FACTORS INFLUENCING PREHOSPITAL MANAGEMENT OF HEAD INJURED PATIENTS IN EMERGENCY MEDICAL SERVICE IN KIGALI

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D E C L A R A T I O N

I, Jacqueline MUKAGASASIRA hereby declare that this thesis submitted in partial fulfillment of the requirement for the Master of Science degree in Critical Care and Trauma Nursing has never been presented anywhere else for the same purpose. All sources I have used and quoted have been acknowledged as complete references.

Jacqueline MUKAGASASIRA

DEDICATION

To my beloved family; my husband and sons

To my Mother, Brothers and Sisters

May blessings from heaven be upon you all!

A C K N O W L E D G E M E N T S

My heartily thanks go to my Almighty God, who gave me life and the chance to finish this work.

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My brothers and sisters have been constantly caring for and inquiring about me, my well-being. I am grateful to them.

Last but not the least; my unforgettable thanks go to everybody who, especially to staff of SAMU and my colleagues in Master in Nursing, has helped me intellectually and spiritually during my academic journey.

TABLE OF CONTENT

List of tables

LIST OF FIGURE

LIST OF ABBREVIATIONS

ACLS: Advanced Cardiac Life Support

APLS: Advanced Pulmonary Life support

ATLS: Advanced Trauma Life Support

BBB: Blood Brain Barrier

CPP: Cerebral perfusion pressure

DPB: Diastolic blood pressure

CPD: Continuous Professional Development

EMS: Emergency medical service (ambulance service)

EMT: Emergency Medical Technician

GCS: Glasgow Coma Score

ICP: Intracranial pressure

ITLS: International Trauma Life Support

LMICS: Low and Middle Income countries

MoH: Ministry of Health

RSI: Rapid Sequence Intubation

SAMU: Service d' Aide Medicale d'Urgences

SBP: Systolic Blood Pressure

TBI: Trauma Brain Injury

UR: University of Rwanda

WHO: World Health Organization

ABSTRACT

Background: Head injury has become a major concern to health globally. It is estimated that approximately 10 million people are victims of head injury annually in the world (Hyder et al. 2007). Many studies have shown that the major cause of head injuries is road traffic accidents and takes place at the prehospital stage (Maas et al., 2008).

Objectives: This study was conducted to assess the factors influencing prehospital management in Kigali. It had two specific objectives; assessing the prehospital management of head injured patients in EMS, and identifying the factors affecting the prehospital management of head injured patients in Emergency Medical Service in Kigali.

Methods: This retrospective and descriptive study covered a period of one month of data collection. Patients' records for cases that occurred during the period of 2014-2015 were reviewed using checklist and questionnaires were administered to 39 EMS personnel. Out of them, 37 filled and returned the questionnaires. Data were analyzed using SPSS version 20.0.

Results: Findings have shown record of 1871 cases of head injury. Findings showed that 74.1% of head injuries were caused by road traffic crashes and 76.5% of all respondents were male. As regards to measure process, IV Fluid was given at 645 patients (94%, n=686), oxygen for hypoxia at 192 patients (99.4%, n=193). Pain Medication was given to 1 758 patients (94%, n=1871), C-Collar immobilization was given to 1 385 patients (74%, n=1 871). Resuscitation was administered to only 14% of patients who were eligible (n=71). Forty one percent (41.89%) of SAMU staff are not aware of the guidelines and protocols of head injury. Lack of functioning equipment was found as the major obstacle to performing procedures at 59.46%. Eight three percent (83%) of cases were rescued within 60 minutes. Traffic jams (86.4%) and limited facilities of receiving health facilities (67.56%) are the major hindrances to prehospital management.

Conclusions and recommendation: The prehospital management in SAMU is moderate but there are factors that need improvement to make it better such as training of EMS personnel, restructuring of the requisition system and proper maintenance of medical equipment. MoH/SAMU should initiate trainings in specialized areas of prehospital care, encourage regular use of guidelines and protocols and strengthen their requisition systems.

