al., 2013) However Droog et al have reviled that referral of patients may be associated with worse outcome; deterioration in respiratory, cardiovascular, and other physiological systems may arise any complication of any patient transport (Droogh et al., 2015) Therefore using appropriate equipment and personnel skills , critical thinking and good planning for each transport can reduce these complications and maximize optimal benefit to the patients (Droogh et al., 2015).

Several problems with the transfer system were identified in developing countries as reviled by study done by Crandon et al in 2012 in Malawi where there was lack of documentation of clinical parameters at referring institutions, functional capacity for suction machine was only present in 50% ambulances, and 68,9% were only accompanied by nurses (Crandon *et al.*, 2012)

In Rwanda Ministry of Health (MOH) has put much effort in strengthening a pre-hospital service and referral system by increasing the number of equipped ambulance per district administrative for SDGs target to reduce morbidity and mortality caused by trauma and NCDs (Scott *et al.*, 2017). Transport of critically ill patients requires specific material and personnel skills and critical thinking to manage or to anticipate the physiological deterioration most cardiac and respiratory arising during transport. The lack of personnel skills for cardio respiratory support for critically ill patient in pre and inter-hospital is the major problem even material available in ambulance may not be used because of lack of skills and guidelines or protocols related to emergencies and critical care.

Due to geographical characteristics of Rwanda composed by mountains and hills, non-paved roads do not facilitate the ground ambulances ‘s electronic material like cardio respiratory monitor’s which are mostly damaged by vehicles motion , acceleration and deceleration movement this is also another challenge in pre and inter-hospital transfer. A study done in Rwanda to tertiary level hospital by Mbanjumucyo et al revealed that from 2012 to 2015 ;1668

patients were transported by prehospital service (SAMU) for traumatic injury during the study period, The majority (77.7%) of patients were male. The median age was 30 years. Motor vehicle collisions accounted for 75.0% of encounters of which 61.4% involved motorcycles. 48.8% of patients sustained injuries in two or more anatomical regions. 40.1% of patients were admitted to the hospital and 78.1% required surgery. The overall mortality rate was 5.5% with nearly half of hospital deaths occurring in the emergency center (Mbanjumucyo *et al.*, 2016).

Pre and inter-hospital transfer in developing countries is associated with problems concerning resources that's why this is motivated to do this study in Rwanda if 5.5% of trauma patients died in emergency department from prehospital; there was a need to assess facilitators and challenges in pre-hospital and inter-hospital transfer for safety of critically ill patient in ambulance to tertiary care in terms of personnel, equipment, communication, guidelines , protocols and challenges the reason of this study.

1.3 The Aim of the Study

The aim of this study was to assess facilitators and challenges in pre and inter-hospital transfer for critically ill patients' safety to tertiary care at CHUK and RMH

1.4 Research Objectives

1.4.1 General Objective

The general objective of this research was to assess facilitators and challenges for the critically ill patients' safety in pre and inter hospital transfer to tertiary care.

1.4.2 Specific Objectives

Specifically, these objectives are:

1. To identify facilitators in pre and inter hospital transfer of critically ill patients safety to tertiary care at CHUK and RMH
2. To identify challenges in pre and interhospital transfers for of critically ill patients to tertiary care at CHUK and RMH
3. To identify essential materials and drugs available in ambulance in pre and interhospital transfer for critically ill patients safety to tertiary care at CHUK and RMH

4. To identify demographic factors like education level associated with patients monitoring during transfer for safety of critically ill patients to tertiary care.
5. To identify the characteristics of critically ill patients on arrival at destination at emergency department of CHUK and RMH

1.5 Research Questions

1. What are facilitators in pre and interhospital transfer for critically ill patients safety to tertiary care at CHUK and RMH?
2. What are challenges in pre and interhospital transfer for critically ill patients safety to tertiary care at CHUK and RMH?
3. What are the materials and drugs in pre and interhospital transfer for critically ill patients safety to tertiary care at CHUK and RMH?

4 .Is there association between the demographic factors like educational level and patients monitoring during transfer for safety of critically ill patients to tertiary care?

4. What are the characteristics of critically ill patients referred at CHUK and RMH?

1.6 Significance of the Study

In nursing practice: The result of this study is expected to give a clear picture of the inter-hospital and pre-hospital facilitators in transfer of critically patients in Rwanda and this will increase awareness on critical care and trauma nursing domain which is recently developing in Rwanda about facilitators availability to transport critically ill; medical and trauma patients from inter-hospital or pre-hospital to tertiary care. This will help in improvement measures at health facilities with accurate data consequently mortality and morbidity of critically ill patients will be reduced.

In nursing education: The result of this study will contribute as an additional source of information to the available literature on this subject, and may be used as references in critical care and trauma nursing specialties in management of critically ill patients in pre and interhospital transfer and this study also may give basic information for curriculum development in nursing education in critical care and trauma nursing specialty.

In nursing research: This study may contribute to foundation for further research in critical care and emergency medicine and nursing concerning the inter-hospital or pre-hospital transport in developing countries where the studies shows a paucity of data regarding transport of critically patient in inter-hospital and pre-hospital in sub-Saharan countries

In nursing management: The result of this study may show where there is a gap or need for improvement in safe transport for critically patients from inter-hospital or pre-hospital, the stakeholders in nursing or in health system in general in Rwanda may use the findings of this study to improve where there is a gap. Consequently the body of knowledge in nursing profession will be increased, this study may probably inform guidelines and protocols that may be developed amended following this study

Concept definitions

Critically ill patient: patient at high risk of potential or actual health life threatening problem, they are highly vulnerable unstable there by requiring intensive nursing care in addition to medical and surgical care. Anatomically many system may be involved Cardio respiratory, CNS, endocrine, genito urinary system abdomen and muscular skeletal system. Etiology can be congenital, trauma, system dysfunction or infectious .(Intensive Care Society, 2014) in this study critically ill patients stand for every patient who is not been able to be managed at secondary level hospital and transferred to tertiary level hospital by ambulance

Inter-hospital transfer: Where the referring hospital lack appropriate staff, equipment or diagnostic facilities, either immediately or when patients deteriorating conditions require more sophisticated and patient is transferred to tertiary care level hospital (Intensive Care Society, 2014). In this study inter-hospital transfer was transfer from district hospitals to tertiary referral hospital or from other tertiary referral hospital to another tertiary referral hospital, or from private clinics or hospital to tertiary referral hospital

facilitators: Skills or something that permits an easier performance of an action (dictionary .com) in this study facilitators stand for staff skills, education and training received by staff accompanying critically ill patients, ability to monitor the patients vital signs, equipment and drugs, guidelines and communication available in the referral system.

Challenges as anything used or acting to block someone from doing something, or to block something from happening: or something that prevents something else from happening or makes it more difficult (Cambridge English Dictionary).In this study challenge would be: Lack of equipment, failure to use equipment, lack of appropriate skills and knowledge, lack of guidelines, patients characteristics, road conditions, duration of transport, Lack of communication, time taken to hander over the critically ill patients after arriving at emergency department of referral hospital.

Safety outcome of critically ill patients it means physiological stability or instability of critically ill patients on arrival at tertiary level Hospital showed by vitals parameters on arrival, absence of complications or ability to manage or to prevent complications during transport, absence or presence of skilled staff, absence of presence of equipment, and all system of transfer.

Pre-hospital refers to: Transfer of critically ill patient from their location home or scene of accident to health facility.(Intensive Care Society, 2014)

Referral Hospitals: are hospitals at tertiary level care with specialized service and specialized health care providers in different domain.

Conclusion: There is limited studies done in Rwanda about resources in transporting critically ill patients in pre-hospital and inter-hospital that's why the need for this study.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter reviews the literature related to inter-hospital, transport and pre-hospital of critically ill patients covers Theoretical literature, empirical literature, critical review of gaps identified and conceptual framework. Search engine like pub med, Hinali, Google scholar, Cochrane have been different articles published in different journals have been used.

2.1 Theoretical literature review

2.1.1 Inter-hospital transfer and Pre-hospital transfer

Transfer of critically ill patients is necessary in three set of circumstances, in pre-hospital, inter-hospital and intra-hospital transport.

The inter-hospital transfer occur when referring hospital lack appropriate staff, equipment or diagnostic facilities, either immediately or when patients deteriorating or conditions require more sophisticated and patient is transferred to tertiary care facility (Whiteley *et al.*, 2011)

Pre-hospital transfer refers to transfer of patients from their location home or scene of accident to hospital (Kulshrestha and Singh, 2016a)

Primary transfer, sometimes called scene transfer, is the transfer of the patient from the scene of the accident to hospital. The aim is to reduce the number of inter -hospital transfers. Many health-care systems in developing country use pre-hospital transfer to reduce mortality mostly in injury victims. Secondary transfer, or inter-facility transfer, is the transfer of patients from one facility to another(Alabdali *et al.*, 2017)

Different guidelines have been proposed by various professional bodies to perform safe transfer of critically ill patients. According American College of Critical Care Medicine, Society of Critical Care Medicine, Intensive Care Society, Association of Anesthetists Great Britain and Ireland and Pediatrics Intensive Care Society all guidelines have stressed upon some key elements of safe patient transfer. Administrative guideline should cover all aspect of transport of critically ill patients such as insurance, budgeting and personnel, patient handoff practices between referring and receiving hospital (Intensive Care Society, 2014)

Pre and inter -hospital transport services using road ambulance, fixe or rotary wing aircraft have to be coordinated for, rapid, effective and efficient for safe transport for critical ill patients for a 24 hours basis. The way of initiation transport should be simple with clear guideline and channel In all situations with emergency of transport of the critically ill rapid response of the transport system together with minimal delays are a must. (England *et al.*, 2015)

2.1.2 Coordination and Communication during transfer

Coordination of transport of critically ill must be centralized to ensure optimum utilization of resources reliable communications must available all time between transport team and referring and receiving hospital. (Intensive Care Society, 2014)

Staff engaging in transportation of critically ill should be trained in various aspect of patient transportation, team must have skills in securing airways, ventilations of lungs, hemodynamic resuscitation and other anticipated emergency transport procedures, staff undertaken patient transportation must be aware of the limitation of available equipment and capabilities.(Intensive Care Society, 2014)