Key words

The prehospital management: the care, assessment, stabilization and transport of patient from initial scene of injury or illness to appropriate receiving health facility by an emergency medical technician (Campbell, 2012) (Farlex, 2012)

Head injury: any trauma to the scalp, skull, or brain. The injury may be either closed or open (penetrating). (Medical dictionary, 2015)

CHAPTER 1: INTRODUCTION

Background to the study

Head injury has become a major concern to health globally. Approximately 10 million people are victims of head injury on the health care system in the world every year (Hyder AA1 et al. 2007). It is critical to both developed and developing countries (Ghajar, 2000). Head injury related deaths represent around one third of all injury-related deaths. Studies have shown that brain injury is the common complication of head injury and poses a leading cause of disability and mortality in all regions of the Globe, despite advancement in prevention and treatments. Its global incidence is rising and predicted to exceed many diseases as a major cause of death and disability by the year 2020 (Hyder AA1 et al. 2007).

It was revealed that resuscitation of head injured patients at the scene of accident is key to minimizing morbidity and mortality (Hari H, 2008). This can be achieved through prehospital care for example a study conducted by Barbacia and JM (2001) revealed that when the prehospital care is well provided it can reduce mortality from 90% to 40% (Barbacia & JM 2001).

The incidence of traumatic head injury in the United States and Europe has been estimated between 180-250 and up to 500 per 100 000 populations per year, respectively (Jr1 & WA. 2003). Traumatic head injury was perceived as the major cause of one third to one half of all trauma deaths and the leading cause of disability in people under 40, severely disabling 15–20 per 100 000 populations per year (Fleminger 2005). In the United States, trauma is a leading cause of death and disability, among persons of all ages and approximately 500,000 traumatic head injuries occur yearly and more than 17,000 of the most severe head injury result in death (Narayan et al. 2002), (Jr. et al. 2005).

According to the Indian Journal of Neurotrauma, studies have reported that nearly 1.5 to 2 million people are injured and 1 million yield to death every year in India due to head injury (Saxena et al. 2010). The World Health Organization (WHO) report estimates that 5.8 million deaths annually are attributable to injuries, 90% of which occur in low-and middle-income

countries (LMICs). Moreover, rates of one of the main causes of death, road traffic crashes, are increasing in most LMICs (Sasser et al. 2005), (Dash 2008).

As regards to developing countries, studies have shown that in sub Saharan African urban 24% of head injured patients were admitted and 18% died (Qureshi et al. 2013). Similarly in South Africa, each year, approximately 89,000 (180 out of 100 000) new cases of head injury are reported whereby 50% were due to road traffic accidents (Stassen et al. 2014). A study in Uganda has shown that head injury is one of the top 4 common admission diagnoses contributing 45.3% of mortality rate. Another study showed 75% mortality rate (Hsia et al., 2010, Kwizera et al., 2012). Head injury represents 65% of all injury related facilities in urban Uganda. (Jayaraman, 2011).

In Rwanda, in the study carried out at Kigali University Teaching Hospital (CHUK) in 2008, out of 1101 road traffic accidents victims, the commonest injuries were wound and contusions (54.7%), lower limb injuries (41.9%) and head injury (29.4%) (Twagirayezu et Al, 2008). According to WHO-Rwanda burden of disease 2010 report, among the age group 10-40, injuries account for 25 per cent of overall deaths. According to SAMU Report (2015), out of 6,511 patients, 3,336 patients (62%) were trauma cases, 2,049 patients (38%) were medical emergencies and 1,126 patients (17%) were obstetrical cases. However, this report does not specify the number of head injury cases and their management.

This study assessed the prehospital care administered to head injured patients in SAMU/Kigali to finally bridge the existing gap in the prehospital setting in Rwanda.

Problem statement

Good prehospital care of head injured patient can minimize secondary brain injury. Secondary brain injury that occurs in minutes to day after primary injury can result in increased mortality and disability (Badjatia, 2008). Prehospital care is an essential part of a comprehensive trauma care system. Emergency medical systems are responsible for initial medical assessment and treatment prior to arrival at a medical facility. Provision of prehospital care to trauma patients in more rural and remote environments is an important and neglected health issue.