2.1.3.Requirement for ambulance for transfer

Ambulance should be appropriate, to the task in terms of design and equipment, regular checking of availability and functionality and servicing of equipment is required. Particular requirement relate to safety of both patient and staff, adequate space for patient access and to perform medical intervention, adequate power supplies and gases for life support system, adequate lightening and internal climate control, adequate suction, secured stretcher and equipment, acceptable noise and vibration levels and noise protection for passenger, adequate speed and response time, good communication system internal and external, appropriate seating and restraint for staff (Intensive Care Society, 2014).There is two most commonly employed modes of transfer of patients are ground transport, and air transport which includes helicopter or aero-plane ambulances. In Rwanda most mode use for patients transfer are ground ambulances. Mobile intensive care unit are specialized ambulances with all the equipment and staff to transfer critically ill patients and are usually used in addition with specialist retrieval teams available in few developed countries. The literature also supports the use of MICUs with reduced incidences of major adverse events during transfer and improved survival rates with reduced mortality. It is mandatory

recommended to have at least two competent personnel accompanying the patient to be transferred (Catro, 2017). The transferred patients critical care dependency and required are according the failure of single or multiple organ or system failure Patients with requirement of advanced respiratory care during the transport with support of at least two failing organ systems. These patients have to be accompanied by a competent doctor along with a nurse and a paramedic. The accompanying person should be suitably trained, competent and experienced and preferably should have done training in patient transfer and should have sufficient training in advanced cardiac life support, airway management and critical care. If the physician not available to transfer unstable patients, then the provision of contacting the concerned physician by the transport team should definitely be available is (Kulshrestha and Singh, 2016).

Equipment should be checked for adequacy in amount ,available and well-functioning of each transport, taking into account duration of transport, patient's conditions of transport and level of therapeutic required; equipment should be adequately restrained and adequately accessible to the operator. The following equipment should be considered; Respiratory support equipment like Airways, oxygen, mask, nebulizer, suction equipment of appropriate standard, self-inflating and ventilating assembly with PEEP valve, intubation set with appropriate size blade and endotracheal tube, emergency surgical airway set, oxygen supply in excess of that estimated for the maximum transport time.(Intensive Care Society, 2014). Circulatory support equipment Monitor/ defibrillator /External placer, pulse oxymeter, noninvasive blood pressure measuring with appropriate size cuff, vascular cannula, IV fluids and pressure set, infusion pump, arterial cannula and arterial devices, syringes and needle, percardiocentesis equipment (Droogh *et al.*, 2015).

Other equipment like Dressings, bandages, splints and tapes, gloves and goggles for staff protection, nasogastric tube and bag, urinary catheter and bag, pleural drainage equipment, instruments, antiseptic lotion. Cutting shears and portable torch, Neonatal, pediatric, obstetric transport equipment when applicable In addition of equipment; Pharmacology agent in pre and interhospital transfer **.**The drugs necessary for patient transfer include inotropes and resuscitation drugs muscle relaxants, sedatives, analgesics. The medical personnel accompanying critically ill

patient should ensure proper supplies of these emergency drugs. Some emergency drugs like inotropes have to be prepared in pre-filled syringes.

Those drugs are important to manage adverse event , patient specific clinical condition and acute life-threatening medical emergencies like cardiac arrest, hypotension, hypertension, cardiac dysarthimia, anaphylaxis, bronchospasm, convulsions, pain, agitation, hypoglycemia, electrolytes abnormalities, emesis, raised Intracranial pressure (Intensive Care Society, 2014)
The decision to transfer the patient from one health facility to another is important because of exposure of the patient, the staff to additional risk and additional expenses for the relatives and the hospital. The decision to transfer a patient is ranged by a senior consultant level doctor after explanation with patients about the risks and benefits involved. A written and informed consent of patient's relatives along with the reason to transfer is mandatory before the transfer; In some countries dedicated critical care transfer groups have been established to coordinate facilitate the patient transfer. These groups also arrange appropriate facilities at the receiving hospital. A direct communication between the transferring and the receiving should be undertaken with sharing of complete information on patient clinical condition, treatment being given, reason for transfer, mode of transfer and timeline of transfer, in a written document(Intensive Care Society, 2014)

2.1.4.Pre-transfer stabilization and preparation

A proper preparation and stabilization of patient is necessary before transfer to prevent any adverse events or deterioration in patient's clinical condition. The patient should be adequately stabilized, patient's A, B, C and D, airway, breathing, circulation and disability, should be checked, and any associated preventable problems should be corrected. The use of pre-transfer checklist is useful in this context (Kulshrestha and Singh, 2016)

Prestabilization includes: Airway, breathing and circulation a**s** the critically ill patients with Risk or possibility of airway compromise during transfer should be electively intubated with endotracheal tube (ETT) with a cuff and well secured and in correct position. A nasogastric tube is required in some patients to prevent aspiration of gastric contents during transfer. The cervical spine stabilization may be required in some trauma patients (Kulshrestha and Singh, 2016)

Breathing**,** oxygenation and ventilation should be adequately monitored with optimization of the arterial blood gas values. In the suspected pneumothorax, chest drain should be inserted before transfer, especially before air transport (Kulshrestha and Singh, 2016).

Circulation before transfer two wide bore intravenous working cannulas in place are mandatory if any external hemorrhage, should be adequately controlled, and any shock should be treated with intravenous fluids and/or vasopressors. The availability of crossed-matched blood may be required during the transport (Kulshrestha and Singh, 2016).Disability and Neurological status **c**ritically ill patients with head injury, their Glasgow coma scale (GCS) have to be adequately monitored and documented before and during transfer and before administration of any sedative or paralytic agent. Apart from the above pre-transfer checklist, the patient should be protected from cold by provision of suitable blankets. All the baseline investigations should be done on the day of transfer to reflect the present condition of the patient. (Kulshrestha and Singh, 2016)

2.1.5.Monitoring in pre and interhospital transfer

The minimum standard of monitoring recommended for patient transfer includes continuous electrocardiogram monitoring, non-invasive blood pressure, oxygen saturation (SPo2), end-tidal carbon dioxide (in ventilated patients) and temperature. The non-invasive blood pressure may be significantly affected by the motion artefacts, so it may be prudent to use invasive blood pressure monitoring in selected subset of patients. All the monitoring equipment should be secured properly and should be placed at or below the level of the patient for uninterrupted monitoring. The electrical equipment must be functional on battery power with the provision of extra batteries during the transfer. Patients on ventilator must be transferred on portable transport ventilators with the provision of display of alarms related to tidal volume, airway pressure, inspiratory: expiratory ratio, inspired oxygen fraction and respiratory rate (Castro, 2017)

2.1.5.Documentation in pre and interhospital transfer

The documentation of patient transfer is most important but often missed as part of transfer. The documentation should always be clear at all stages of transfer. As it was the only legal document that the patient was transferred, so it must include the patient's condition, reason to transfer, names and designation of referring and receiving clinicians, details and status of vital signs

before the transfer, clinical events during the transfer and the treatment given. A standardized document should be used and maintained both for inter-hospital transfer. These documents should be used for audit purposes for investigating the flaws in the patient transfer. There should be a formal handing over at the receiving facility between the transferring team and the receiving team including the doctors and nurses. The various reports of clinical investigations and diagnostic studies should be handed over to the receiving team. In spite of existing recommendations and guidelines for safe patient transfer, these are often not followed or are not met (Castro, 2017)

2.1.6.Physical environment factors affecting a safe patient transfer in pre and inter hospital transfer

Noise, Vibrations acceleration and deceleration may challenges safety transportation of patients: sources of noise during the patient transfer are usually external wind, rotors of helicopter, and propellers of aircraft, engine and monitoring equipment. The noise created can hinder the auscultation of patient and also can interfere in conversation between the team who are the transferring patient. (Beard *et al.,* 2016) .The various sources of vibration are bad roads and vehicle suspension creating vibration in ground transport, where engine, rotors, propellers and air turbulence create vibration during air transport. The vibration is source of nausea, dizziness discomfort, headache, pain at fractured site, spinal injuries and internal brain hemorrhage can be aggravated with loss of access in intravenous cannulation, endotracheal intubation, . There can also cause the malfunction of motion sensing pacemakers and motion artefacts in the monitoring equipment. These effects of vibration can be minimized by use of holding restraints for the accompanying persons, vibration absorbing mattresses and padding of contact points between the vehicle and the patient. (Beard *et al.,* 2016)**.**The patients are candidates to both radial and linear acceleration and deceleration forces during transfer and the physiological effects produced may be more profound in critically ill patients due to their hypovolemic and vasodilator nature. The patient can have transient hypertension and dysrhythmias due to sudden acceleration or deceleration (Beard *et al.,* 2016) The environment inside the ambulance temperature, humidity is kept at lower temperature by use of air conditioning which can cause hypothermia in susceptible patients, especially neonates. These patients should be covered with warming blankets during transfer. The humidity decreases with altitude in air transport and thus can lead

to drying of secretions of respiratory tract and mucous membranes. These patients will require the use of humidified oxygen and lubrication of eyes by use of artificial tears or drops (Beard *et al.,* 2016)**.**There is another factor which may lead to hypoxia related to altitude mainly in air ambulance**:** The effect of increasing the altitude is mainly related to decrease in inspired oxygen levels most commonly in air ambulance The pressure changes associated with altitude changes causes increased vascular permeability thus causing fluid shifts from intravascular to extravascular compartment leading to edema and hypovolemia from third space fluid loss(Kearney *et al.*, 2016) The difference between the visual and vestibular inputs to brain produces nausea, vomiting or retching caused by motion sickness . There should be provision of a mechanical or electrical suction apparatus during the transfer to prevent from any aspiration (Beard *et al.,* 2016) There are some risk factors for developing complications related to patient conditions and some complications related to staff like inexperienced staff and unfamiliarity with monitoring equipment or insufficient preparation of patient, poor communication with receiving facility, inadequate resuscitation, interruption in therapy failure to prepare monitors before transport and lack of checklist and protocols(Droogh *et al.*, 2015)

2.1.7.Complications during transfer and prevention strategies

Literature shows that oxygen desaturation, atelectasis, bronchospasm, pneumothorax, accidental extubation and airway loss may happen during patient transport. Prevention is provision of optimal sedation and analgesia with provision of suctioning of ETT, end ensuring of correct position of ETT and provision of full oxygen cylinder before transport. And pulse oxymeter for monitoring Spo2 (Castro, 2017) Tachycardia, hypotension, hypertension, arrhythmia and even cardiac arrest .34–16%) may occur during transport prevention is performing adequate resuscitation before transport with provision of invasive and non-invasive hemodynamic monitoring to prevent these complications. (Castro, 2017)Hyperglycemia and hypoglycemia may occurring during transport due to discontinuation of insulin pumps and altered fluid therapy. Prevention is close monitoring to glucose regulation during all phases of transport. Acid-base derangement, caused by equipment dislodgement and interruption in vital infusions such as vasopressor, inotrope, analgesia and sedation. These complications may be prevented by performing ABG before transport which can be repeated during the transport if the facilities are available and ensuring the running and patent lines to continue infusions adequate ventilation-

2.2 Empirical literature

2.2.1Prevalence of transfer in developed and developing countries and associated facilitators and Challenges

A descriptive survey among United State of America in 32 tertiary care from September 2013 to September 2015 founded that in inter -hospital approximately 247,000 patients transferred yearly and the median number of patients transferred each month per receiving institution was 700 (range, 250–2500); on average, 28% of these patients were transferred to an intensive care unit. Transfer protocols and practices varied by institution. Transfer center coordinators typically had a medical background (78%), and critical care trained registered nurse was the most prevalent (38%). Common practices included: mandatory recorded 3-way physician-to-physician conversation (84%) and mandatory clinical status updates prior to patient arrival (81%). However, the timeline of clinical status updates was variable. Less frequent transfer practices included: electronic medical record (EMR) cross-talk availability and utilization (23%), real-time transfer center documentation accessibility in the EMR (32%), and referring center clinical documentation available prior to transport (29%). A number of innovative strategies to address challenges involving inter-hospital handoffs are reported (Herrigel *et al.*, 2016) .This study shown that referral system in high income countries is highly developed in terms of staffing , communications system with technology and availability of protocols and guidelines. In a study from the United Kingdom, 56 children were prospectively monitored for adverse events during inter-hospital transport. Seventy five percent of the patients experienced important complications, with 20% of those being life-threatening. The most common adverse events were hypothermia, drug errors, tachycardia, procedure errors, loss of intravenous access, and cyanosis. Life-threatening events included cardiac arrest, bradycardia, hypotension, and inadequate respiratory support as a result of failed oxygen systems and ventilator malfunctions(Thomas et al 2013.). This study has been done in high income country where they have necessary equipment and qualified staff, the results shows how much complications during transfer are more likely to happen that's why staff competencies and critical thinking is needed and strong referral system to reduce those complications for patients' safety. Rishu revealed that in 7654 patients admitted in ICU in study done in Saudi Arabia 8% of them were transferred from others hospitals, 35.3% of them have had direct admission from Emergency department and 56.7% from hospital

wards (Rishu *et al.*, 2013)A prospective descriptive analytical study done in Jamaica in 2012 revealed that in 122 critically ill patients transferred; Public hospital ambulance transported 91.8% and 7.4% transported by helicopter, ambulances were equipped with facilities of oxygen administration in 99.2% sphygmomanometers present in 91% .although functional capacity of the suction machine present only in50% of ambulances just over 11.4% of critically ill patients were accompanied by physicians and 68,9% were accompanied by nurses(Crandon *et al.*, 2012).Another retrospective study by Laura et al in developing countries in Malawi in 2017 showed that among 50,059 trauma patients referred for tertiary care to Kamuzu Central Hospital among them 6,578 were transported from referring facilities and 43,481 patients were from the scene and the author suggested that there is a need for strengthening pre -hospital care because direct transfer of trauma from the scene to tertiary care is associate with a survival benefit and timely transfer from district hospitals could mitigate trauma related mortality in poor settings. (Boschini *et al.*, 2017).Fried et al in a retrospective study of 2,396 inter-hospital patients' ground transfers to study the reason of transfers and to search for adverse effect during transfer, 89% of transport were for special diagnostic and specialist care. The most common event were monitor failure, infusion pump failure and unspecified ventilator failure. The author suggested that the role of personnel accompanying critically ill patients is to recognize problem early and provide correction action as soon as possible(Whiteley *et al.*, 2011)

In prospective audit of ground transport of ICU patients in 2011 in the Netherlands, Lightnebargs and associates found that adverse events occurred in 34 % transfer. Respiratory problems were the most common reasons of patients transfer to tertiary care, followed by multisystem failure and sepsis. Sixty five percent of patients were mechanically ventilated. Adverse event ranged from severe physiologic instability to equipment malfunctions. After reviewing records, the author suggested that 70% of adverse events should had been avoided by better preparation prior to the transport, through better communication between referring and receiving hospitals and by the use of checklist and protocols (Rrt and Branson, 2013).

Observational case control study done in rural Midwestern state from 2005 to2014 in a total of 18,146 patients which 59% were transferred between hospital ,majority had sepsis and associated with high mortality and longer hospital stay (Shane, 2017)

Another study done in pediatrics critically ill revered that in 75% of children transferred at Birmingham children hospital, inadequate cardio respiratory support, equipment failure, drug administration errors, and inexperienced medical escort in the care of critically ill were common, incapable of performing basic necessary resuscitative measures .

In a systematic review from 5,699 articles from MEDLINE, EMBASE and CNAHL in 2012 showed that patient safety outcome during pre- hospital and inter -hospital transfer ranged from patients physiological variables like heart rate, blood pressure, oxygen saturation, and equipment rate of malfunction like defibrillators, stretchers, monitoring equipment, perceived barriers in self-reporting adverse event like culture, fatigue, policies and information exchange in dispatch at transfer of care, technical skills accuracy like Medication errors, dose calculation, endotracheal success rates,.(Bigham *et al.*, 2012)

Difference in geography, population density, local National Health System (NHS) organization and infrastructure make difficult to extrapolate data to estimate the numbers of transfers occurring nationally (Whiteley *et al.*, 2011)

Ginn and associates in a retrospective study in 2010, examined the transport of 192 multiple trauma and isolated head injury patients by a specialized transport team with the longest transport being 120 miles in ground ambulances, Eighty three of the multiple trauma patients required mechanical ventilation. One patient died during the transport from progressive illness rather than the action of transport team. The expertise of those team suggested the author could have a positive impact on the outcome of transported trauma and other critically patients. Inter-hospital or pre-hospital of critically ill patient require a team with high skilled members, in addition to vehicle operator, a minimum of 2 people should accompany critically ill patient. The team can be a combination of doctors , nurses, respiratory therapists, and paramedics with each being skilled in advanced airway management and advanced cardiac life support (Rrt and Branson, 2013)

As reported by Droogh and associates in a study from 2009 to 2011 in a period of 30 months on 353 patients who were transported 24% of incidents were cardiovascular bradycardia , or tachycardia, hypotension or hypertension, arrhythmia and 36% were technical incidents related

to missing or damaged equipment, gas supply problem, power failure and author suggested that 52 to 92% were preventable (Droogh *et al.*, 2015)

A study done in Rwanda to tertiary level hospital by Mbanjumucyo et al revealed that from 2012 t0 2015; 1668 patients were transported by prehospital service (SAMU) for traumatic injury during the study period. The majority (77.7%) of patients were male. The median age was 30 years. Motor vehicle collisions accounted for 75.0% of encounters of which 61.4% involved motorcycles. 48.8% of patients sustained injuries in two or more anatomical regions. 40.1% of patients were admitted to the hospital and 78.1% required surgery. The overall mortality rate was 5.5% with nearly half of hospital deaths occurring in the emergency center (Mbanjumucyo *et al.*, 2016)

2.3 Critical review and gap identification

The transport of critically ill patients during pre-hospital and inter-hospital is more advanced in developed countries in terms of facilitators as has been shown by studies and contribute to reduction of mortality and morbidity (Bigham *et al.*, 2012) therefore in developing countries there is a paucity of data in this domain especially in sub-Saharan Africa where in some countries these referral system do not yet exist. In Rwanda there is a pre-hospital service and inter-hospital referring system. Few studies have been done and they are concerned on epidemiology of trauma patients referred in inter-hospital and pre-hospital to tertiary care therefore, they did not study about facilitators available and challenges for safety transport of those patients and inter-facility transport has been ignored .Hence the interested in this study

2.4. Conceptual Framework

This section summarizes the variables that will guide the researcher. The main objective of this study is to assess the facilitators and challenges in pre and inter-hospital transfer of critically ill patients safety to tertiary care at CHUK and RMH:

Facilitators was been explained by ambulance equipment available and functional for monitoring vital signs of patients, equipment for supporting cardiorespiratory system, ambulance equipment and communication equipment, Facilitators concerning staff accompanying critically

ill qualification nurse, anesthetist, physician, critical care nurse, training received on Basic Life Support, Advanced cardiac life support and other training related to emergencies and critical care Guidelines and protocols of management critically ill patients available in ambulance

Challenges in pre and interhospital transfer related to Lack of skills and knowledge, Lack of training related to BLS, ACLS or other training related to emergencies and critical care .Challenges related to environment, challenges related to patients complications during transportation and challenges related to lack of equipment.