The access to prehospital care remains a major concern in Rwanda health system despite endless efforts put in by the Ministry of Health. The number of critical ill or injured patients who need ambulance sometimes overtakes the number of available ambulances. On the other hand, people living in rural or remote areas have limited access due to geographical obstacles. The prehospital medical service is located in the City of Kigali and cannot serve the rest of the country.

Prehospital care is efficient when there is respect of "Right patient to Right Place at Right time" principle (Donald, 2011). The response time may always be affected by the traffic jam in the city especially during peak hours. Lack of clear geographic positioning system that can effectively guide health care providers may also lead to delay of prehospital care. Similarly, in Rwanda, seventy percent (70%) of the calls for SAMU in Kigali are for road traffic accidents and 30% are for obstetrical or medical emergencies. (MoH Needs Assessment Report, 2013).

Since 2007, Rwanda has only one of the prehospital emergency responses in the region to improve the access to care and treatment of emergencies. EMS personnel are organized into teams made of a driver, a nurse and anesthetist. Their package of knowledge, skills and practice is of paramount importance to improving the outcomes of injured patients. However, factors such as insufficient training, lack of or unavailability of protocols and guidelines and limited resources in prehospital setting especially in developing countries like Rwanda may influence the prehospital management. In addition, lack of previous studies in the domain to serve as guide, lack of peoples' awareness on the use of ambulances that may sometimes result in misguiding them via the toll calls at "912" may all affect the quality of prehospital care in Rwanda. The present study examined the factors affecting the prehospital management such as knowledge and

skills of health care providers, equipment for the provision of prehospital care and environment within which EMS personnel operate in Rwanda.

Main objective

The main objective of this study was to examine management of head injured patients in prehospital settings in Rwanda.

Specific objectives of the study

The specific objectives of this study were:

- ✓ To assess the prehospital management of head injured patients in prehospital settings in Kigali.
- ✓ To identify the factors influencing the prehospital management of head injured patients in prehospital settings in Kigali.

Research questions

- ✓ What is prehospital management of head injured patients implemented in prehospital settings in Kigali?
- ✓ What are the factors affecting the prehospital management of head injured patients in SAMU/Kigali

Significance of the study

This study is expected to give a clear picture of the prehospital management in Rwanda. It gives an evidence of the factors affecting the prehospital management such as knowledge and skills of health care providers as regards to prehospital management of head injured patients. It also shed light on other factors like availability of procedures, guidelines and protocols for administering head injuries at prehospital stage, the equipment and infrastructural facilities that may promote or strengthen the management of prehospital care. This study also serves as a tool for professional and training bodies in the preparation of nurses' curriculum to address the identified gaps within the relevant institutions like hospitals, schools and government health institutions. For nursing practice, the findings of this study guide the Continuous Professional Development (CPD) especially for EMS personnel. Equally, findings of this study give a clear picture that can help health policy makers and planners on the establishment of protocols, resources requirements and

staff profiles required to improve the prehospital. Finally, the results of this research open an eye to researchers who would need to carry out further studies on similar or associated topics.

Subdivision of the project

This study is organized into five chapters as follows; the first chapter is made of the introduction highlighting the background of the research problem, the objectives and research questions as well as the significance of the study. The second chapter concentrated on review of literature whereby the literature, conceptual framework and empirical studies have been reviewed. The third chapter focused on the methodological aspects of the study highlighting clearly the research design, study population, data collection tools and techniques, samples and sampling techniques and the techniques for data analysis. The fourth chapter presented the findings and its discussion while the last chapter presented the summary of key findings and then provided conclusions and recommendations.

CHAPTER: LITERATURE REVIEW

2.1. Introduction

This section reviews the literature related to head injury. It highlights the epidemiology of head injury, the empirical studies and the conceptual framework that guides this research. It also presents the guidelines and recommendations that describe the situation to currently accepted standards.

Definitions of Head injury

In prehospital settings, Head injury defined as a variation in brain function, or other evidence of brain pathology caused by an external force (Menon et al., 2010). Head injury can be classified with the help of Glasgow Coma Scale (GCS) with as score of 13-15 as mild, 9-12 as moderate, and 3-8 as severe (Maas et al., 2008).