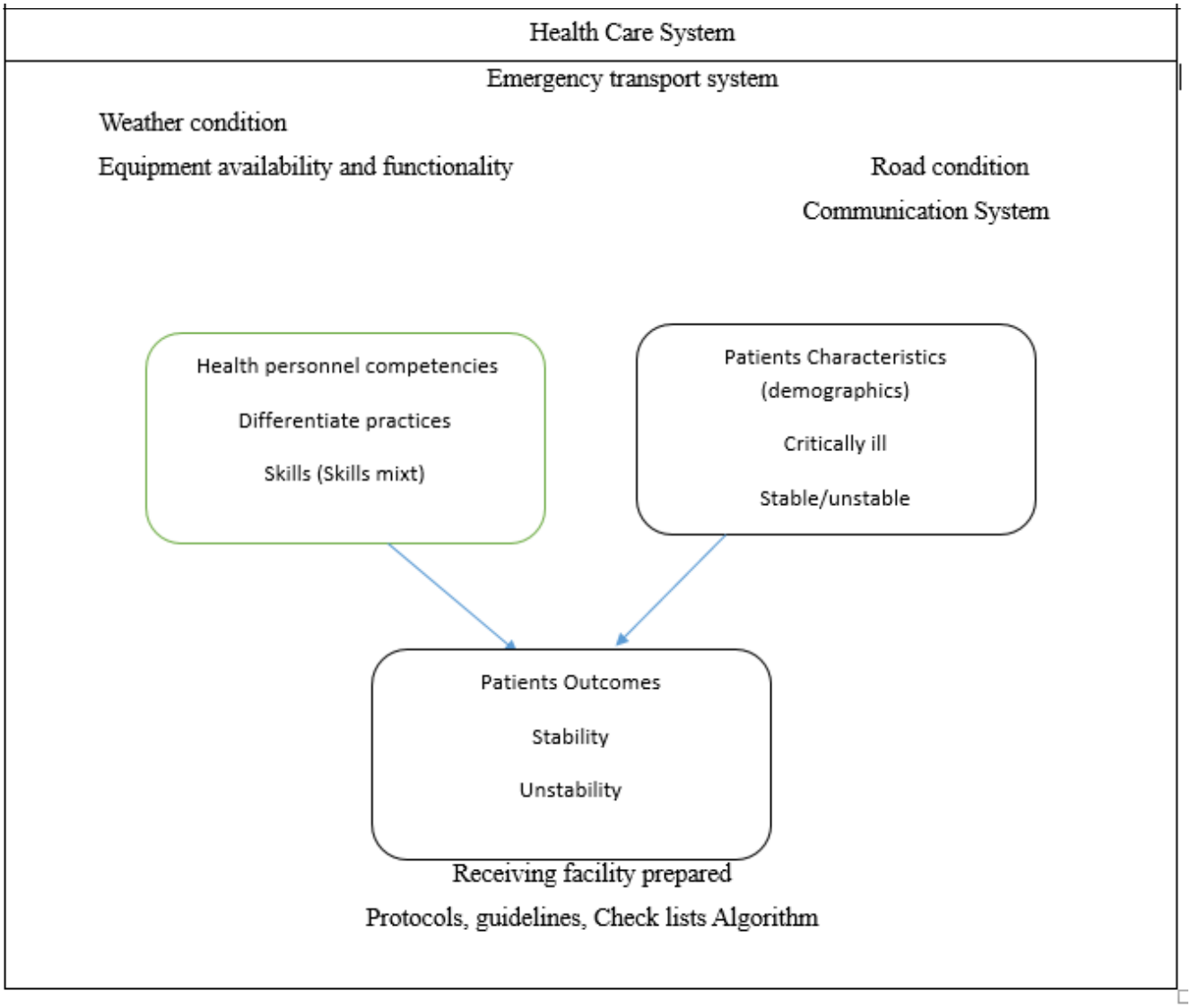
Patients characteristics were explained demographic data, age, sex, type of illness, stable or unstable. By Airway, Breathing, circulation, Disability (Glasgow coma scale) and vital signs on arrival at emergency department of receiving hospital.

I will adopt American Association of Critical Care Nurse (AACN) Synergy Model. The American Association for critical nurses' synergy model has been used in different settings of critical care and transfer of patients. It would be beneficial to the patient to base decisions about transporting a critically ill patient based on a model that focuses on patient characteristics and nurses' competencies. Application of the AACN Synergy Model in this study will help to understand the concepts used and relationship between concepts.

Most of the time, when the patients are referred to the tertiary level care facilities, their conditions are unstable, unpredictable, vulnerable and unable to take any decisions on their own. Based on the patient's condition, the nurse and the other health care professional should possess adequate clinical judgment skills and availability of all the necessary resources to provide optimum care. The individual or the person making the triage decision carries the responsibility of ensuring the most appropriate mode of transport, good communication, availability of the resources to observe changes in the patient and provide emergency care, time and level of care provided to the patient, reaching the correct destination on time and resources necessary for resuscitation. When the triaging and transporting of the patient carried out effectively, it will reduce the mortality and morbidity of the patient and save the resources for the health care system. It will also assist the nurses to achieve the desired objectives or goals set for the patient. In this study, the referring health personnel is expected to possess adequate clinical judgment skills, clinical inquire and able to collaborate with the referral hospitals to enable smooth transfer

of the patient from the destination. Furthermore, the accompanying health personnel should apply systems thinking to observe any changes in the vital signs to avoid further deteriorations in the client's condition. In health system of patient transportation there must be equipment, protocols and guidelines, environment conditions, health personnel skills and patients characteristics in combinations these will have outcome on safety of critically ill patients transport to tertiary care.

Figure 1: Application of Synergy model in this study



(Curley, 2007)

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Introduction

This chapter describes the whole process that used to get accurate data of all variables under study like the study population, study approach, research design, research setting, instrumentation and its reliability and validity data collection process and analysis and how data will be managed ethically and academically.

3.1. Research design

The study was cross- sectional descriptive design as information was collected once at time. This method was selected to allow accurate collection of information that was required for this research project.

Descriptive design: is a way of inquiry used when little is known about a particular concept, the investigator describes, observes and documents different aspects of that concept (Sousa et al, 2007)

3.2.Research approach

A quantitative research approach have been used to quantify statistically the facilitators and challenges in transfer of critically ill patient

3.3 Research setting

The study was conducted at Emergency department of tertiary level hospitals CHUK and RMH located in Kigali city. The selection of those two sites was based on fact that they have a well-organized Emergency department receiving critically ill patients' trauma and medical; patients which may need surgery from different hospitals and from home or scene of accident.

CHUK is tertiary level Hospital located in Nyarugenge District. The hospital bedding capacity is 550 beds. CHUK is the first Rwandan Teaching Hospital and the largest hospitals in the country (Rwanda) with staff turning around 792, among these, nurses are 500 (63%) and CHUK receives critically ill patients transferred from about 42 district hospitals in the country in addition to patients from home or scene of accident from Kigali city and nearest provincial districts; patients who are admitted to Emergency and ICU are among the various types of critical illnesses, both

medical, trauma and surgical about 300 transfer every month received at Emergency department.

Rwanda Military Hospital (RMH) is also a tertiary level hospital, located in Kigali city in Kicukiro District, receives referral patients mainly from Eastern province civilians and Masaka District Hospital and from military and police. The 2 tertiary level referral hospital CHUK and RMH have general ICU, They offer specialized care mainly general and orthopedics surgery and neuro surgery. They have CT scan for advance medical imaging.

3.4 Population

The population of this study were nurses, non-physicians anesthetists and Emergency medical Physicians who accompanied critically ill patients to tertiary level hospital

3.5 Sampling

3.5.1 Sampling

A Non Probability Convenience Sampling strategy was used: the researcher collected data from nurses, non-physicians anesthetists and medical doctors who accompanied critically ill patients from hospitals; district hospitals or from other referral hospitals or from pre-hospital that the researcher met at the emergency department of CHUK and RMH.

3.5.1.1 Inclusion criteria

All Nurses, non-physician anesthetists and medical doctor who accompanied critically ill patients to tertiary care transported by ambulance at CHUK and RMH, from district hospital or other referral hospital or from pre-hospital Services who agreed to consent to study.

3.5.1.2 Exclusion criteria

Nurses, non-physician anesthetists and medical doctor who accompanied transfer of critically ill patients to tertiary care transported by ambulance at CHUK and RMH, from district hospital or other referral hospital or from pre-hospital Services who were not consent to participate in the study.

3.5.2 Sample size

A total population of 120 participants have been enrolled in this study89 nurses, 24 non-physicians anesthetists and 4 Emergency medical Physicians who accompanied critically ill patients to tertiary level hospital.

Sampling strategy

In this study participants were selected conveniently with a non-probabilistic convenience strategy technique, participants were selected based on characteristics of population and objective of the study, all health care providers accompanying critically ill patients from hospitals or from home or from scene of accident with ambulance to Emergency department of CHUK and RMH. At least 2 health care provider from 42 district hospitals and 5 referral hospitals which make a total of 94 plus 28 nurses and 12 non physicians anesthetists from prehosipital service a total population of 134 participants but only 120 were enrolled in this study.

Validity and reliability of research instrument

A structured questionnaire adapted from similar study done in Tanzania at Muhimbiri National Hospital has been adapted after getting permission to use it and adapt it in this study: some modification on the tool on assessment of communication facility availability. A check list for ambulance equipment also has been used.

Validity

Content and face validity of tools used in this study have been assessed by experts in critical care specialty professor BUSISIWE BWENGHU. Consultation of professor in critical care and trauma nursing and Emergency medical doctors working at CHUK at emergency department they checked content of tool are according objectives, literature and were questions were clear. A content validity is concerned on degree to which has an appropriate sample of items for the construct being measured and is based on expert judgment (Polit & Beick, 2003)

Reliability

Reliability of tool is the consistency which the tool measures the target attribute and give the same results to make sure that the tool is measuring what it is supposed to measure, the

questionnaire was adapted to the current study. The questionnaire was finalized after the test and retest among 6 nurses and 4 non physician anesthetists used to test the instrument.; to determine the clarity of questions, effectiveness of instructions, completeness of response sets, time required to complete the questionnaire and success of data collection technique and were asked to comment on the applicability and appropriateness (validity) of the questionnaire.

Internal consistency among the questionnaire items was 0.90 Cronbach's alpha (α) and it was considered within the acceptable range. The researchers determined that it would take10 to 15 minutes to complete the questionnaire.

3.6 Data collection

Data collected by the researcher only from nurses, non-physicians anesthetists and physicians, who accompanied critically ill patient in ambulance, questionnaire administered to personnel accompanying critically ill patient in ground ambulance who accepted to participate in this study and a check list for checking availability and functionality of ambulance equipment done by researcher herself. The transfer documents and a triage form for patient characteristics and Vitals on arrival have been checked.

Table 3. 1: Construct validity of the tool

Objectives of the study	**Components of the conceptual framework**	**Items in questionnaire**
To identify facilitators in pre and interhospital transfer for critically ill patients safety to tertiary care	Demographic data of staff accompanying critically ill patient Training received by staff, and ability to monitor patients vital signs. Availability of equipment and protocols Communication system	These have been assessed by section 1 of questionnaire by questions related to assessment of facilitators.
To identify challenges in pre and interhospital transfers for of critically ill patients safety to tertiary care at CHUK and RMH	Lack of competencies Lack of Equipment Lack of protocols and guidelines Patients complications Time used from referring to receiving setting	This has been assessed by section 2 of questionnaire, questions related to assessment of challenges
Patients characteristics on arrival at emergency department	Patients Stable or unstable (Vitals on arrival: pulse, Blood pressure, Respiratory rate, temperature, SPO2, GCS, Glycaemia)	This was assessed in checklist filled by researcher from triage form of emergency department filled

The table above illustrates the construct validity tool. Reliability of instrument

3.6.1 Data collection procedure

The data collection took place in April and May 2019 at Emergency department of CHUK and RMH: after the handing over of the patient. The health care providers accompanying the patient were approached and given an oral information about study and the purpose of the study and showed the permission to conduct the study and asked if he agreed to participate in the study and signed informed consent form; upon agreement to participate a structured questionnaire administered and asked to fill when he fill comfortable and have time .some decide to fill in that time when are waiting the administrative procedure concerning transfer, other decide to go with it and then bring it back and others refused. Data were collected using closed ended questionnaire to health care providers accompanying critically ill patients referred in ground ambulances. A checklist also has been used to check essential ambulance equipment and drugs by researcher him/herself after getting approval from health care provider and driver. Triage form of emergency department and referral letter have been checked at every triage of referred patient brought by ambulance for patients characteristics at arrival and check list filled.

3.7 Data analysis

Data was recorded and analyzed using the SPSS program version 21. Descriptive statistics was been done to analyze variables frequencies, percentages. The Chi-square test was used to measure the strength of associations between variables, a “p” value of <0.05 was considered to be statistically significant.

3.8 Ethical consideration

Ethical clearance to conduct this research approval was obtained from CMHS IRB (see appendix), Permission to conduct study at the site was been approved by CHUK and RMH ethic committee (see appendix). The researcher presented ethical clearance from IRB/CMHS and ethical clearance from CHUK and RMH to unit managers of emergency department and explain the purpose of study .The researcher began collection of data by ensuring to participant that the participation in the study was voluntary. Anonymity of participant and Health facility have been considered by using codes and explain to participant that no name of participant or Health facility must not appearing to the questionnaires and Checklist. The participants assured that the information for the study is confidential and used for study purposes of this study alone, and a signed informed consent obtained from Participants. To ensure voluntary participation,

participants were informed on their right to withdraw in study at any time without any consequence.

Confidentiality is considered on data, data are kept in locked cabinet only researcher have access on data hard copies and password is used on computer for soft data.

3.9 Data management

All data collected entered in software, stored on external disk of computer with code known by researcher only, and hardcopies are kept in locked cupboard for confidentiality and be used for the purpose of research and will be destroyed after 5 years.

3.10 Data Dissemination

The results of this study will be published in order to be accessible by public in need because will provide current information on facilitators and challenges in transfer of critically ill patients and the researcher will provide feedback to the study setting CHUK and RMH and the Ministry of Health which may inform all hospitals to increase awareness on transfer of critically ill patients.

3.11 Problems and Limitation of the study

Limitation of study is related to research design used as descriptive study cannot relate the cause and effect of critically ill patient's status and safety outcomes by the facilitators and challenge found during transportation in pre and interhospital transfer.

Problem related to participant where one participant may accompany critically ill patients more than once. The participant fill the question once time this is the same for ambulance, one ambulance brought different patients, ambulance number have been coded by the researcher to be identified for another transfer.

Conclusion to chapter 3

The researcher ensure that the methodology used to collect data, sampling, and data collection instrument came out with accurate and reliable data

CHAPTER FOUR: RESULTS

4.0.Introduction

This chapter includes description of results, starting with a descriptive analysis of participants' demographic data, descriptive analysis of facilitators and descriptive analysis of challenges in pre and interhospital transfer, descriptive statistics of essential material and drugs available in ambulance followed by inferential statistics by Pearson chi-square test on association between demographic factors like educational level and Patients monitoring in pre and interhospital transfer. Results are presented in tables.

Presentation of this study findings as aligned with objectives

4.1.Demographic characteristics of respondents

Table 4. 1: Distribution of respondents by socio-demographic characteristics (N=120)

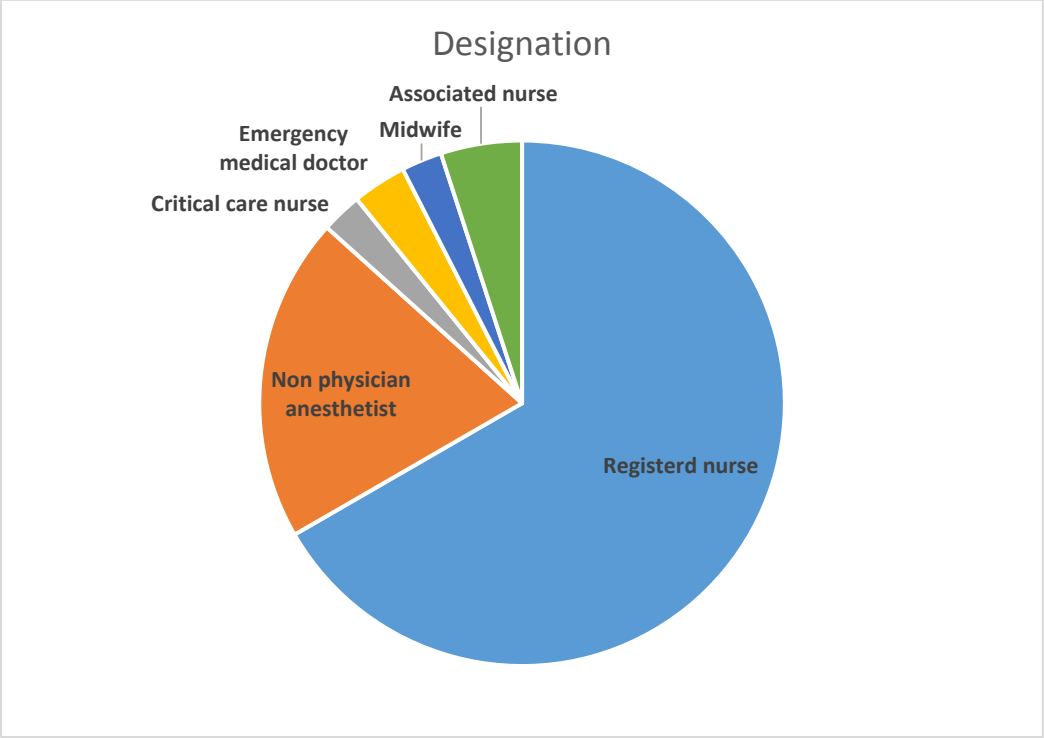
Demographic variable	Frequency (n)	Percentage (%)
Gender		
Male	75	62.5
Female	45	37.5
Qualification		
High school	10	8.3
Advanced Diploma	88	73.3
Bachelor	17	14.2
Masters	5	4.2
Position		
Registered nurses	83	69.1
Non physician anesthetists	24	20.0
Emergency medical Doctor	4	3.3
Midwifes	3	2.5
Associate nurses	6	5.0
Place of work		
District Hospital	70	58.3
Pre-hospital service	33	27.5

Referral Hospital	17	14.2
Working experience		
Less than one year	6	5.0
1 year to 2 years	16	13.3
Above2 years - 3 years	28	23.3
Over 3 years	70	58.3
Working Department		
Emergency Department	43	35.8
Ambulance Service	43	35.8
ICU	7	5.8
Operating Room	6	5.0
Internal Medicine ward	14	11.7
Surgical ward	6	5.0
Obstetrics and gynecology ward	1	0.8
Training received		
ACLS	24	20.0
BLS	40	33.3
Training related to emergencies and critical care	14	11.7
No training received	42	35.0

Source: Research findings, (2019)

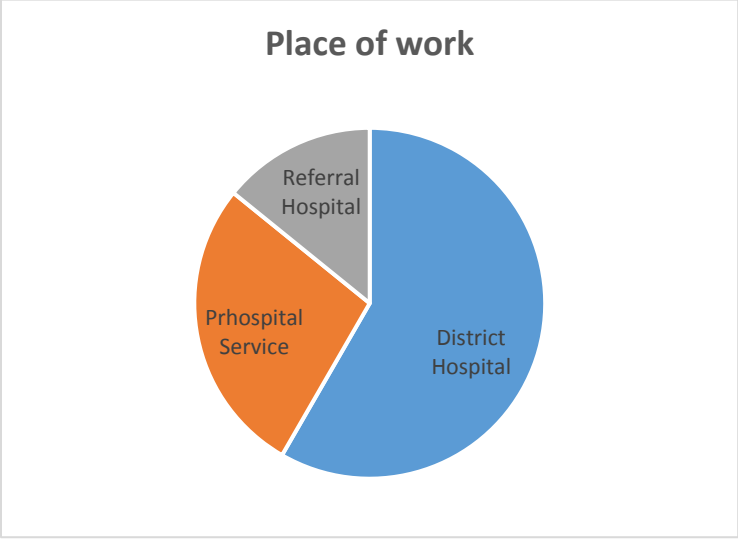
As shown in the table 4.1 above 62.5 % participants were male, 73.3 % hold advanced diploma and 69.1 % of participants were registered nurses and 20% were non-physicians anesthetists (=120) and emergency medical doctor 3.3% of participants. 58.3 % of participants were working in district hospitals and 35.8% (n=120) were working in ambulance services and emergency department. 35.0 % didn't receive any training regarding BLS, ACLS or emergencies and critical care. 58.3 % had above of 3 years of working experience.