Prehospital management

The prehospital management can be classified as the movement of patient from initial scene of injury or illness to receiving hospital, this movement being the responsibility of the emergency ambulance service (Campbell, 2012). In this regard, a minimum of two people must accompany the patient namely a registered nurse, physician, or advanced EMT capable of providing advanced airway management, including endotracheal intubation, IV therapy, arrhythmia interpretation and treatment using basic and advanced cardiac and trauma life support (Chulay et al., 2005).

Epidemiology of Head injury

Head injury has become one of the major causes of death worldwide. It is estimated to be the primary cause of 30% to 50% of traumatic deaths (Bruns & Hauser, 2003, Corrigan, Selassie, & Orman, 2010). In developed countries, the incidence of head injury varies between 200 and 281 per 100,000 and the mortality rate of head injury ranges from 10 to 25 per 100,000 (Rosso et al., 2007). Approximately 10%-15% of cases of head injury are moderate or severe (Maas et al., 2008). The outcome for this group is poor even in developed countries. Within six months after the injury, the case-fatality rate of moderate and severe TBIs remain vegetative or severely disabled state (Andriessen et al., 2011). On the other hand, the incidence of TBI in less

developed countries has increased in recent years, partially because of the rapid increase in the number of vehicles and relatively poor traffic conditions and emergency management (Maas et al., 2008). In Rwanda, the study has shown that, out of 1101 road traffic accidents victims, the commonest injuries were wound and contusions (54.7%), lower limp injuries (41.9%) and head injury (29.4%) (Twagirayezu et Al, 2008).

Primary brain injury

Primary brain injury is defined as the immediate damage to the brain tissue that is the direct result of the injury force and is essentially fixed at the time of injury (Campbell 2012)

Secondary brain injury

Secondary brain injury is on the other hand, a result of hypoxia or decreased perfusion of brain tissue. A large proportion of head injury patients die days to weeks after the injury and not immediately after the injury. The primary injury as the damage that occurs at the moment of trauma when tissues and blood vessels are stretched, compressed, and torn is not adequate enough to explain the death (Campbell, 2012). It is actually caused by secondary brain injury, which is a complex set of cellular processes and biochemical cascades including lipid peroxidation, mitochondrial damage, and apoptosis that occurs in the minutes to days following the trauma. These secondary processes can significantly worsen the damage caused by the primary injury and account for most TBI deaths occurring in hospitals (Atabaki, 2006).

Hypoxia is defined as arterial haemoglobin oxygen saturation less than 90% (Badjatia et al., 2008). Post injury events, such as hypoxia, hypercapnia, hypotension, intracranial hypertension are known as secondary insults. Adequate prehospital care can therefore help prevent the development of secondary brain injury.

Research has shown that hyperventilation actually has only a slight effect on brain swelling, but causes a significant decrease in cerebral perfusion from vasoconstriction, which results in cerebral hypoxia. The injured brain does not tolerate hypoxia. Thus, both hyperventilation and hypoventilation can cause cerebral ischemia and increased mortality in the TBI patient (Campbell 2012).

Hypotension is also defined as systolic blood pressure (SBP) less than 90 mmHg (Badjatia et al., 2008). TBI alone does not generally cause hypotension unless there is prolonged compression of the brainstem. Intracranial hypertension is associated with cerebral hypoxia and poor neurologic outcome and should be prevented and treated in the pre-hospital period. According to White, Cook, & Venkatesh (2006), the pathophysiology of intracranial hypertension is complex, including the mechanism of cerebral edema, increased volume of intracranial components, damage of the blood/brain barrier (BBB), and decreased cerebral perfusion pressure (CPP).

Prehospital management

After a traumatic event, there is little chance that something can be done about the primary injury, but much more can be done to minimize secondary brain injury. In addition, the duration and severity of secondary head injury can influence significantly the TBI outcome. Therefore, pre-hospital management that can prevent, detect and correct secondary insults immediately at the scene of the accident is deeply crucial to decreasing (Badjatia et al., 2008).

Guidelines for prehospital management have been published in many countries including the Europe, United States and Australia. They were intended to standardize treatment and improve outcomes in severe head injury patients (Badjatia et al., 2008). According to these guidelines, key issues of prehospital TBI management focus on assessment and treatment of hypoxia, hypotension, and cerebral herniation (QAS, 2011).