Figure 2: position



Source: Research findings 2019

Figure 3: Place of work



Source: Research findings 2019

Table 4. 2: Distribution of responses on facilitators in pre and interhospital transfer (n=120)

Frequency variable	Frequency (n)	Percentage (%)
Number of health providers accompanying the patient in ambulance		
One healthcare provider	82	68.3
Two health care providers	38	31.7
Number of patient brought in transfer		
One patient brought in ambulance	104	85.0
Two patients brought in ambulance	16	13.3
BP monitoring		
No	68	56.7
Yes	52	43.3
Pulse monitoring		
No	37	30.8
Yes	83	69.2
Respiratory rate monitoring		
No	26	21.7
Yes	94	78.3
SPO2 monitoring		
No	62	51.7
Yes	58	48.3
Temperature monitoring		
No	109	90.8
Yes	11	9.2
Glycemia monitoring		
No	59	49.2
Yes	25	20.8
Not necessary	3	2.5
Vital signs documented during transportation		

No	92	76.7
Yes	28	23.3
GCS assessment during transportation		
No	44	36.7
Yes	76	63.3
Remembering to elicit GCS		
No	62	51.7
Yes	58	48.3
Referring facility called receiving physician		
No	12	10.0
Yes	108	90.0
Communication by cell phone		
No	3	2.5
Yes	117	97.5
Communication by radio		
No	119	99.2
Yes	1	0.8
BLS Protocol in ambulance		
No	113	94.2
Yes	7	5.8
ACLS Protocol in ambulance		
No	115	95.5
Yes	5	4.2
Other protocol related to emergencies management		
No	62	51.7
Yes	24	20.0
Transfer Protocol		
No	106	88.3
Yes	14	11.7

Source: Research findings 2019

As shown in the table above 68.3% participants are health care providers accompanying critically ill patients in ambulance in number of one health care providers without considering driver and patients relatives, and 85 % of health care providers brought one patient in ambulance. Monitoring as important in transfer about 56.3% of health care providers did not be able to monitor Blood pressure during transfer and 51.7 % didn't be able to monitor SPO2, and 76.6% did not document vital signs during transfer and 90.2 % did not monitor patients' body temperature. For communication about 90% health care providers calling receiving physician before transportation by cell phone. Transfer protocol about 88.3% participants respond don't have transfer protocol and others protocol related to emergencies and critical care.

Table 4. 3. Distribution of challenges in pre and interhospital transfer for critically ill patients safety to tertiary care (n=120)

variables	Frequency (n)	Percentage (%)
Time used from referring to receiving		
30 minutes to 1 hour	47	39.2
1h30 minutes to 2 hours	36	30.0
2h30 minutes to 3 hours	21	17.5
Over 3 hours	15	12.5
Lack of skills and knowledge related to emergencies and critical care		
No	97	80.8
Yes	22	18.3
Lack of equipment		
No	31	25.8
Yes	89	74.2
Lack of guideline and protocols related to emergencies and critical care		
No	55	45.8
Yes	65	54.2

Lack of training related to emergencies and critical care		
No	24	20.0
Yes	96	80.0
Frequency of environment bad road and traffic jam		
Never	17	14.2
Rarely	47	39.2
Sometimes	24	20.0
Very frequently	32	26.7
Adequacy of space and light in ambulance for management critically ill patients		
Not adequate	93	77.5
Adequate	26	21.7
Difficulties in communication		
No difficult	40	33.3
Line busy	24	20.0
Misunderstanding on transferring patient	41	34.2
Delay to respond	10	8.3
Lack of network	2	1.7
Patients complications during transportation		
No complications	37	30.8
Dyspnea	4	3.3
SPO2 below 92%	2	1.7
Low blood pressure	2	1.7
Bradycardia	3	2.5
Hyperglycemia	1	0.8
Agitation	14	11.7
Altered mental status	2	1.7
Pain	17	14.2

Vomited	24	20.0
Loss of IV access	1	0.8
Oxygen emptying	13	10.8
Ability to manage the complications		
No	57	47.5
Yes	31	25.8
Not applicable	32	26.7
Time taken to hander the patient		
In 10 minutes	42	35.0
Above10 minutes to 30 minutes	33	27.5
Above 30 minutes	45	37.5
Doing a written handover		
No	117	97.5
Yes	3	2.5

Source: Research findings 2019

As results shown in above table on challenges in pre and interhospital transport for critically ill patients safety to tertiary care; 30.0% respondents use between 1hour 30 minutes to 2 hours from reoffering to receiving facility, 17.5% use 2hours 30 minute to 3 hours from referring facility to receiving facility, 12.5% use over 3 hours to reach receiving facility. 74.2% participant reported lack of equipment as a challenges and 80% reported lack of refresher training in management of critically ill patient during transfer but only 18.3% reported lack of skills and knowledge in emergencies and critical care. On environment 26.7% reported to meet very frequently bad road and traffic jump. In communication 34.2% participants reported misunderstanding to transfer the patient to referring facility. For patients complications 20% of participants reported vomiting as most complications got by patients during transportation and Oxygen emptying during transportation as most adverse effect and 47.5 % of participants didn't be able to manage patients complications during transportation and 77.5 % find that space and light for management of critically ill patients were not adequate. Time taken to handover the patient 37.5 % of participants reported above 30 minutes for handover the patient to receiving facility and 97.5 % did not perform a written patients handover.

Table 4. 4. Essential Material available in ambulances (n= 40)

Frequency variable	Frequency (n)	Percentage (%)
Bag valve mask		
Not available	10	25.0
Available not functional	5	12.5
Available and functional	25	62.5
Portable ventilator		
Not available	38	95.0
Available and not functional	0	0.0
Available and functional	2	5.0
Oxygen cylinder with manometer and oxygen gas		
Not available	6	15.0
Available not functional	2	5.0
Available and functional	32	80.0
Venturi masks and nasal cannula		
Not available	7	17.5
Available and functional	33	82.5
Laryngoscope with blades bulbs and batteries		
Not available	26	65.0
Available and functional	14	35.0
Oropharyngel airway		
Not available	27	69.2
Available and functional	12	30.8
Magill forceps different size		
Not available	29	74.4
Available and functional	10	25.6
Suction machine and tubes		
Not available	22	55.0
Available not functional	1	2.5
Available and functional	17	42.5
Defibrillator		
Not available	37	92.5
Available not functional	2	5.0
Available and functional	1	2.5
Infusion pump		
Not available	39	97.5

Available not functional	1	2.5
Syringes pump		
Not available	40	100.0
Cardiac monitor		
Not available	23	57.5
Available not functional	6	15.0
Available and functional	11	27.5
Pulse oxymeter		
Not available	20	50.0
Available not functional	6	15.0
Available and functional	14	35.0
Sphygmomanometer and stethoscope		
Not available	17	42.5
Available not functional	12	30.0
Available and functional	11	27.5
Thermometer		
Not available	24	60.0
Available not functional	8	20.0
Available and functional	8	20.0
Glucometer		
Not available	23	57.5
Available not functional	7	17.5
Available and functional	10	25.0
Electricity sources		
Not available	1	2.5
Available not functional	7	17.5
Available and functional	32	80.0
Stretcher		
Not available	1	2.5
Available not functional	10	25.0
Available and functional	29	72.5
Sheet or blanket		
Not available	28	70.0
Available	1	30.0
Tapes and bandages		
Not available	9	22.5
available	31	77.5
Cervical caller		

Not available	28	70.0
Available	12	30.0
Gloves		
Available	40	100.0
Facial masks		
Not available	20	50.0
Available	20	50.0
Goggles		
Not available	36	90.0
Available	4	10.0
Disinfectants		
Not available	22	56.4
Available	17	43.6

Source: Research findings 2019

This table 4.6 above is showing results for our study of essential equipment available in ambulance during transportation of critically ill patients, 40 ambulances have been checked to ensure the availability and functionality of those equipment for Respiratory support equipment like Bag Valve Masks were available and functional in 62.5 % ambulance, portable ventilator available in only 5.0%, Oxygen cylinder with manometer available and functional in 80.0 % ambulances, Venturi masks and nasal cannula available in 82.5 %. For airway management; laryngoscope with blades bulbs and batteries available at 35.0 % ambulances, Suction machine available and functional in 42.5 % ambulance, Oropharyngeal airways available in 30.8% and cervical collar available in 30.0% ambulances. For Hemodynamic support equipment; defibrillator was available in only 2.5 % and Tapes and bandages available in 77.5%, For monitoring equipment cardiac monitor available and functional in 27.5%, Sphygmomanometers and stethoscopes available and functional in 27.5% Pulse oxymeters available and functional in 35.0%, Thermometer available in 20.0 %, glucometer in 25.0% ambulances. For other supportive equipment electricity sources was available and functional in 80.0 %, stretcher available and functional in 72.5 %, sheets or blanket available in 30% ambulances. For infection control equipment; Gloves were available at 100% in all ambulances checked, Facial masks available in 50.0%, Goggles available in 10% and disinfectants available in 43.6% ambulances.

Table 4. 5. Necessary Drugs available in ambulance (n= 40)

Frequency variable	Frequency (n)	Percentage (%)
Adrenaline or noradrenaline		
Not available	19	47.5
Available	21	52.5
Ephedrine		
Not available	26	65.0
Available	14	35.0
Cristalloids fluids		
Not available	11	27.5
Available	29	72.5
Antiarrhythmic		
Not available	36	90.0
Available	4	10.0
Antiseizures		
Not available	12	30.0
Available	28	70.0
Analgesics		
Not available	13	32.5
Available	27	67.5
Infusion set		
Not available	2	5.0
Available	38	95.0
Syringes		
Not available	3	7.5
Available	37	92.5
IV Catheters		
Not available	3	7.5
Available	37	92.5
Bronchodilatators		
Not available	10	25.0
Available	30	75.0
Check list for drugs and equipment		
Not available	28	70.0
Available	12	30.0

Source: Research findings 2019

The table 4.7 above are findings from this study on necessary drugs available in ground ambulances transferring critically ill patients in pre and interhospital transfer to tertiary care (N=40) for cardiac support drugs: inotropes like adrenaline or noradrenaline were available in 17.5% (n =40), antiarrhythmic available in 3.3 % , and crystalloids fluids most available in 24.2%, antiseizures available in 23.3%, analgesics available at 22.5 %, and bronchodilators available in 25.0% and checklists for drugs and equipment available in 10.8% ambulances, Syringes to administer those drugs available in 92.5% ambulances, IV catheters available in 92.5% ambulances, infusion set available in 95.0% Ambulances.

Table 4.8 Associated demographic data with patients monitoring in pre and interhospital

Table 4. 6. Necessary Drugs available in ambulance (n= 40)

Frequency variable	Frequency (n)	Percentage (%)
Adrenaline or noradrenaline		
Not available	19	47.5
Available	21	52.5
Ephedrine		
Not available	26	65.0
Available	14	35.0
Cristalloids fluids		
Not available	11	27.5
Available	29	72.5
Antiarrhythmic		
Not available	36	90.0
Available	4	10.0
Antiseizures		
Not available	12	30.0
Available	28	70.0
Analgesics		
Not available	13	32.5
Available	27	67.5

Infusion set		
Not available	2	5.0
Available	38	95.0
Syringes		
Not available	3	7.5
Available	37	92.5
IV Catheters		
Not available	3	7.5
Available	37	92.5
Bronchodilatators		
Not available	10	25.0
Available	30	75.0
Check list for drugs and equipment		
Not available	28	70.0
Available	12	30.0

Source: Research findings 2019

The table 4.7 above are findings from this study on necessary drugs available in ground ambulances transferring critically ill patients in pre and interhospital transfer to tertiary care (N=40) for cardiac support drugs: inotropes like adrenaline or noradrenaline were available in 17.5% (n =40), antiarrhythmic available in 3.3 % , and crystalloids fluids most available in 24.2%, antiseizures available in 23.3%, analgesics available at 22.5 %, and bronchodilators available in 25.0% and checklists for drugs and equipment available in 10.8% ambulances, Syringes to administer those drugs available in 92.5% ambulances, IV catheters available in 92.5% ambulances, infusion set available in 95.0% Ambulances.

4.2. Identify association between educational level and Vital signs monitoring during transfer

Table 4. 7.Educational Level and ability to monitor patient's Respiratory rate during transfer to referral hospital

		Have you been able to monitor patient's Respiratory rate during transportation to hospital		Total	Chi-Square
		Yes	No		
Educational Level	High school	4	6	10	0.006
	Advanced diploma	69	19	88	
	Bachelor	16	1	17	
	Masters	5	0	5	
Total		94	26	120	

Significant relationship exists between educational level and ability to monitor patient's respiratory rate and since Pearson Chi-Square=0.006<0.05

Table 4. 8.Educational and ability monitor the patient's BP during transfer to referral hospital

		Have you been able to monitor the patient's BP during transportation		Total	Chi-Square
		Yes	No		
Educational Level	High school	1	9	10	0.011
	Advanced diploma	38	50	88	
	Bachelor	8	9	17	
	Masters	5	0	5	
Total		52	68	120	
Significant relationship exists between educational level and ability to monitor the patient's Blood pressure since Pearson Chi-Square=0.011<0.05					

Table 4. 9. Educational Level and ability to monitor patient's SPO2 and Pulse during transportation

		Have you been able to monitor patient's SPO2 and Pulse during transportation		Total	Pearson Chi-Square
		Yes	No		
Educational Level	High school	0	10	10	0.001
	Advanced diploma	42	46	88	
	Bachelor	11	6	17	
	Masters	5	0	5	
Total		58	62	120	
Significant relationship exists between educational level and ability to monitor patients Spo2since Pearson Chi-Square=0.001<0.05					

Table 4. 10.Educational Level and ability to monitor patient's Glycaemia during transportation

		Have you been able to monitor patient's Glycaemia during transportation?		Total	Pearson Chi-Square
		Yes	No		
Educational Level	High school	1	9	10	0.001
	Advanced diploma	5	83	88	
	Bachelor	2	15	17	
	Masters	3	2	5	
Total		11	109	120	
Significant relationship exists between educational level and ability to monitor since Pearson Chi-Square=0.001<0.05					

Table 4. 11. Educational Level and ability to monitor patient's Temperature during transportation

		Have you been able to monitor patient's Temperature during transportation			Total	Chi-Square
		Yes	No	Likelihood Ratio		
Educational Level	High school	0	6	1	7	0.000
	Advanced diploma	14	47	1	62	
	Bachelor	9	6	0	15	
	Masters	2	0	1	3	
Total		25	59	3	87	
Significant relationship exists between educational level and patient's temperature monitoring since Pearson Chi-Square=0.000<0.05						

Table 4. 12. Patients characteristics

variables	Frequency (n)	Percentage (%)
Patients ages		
0 to 5 years	3	2.5
6 years to 14 years	6	5.0
15 years to 24 years	15	12.5
25 years to 35 years	37	30.8
36 years to 49 years	25	20.8
50years to 65 years	22	18.3
0ver 65 years	12	10.0
Patients sex		
Male	78	65.0
Female	42	35.0
Type of illness		
Medical	57	47.5
Trauma	63	52.5
Airway compromised		
No	72	60.0
Yes	48	40.0
Airway compromised and cleared by airway adjuncts		
No	33	27.5
Yes	16	13.3
Not indicated	71	59.2
Breathing obstructed		
No	48	40.0
Yes	72	60.0
Breathing obstructed and assisted by oxygen or BMV		
No	16	13.4
Yes	65	54.2
Not indicated	39	32.5
Pulse > 100BPM		
No	54	45.0
Yes	66	55.0
Pulse < 60BPM		
No	104	86.7
Yes	16	13.3

SBP> 140mmhg		
No	75	62.5
Yes	45	37.5
SBP< 90mmhg		
No	98	81.7
Yes	22	18.3
Patients with IV access		
No	14	11.7
Yes	106	88.3
Glasgow coma scale <12		
No	49	40.8
Yes	71	59.2
Glycemia <60mg/dl		
No	53	44.2
Yes	10	8.3
Not documented	57	47.5
Glycemia > 140mg/dl		
No	24	20.0
Yes	37	30.8
Not documented	59	49.2
Temperature > 36 degree celisius		
No	100	83.3
Yes	20	16.7
Temperature < 37.5 degree celisius		
No	98	81.7
Yes	22	18.3

Source: Research findings 2019

This table 4.8 above shows critically ill patients characteristics findings in this study; on Airway, Breathing, Circulation and Disability on arrival to Emergency Department; the study revealed that 30.8 % of critically ill patients age range between 25 to 35 years old mostly male 65.0% and female 35.0 % (n =120) 52.5 % were trauma cases and 47.5% were medical cases including cases needing surgery. 13.3% of critically ill patients (n=120) with airway compromised and cleared with airway adjuncts and 60% (n=120) with impaired breathing, 55.0% with pulse >100 and 37.5% with SBP > 140 mmhg and 59.2 % with Glasgow coma score less than 12/15 and 16.7% has temperature >than 36 degree Celsius and 18.3% had greater than 37.5 % degree Celsius of body temperature.

CHAPTER FIVE: DISCUSSION

5.0.Introduction

This chapter discusses the study findings in correlation with objective**s;** the aim of this study was to identify facilitators and challenges in pre and interhospital transfer for critically ill patient's safety to tertiary care. The researcher compares results of this study; similarities and differences to other similar studies done in LICS and HICS

5.1.Objective 1: Facilitators in pre and interhospital transfer for critically ill patients to tertiary care.

5.1.1.Health care providers accompanying critically ill patients to tertiary care

In this study as shown in table 4.1 on demographic data of health care providers accompanying critically ill patients in pre and inter hospital transfer that registered nurses with 69.1% (n=120) are mostly accompanying critically ill patients in pre and interhospital transfer, 73.3% on educational level have advanced diploma, 35.0% of participants did not receive any training related to BLS, ACLS or other training related to emergencies and critical care and most of them are working in emergency department and ambulance services. 35.8% of participants (n=120) working in district hospitals; also 20.3% of our participants were non-physician anesthetists accompanying mostly intubated patients because they have advance skills in airway management and intubation however because critically ill patients are prone to deterioration during transportation by transport self or by illness; that's why every transfer of critically ill patient consideration of a team with specialized skills and knowledge in advanced airway management and ACLS must be considered in study, where special retrieval team increase the critically ill patients safety outcomes (Rrt and Branson, 2013).

As this study reviled that mostly registered nurse with advanced diploma (69.1%) are accompanying and this is differ from another study done in Tanzania LIC where 32.3% accompanying critically ill patients to tertiary care hospital were health attendant without qualification (William, 2017) as the similar study findings by Crandol et al in study done in Jamaica where critically ill patients were accompanied by physicians in only 11.5% (14/122) of cases, while 68.9% (84/122) were accompanied only by registered nurses.

According Blakeman et al, the interhospital transport of patients requires a team of high skilled members, the team can be a combination of physicians, respiratory therapists and paramedics

with each being skilled in Advance airway management, basic life support and advance cardiac life support; moreover the team must appropriately trained qualified and certified, and be able to provide IV therapy, identify and provide treatment of arrhythmias (Blakeman and Branson, 2013)

Mc Ginn and associates in a retrospective study in 2010, examined the transport of 192 multiple trauma and isolated head injury patients by a specialized transport team with the longest transport being 120 miles in ground ambulances, Eighty three of the multiple trauma patients required mechanical ventilation. One patient died during the transport from progressive illness rather than the action of transport team. The expertise of those team suggested the author could have a positive impact on the outcome of transported trauma and other critically patients Inter-hospital or pre-hospital of critically ill patient require a team with high skilled members. in addition to vehicle operator, a minimum of 2 people should accompany critically ill patient, this is differ from our findings where 68.3% (n=120) are health care provider accompanying critically ill patient alone However in high income countries transfer of critically ill patients is advanced where in USA study done by Herrigel et al showed that Transfer center coordinators typically had a medical background (78%), and critical care trained registered nurse was the most prevalent (Herrigel *et al.*, 2016) .