Hypoxia

Hypoxia is a strong predictor of outcome in TBI patients. The primary goal in prehospital management is therefore to assess the airway and ensuring adequate oxygenation. As a guideline, the percentage of blood oxygen saturation should be measured continuously with a pulse oximeter in pre-hospital settings (Badjatia et al., 2008). A study from San Diego revealed an overall improvement in intubation success rates from 39% in the non- Rapid Sequence Intubation RSI group to about 85% in the RSI group (D.P. Davis, Ochs, et al., 2003. Furthermore, prehospital RSI by paramedics contributes to better first hour survival and first day survival, better neurologic outcomes at six months, and shorter hospitalization times (S.A. Bernard et al., 2010; Klemen & Grmec, 2006). As a conclusion, an appropriate intubation and

ventilation in the prehospital period can decrease mortality and improve outcome of TBI patients.

Hypotension

TBI alone does not generally cause hypotension unless there is prolonged compression of the brainstem. In fact, the primary cause of hypotension is multi-injury with haemorrhage (Walleck, 1992). Patients with hypotension not corrected in the field have a worse outcome than those whose hypotension is corrected by the time of their emergency department arrival (Chesnut et al., 1993). Therefore, patients with suspected TBI should be monitored in the pre-hospital settings for hypotension. Both systolic (SBP) and diastolic blood pressure (DBP) should be monitored as often as possible using precise method available (Badjatia et al., 2008).

The prevalence of hypotension in TBI patients upon first contact in the field was reported at 16% in Australia (Garner, Crooks, Lee, & Bishop, 2001), and 19% in the US (Ochs et al., 2002). Hypotension contributes to cerebral hypoperfusion and can independently predict worse outcomes (Fearnside, Cook, McDougall, & McNeil, 1993). From the report predicting TBI outcomes, hypotension is one of the five factors found to have a 70% or greater positive predictive value for mortality (Bullock et al., 1996).

Cerebral Herniation

Since cerebral herniation can dramatically raise the mortality of TBI, patients should be assessed frequently for clinical signs of cerebral herniation in the pre-hospital phase. The clinical signs include asymmetric, dilated, and unreactive pupils; extensor posturing or no response; or progressive neurologic deterioration (Badjatia et al., 2008). According to the pre-hospital guidelines of TBI management in different countries (Badjatia et al., 2008; Piek & Working Group Neurosurgical Intensive Care, 1998; QAS, 2011), the therapies of elevated ICP mainly include hyperventilation and hyperosmolar therapies.

In summary, hypoxia, hypotension, and cerebral herniation are considered the most significant factors in initiating secondary brain injuries, and therefore, should be paid attention to in prehospital settings. The recommended strategies for assessment and treatment of these

detrimental factors are published in many prehospital TBI guidelines (Badjatia et al., 2008; Piek & Working Group Neurosurgical Intensive Care, 1998; QAS, 2011).

2.2. Theoretical Literature

Anatomy of the Head

To most effectively manage the head-injured patient, one must understand the basic anatomy and physiology of the head and brain. The head is composed of Scalp, Skull, Fibrous coverings of the brain (meninges: dura mater, arachnoid mater, pia mater), Brain tissue, Cerebrospinal fluid and Vascular compartments (Campbell 2012). The scalp is a protective covering for the skull, but it is very vascular and bleeds freely when lacerated. The skull is a closed box. The rigid and unyielding bony skull protects the brain from injury. It also contributes to several injury mechanisms in head trauma. The temporal bone (temple) is quite thin and easily fractured, as are portions of the base of the skull. The intracranial volume is composed of the brain, the CSF, and the blood in the blood vessels. The three completely fill the cranial cavity (Campbell 2012)

Theories of prehospital care of trauma victims

These theories relate to how long it takes a trauma patient to receive treatment, stabilization on scene before being transported to the receiving hospital. The major theory is known as "Gold Hour".