5.1.2.Monitoring, transfer protocols, BLS, ACLS Protocols and guidelines and other protocols related to emergencies and critical care availability in pre and interhospital transfer

Patient vital signs monitoring is an important safety issue, the minimum standard of monitoring recommended for critically ill patients during transportation, continuous monitoring of pulse oxymetry, electrocardiography, noninvasive blood pressure and respiratory rate monitoring. Additional monitoring such as capnography, invasive monitoring for arterial, central venous and intracranial pressure may be required based on patient's clinical status (Warren *et al.*, 2004)Our findings in table 4.2 ability to monitor critically ill patients during transportation to tertiary level was low because only 43.3% (n =120) participants have been able to monitor the Patients' blood pressure, 69.2% (n=120) pulse monitoring, 78.3 % (n=120)respiratory rate and 48.3% (n =120), However ability to monitor BP and SPO2 require equipment, and in our findings cardiac monitors were available at 9.2 %, sphygmomanometers also 9.2% available and functioning,

operating pulse oxymeters at 11.7%. Study also revealed poor documentation of vital signs during pre and interhospital transfer only 23.3% documented the patient's vital signs.

Moreover health care provider skills and critical thinking for patients monitoring were necessary, however even if equipment present in ambulance; lack of patients monitoring may be observed. Health care provider's knowledge and skills and critical thinking acquired by receiving additional training in BLS and ACLS and other training related to critical care as facilitators for patient's safety need also other facilitators like equipment checklist and protocols; those necessary for helping health care providers remembering what to do. Our findings shows that there is a lack of protocols related to transfer process and emergencies and critical care. These findings were similar to study done by Verma and associates in India where they found a lack of essential equipment for patient monitoring; where pulse oxymeter was only present in ambulance at 0.02 % and cardiac monitors at 0.8% , poor vital signs documentation on referral slip at 33.63% (n=327). This the same for study findings from Jamaica another LIC where problems associated with transfer process were which were poor documentation of clinical parameters ; pulse rate in 13.1% (16/122), blood pressure in 9.8% (12/122), respiratory rate in 9.2%, (12/122), Glasgow Coma Score in 10.6%in 4.9 of cases and pupil reaction.

5.2.Objective 2: Challenges in pre and interhospital transfer for critically ill patient's safety to tertiary care

Challenges in pre and interhospital transfer results presented in table 4.3 in management of critically ill patients during transportation to tertiary care, challenges of lack of equipment reported by 74.2% participant confirmed in table 4.7 where essential equipment for vital signs monitoring, airway management, respiratory support and hemodynamic support equipment were in low frequency this impact on continuous of care. if staff are not were trained in emergencies and critical care for acquiring competencies in use of equipment consequently staff will not equipping them in ambulance because, 80% of participants reported lack of training in BLS, ACLS or other training in emergencies and critical care which impacted on acquiring skills and knowledge and competencies in management of critically ill patients.

As shown in table 4.3. 23.7 % of participants very frequently met bad road or road traffic jump. Bad roads in additional to inadequacy of light and space in ambulance because structure of ambulance adapted to high mountains reported by 77.5% are challenges in transportation of

critically ill patients management which may lead to patients deterioration by motion sickness . Longevity of distance between referring and receiving hospital, 17.5 % used the time between 2h and 30 minutes to 3 hours which may lead to different complications to arise and also those bad roads may cause equipment to be damaged or broken like electronics devices and lead to inability to continuation of care to the patients in ambulance and impact on critically ill patients safety. Reported by Singh Ambulance should be appropriate, to the task in terms of design and equipment, regular checking of availability and functionality and servicing of equipment is required. Particular requirement relate to safety of both patient and staff, adequate space for patient access and to perform medical intervention (Kulshrestha and Singh, 2016).

Similary to study done in another LIC Tanzania where challenges of lack of essential material like monitors, pulse oxyimetry, suction devices, oxygen and portable ventilators lead to unsafe transportation for critically ill patients reported by 91% participant (William, 2016).

In challenges most patients complications got during transportation vomiting has been reported by 20.0 % participants (n=120) pain by 14% participants, agitation 11.7 % and adverse event most reported was oxygen emptying by 10.8%. Although other complications like dysarrthmias or hypoxia, hyper or hypotension, hypoglycemia or hyperglycemia reported in small frequency but this is related to poor patients monitoring, these complications could happen frequently and pass unknown; this differs from findings of study done in India where most reported patients complications were associated with hypoxia, dysarrthymias (Panagioti *et al.*, 2015).

The study findings also contrast with studies done in high settings where most patients' complications were mostly cardio vascular or respiratory event. The common cardiovascular event are hyper and hypotension, Brady and tachycardia and arrhythmias, with a reported incidence vary from 9% to 36%. Respiratory event are often inadequate ventilation, oxygen desaturation ranging from 0 to 15%, (Droogh *et al.*, 2012). This is mainly associated with poor patients monitoring in low income settings.

5.3.Objective 4: Identify association between educational level and patients vital signs monitoring during transfer

This study indicated that there were an association between educational level and patients monitoring where P value less than 0.005 were significant there were increase of the number of

health care providers to monitor patients vital signs as their level of education increase and this was explained that by increased level of education the critical thinking increase however there is other factors like material availability may contribute although the critical illness of patient would be also help to health care provider critical thinking of monitoring patients vital signs

5.3.Objective 5: Patients' characteristics in pre and interhospital

This study indicated that 30.8 % of patients range between 25 to 35 years old mostly male 65.0% (n =120) 52.5 % were trauma, 13.3% (n=120) with airway compromised and cleared with airway adjuncts and 60% (n=120) with impaired breathing, 55.0% with pulse >100 and 37.5% with SBP > 140 mmhg and 59.2 % with Glasgow coma score less than 12. The road traffic accident are increasing in LICS mostly caused by increasing use of motorcycle, this explain increase number of trauma patients which are in young age productive group as showed by other study done by Mbanjumucyo in trauma patients were mean age was 30 years old (Mbanjumucyo *et al.*, 2016)

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.0.Introduction

This chapter presents the summary of findings in accordance with objectives, relevant conclusions and recommendations. Our main objective was to identify facilitators and challenges in pre and interhospital transfer for critically ill patients safety to tertiary care.

6.1.Conclusion

The study was identifying the facilitators and challenges in pre and interhospital transfer for safety of critically ill patients to tertiary care at CHUK and RMH. The study was a descriptive cross section that survey nurses, non-physicians anesthetists and emergency medical doctor from referral hospitals and districts hospitals and from pre-hospital service who accompanied critically ill patients to tertiary level hospital CHUK and RMH in period of 2 months from April to May 2019 .A convenience sampling strategies been used and 120 participants responded to our questionnaire and 40 ambulances been checked.

A close ended questionnaire has been administered to participants and checklist for ambulance equipment availability and functionality been used.

Study findings reviled that mostly registered nurses accompanying critically ill patients; have not received no training related to BLS, ACLS and Emergencies and critical care. This have significant association with patients monitoring as facilitator of safety and impact on continuation of care in pre and interhospital transfer. Lack of essential equipment and drugs, Lack of training has been reported major challenges related to management of critically ill patients during pre and interhospital; transfer of critically ill patients' safety. Most our participants reported mostly to meet the bad road and traffic jam.

Transfer is an important but often neglected phase of continuing care of a patient who may also need additional care. The health care providers as important facilitator of safety for critically ill patient should be well qualified in critical care and have critical thinking to anticipate and manage any complications may arise during transport process .Monitoring and documentation as important facilitator for continuation of care during transport in pre and interhospital should be empowering by making available equipment. There is a need of guidelines and protocols in Rwanda referral system and should be according to the infrastructure available in developing countries like Rwanda with periodical quality assessments.

The study also reviled the association of participants with facilitators and challenges and the critically ill patients' status on arrival at Emergency department.

However this study has limitation to relate cause and effect of facilitators and challenges with patients outcomes because is a descriptive study further research quasi experimental with control group may be needed.

This study did not highlighted the mortality of critically ill patients in pre and interhospital transportation.

Implications of the findings for assessment for facilitators and challenges in pre and interhospital transfer for critically patient's safety to tertiary care:

Based on the results of this study showed that that most transfer are done by registered nurses and from district hospitals as facilitator of safety of those critically ill patients those nurses need to be empowered in emergencies and critical care domain and empower their skills and knowledge by formal training related to emergencies critical care like BLS, ACLS and other training related to critical care.

As facilitators of patients safety there is a need for increase critically patient's safety by monitoring vital signs and anticipate any complication which may arise during transportation.

6.2.Recommendations

Nursing administration in collaboration with Ministry of health

- To establish a national protocol or guideline for referral system according and increase awareness
- Building capacity of health care providers related to critical care and emergencies to increase safety of critically ill patients in pre and interhospital transfer.
- Continue Equipping ambulance with essential equipment which tolerate our physical environment high mountains
- Increase tertiary level hospital number with specialized care and ICU beds this may reduce the number of transfer and reduce the time of transportation in ambulance and increase the critically ill patients safety
- Empowering nurses in emergencies and critical care as mostly delegated responsibility for continuity of care during transportation this impact on their responsibility and accountability.

Nursing Education

- Develop curriculum which will empower more knowledge and skills nurses in critical care domain for critically ill patients transportation.
- Performing further research in transfer process of patients, quasi experimental research to relate cause and effect for patient's safety outcome with facilitators and challenges in pre and interhospital.

Nursing practice

- Empowering registered nurses in charge of transfer by in service trainings or by continuous developing program in critical care specialty.
- Quality assessment in pre and interhospital transfer.
- Establish transfer protocols and checklist related to emergencies and critical care
- Registered Nurses in critical care and emergencies medical doctor, anesthesiologist with more knowledge and skills in critical care to form a critical care association or society which may be consulted for protocol and guideline related to critical care for patients safety and CPD provider in critical care and emergencies domain

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