Golden hour

In prehospital settings, the **golden hour** (also known as **golden time**) explains a period of one hour or less after the occurrence of a traumatic injury or another medical emergency, during which there is the highest likelihood that the medical intervention will prevent death or increase the patient's chance of surviving or prevention of secondary injury. (www.en.wikipedia.org accessed on 12 October 2016). This concept is commonly known as critical one hour time period.

This period called "Golden hour" is defined as the immediate time after injury when resuscitation, stabilization and transfer at nearest hospital will be most beneficial to the patient. Health care providers should be well organized to provide quick care (within 10 minutes). As

ambulance personnel care provider must pay attention to the head, pupils and vital signs (Campbell 2012).

Notwithstanding, the vital decision in prehospital care is whether the patient should be taken immediately to the receiving health facility, which is known as "Scoop and Run" or advanced care resources should be administered to the patient where they lie. This approach is known as "Stay and Play". The Golden hour theory advocates for the minimal time spent by emergency health providers giving attention to ABC's (Airway, Breathing and Circulation). The aim in scoop and run is generally to transport the patient within 10 minutes of arrival. This is also known as "Platinum 10 minutes" (Mahmood et al., 2010).

2.3. Empirical Literature

This section compiles other literature related to prehospital management as presented by other scholars. Research variables reviewed are scene size-up, staffing of emergency medical personnel, infrastructure and equipment and the environment.

2.3.1. Mechanism of injury

A study was carried out in Tanzania covered 5663 patients. Data revealed that 75% of patients had sustained blunt injuries mostly caused by traffic collisions. The most frequent injuries were fractures representing 60%. Head injuries represented 20%. A study in Uganda discussed the response time; the median time delay was 330 minutes at the referral trauma center and 123 minutes at the other five regional centers (Dakermandji et Al., 2006). Head injury is one of the top 4 common admission diagnoses contributing 45.3% of mortality rate. Another study showed 75% mortality rate (Hsia et al., 2010, Kwizera et al., 2012). Head injury represents 65% of all injury related facilities in urban Uganda (Jayaraman, 2011).

2.3.2. Staffing, knowledge and skills and equipment in prehospital management

A study conducted in Kenya by Bhoyyo (2010) examined how the skills and performance of practitioners affect the outcomes of TBI patients at Kenyatta National Hospital (KNH). Out of 53 practitioners surveyed, it was found that the majority of them did not follow the protocols and guidelines, only 20% managed hypotension in TBI patients as required by Brain Trauma

Foundation, the reason being limited staff and resources, including hospital beds. (Bhoyyo, 2010). Another study was conducted in critical care unit at KNH in 2013 has covered 133 participants. The researcher has found that there is a significant correlation between nurses' knowledge, skills and their quality of their management of TBI patients. The barriers that were identified were inadequate staff, lack of or shortage of equipment, and lack of guidelines. (Macharia, 2013)

2.3.3. Research gaps

The existing literature reviewed in Uganda, Kenya and Tanzania has indicated that the major cause of head injuries is the road traffic accidents. Although there exists paucity of literature in the context of Rwanda, SAMU Report (2015) does not give out the prevalence of head injuries. Tugireyezu et al., (2008) presented the prevalence of 29.4% of cases of head injuries. The response time was estimated in Tanzania, such study has not been conducted in the rest of East African Communities. In case of Rwanda, a 10 minutes response time has been conventionally fixed but no research has been carried out to test the validity of such standard. Furthermore, no study was conducted to study the factors influencing the prehospital management domain.

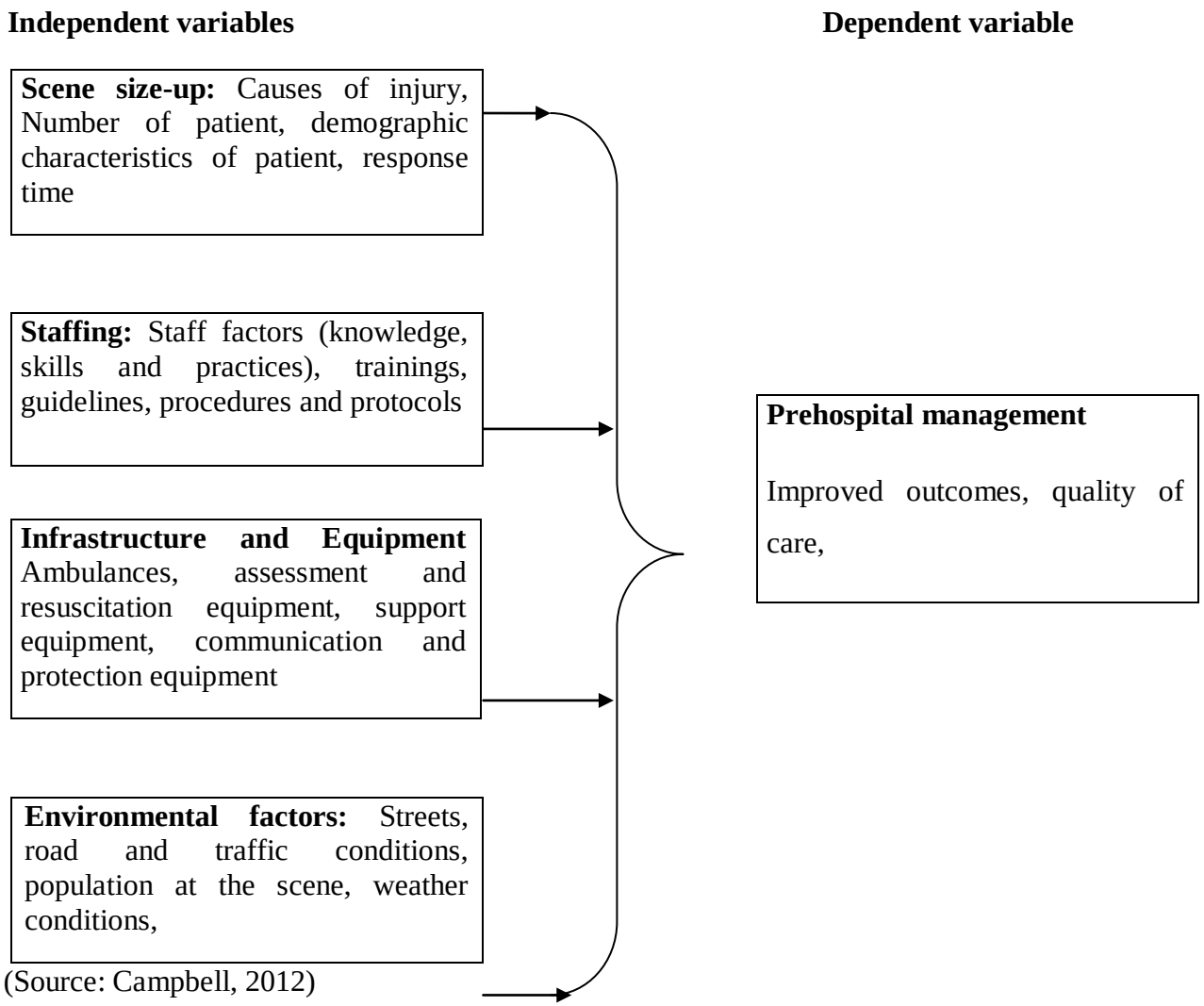
2.4. Conceptual framework

This section summarizes the variables that will guide the researcher. The main objective of this study was to examine the factors affecting the prehospital management in prehospital settings in Kigali. according to Campbell (2012), those factors were grouped into four categories namely the scene size-up, staffing, infrastructure and equipment and environment as presented in the diagram below. The scene size-up is explained by the mechanism and cause of injury, the number and identification of patient, demographic characteristics of patients and the response time.

The staffing factor is explained by the quality of the health care providers, their quality in terms of knowledge, skills and practice, the trainings undergone in relation to prehospital management, guidelines, protocols and nursing procedures that are in place. The infrastructure and equipment were explained by the availability and readiness of ambulances, assessment and resuscitation equipment, communication and protection equipment available within the prehospital emergency service.

The factor of environment refers to conditions and location of scene under which the intervention takes place. The status of streets like traffic jams or poor conditions of the roads and accessibility will determine the response time. The weather conditions shall also explain the appropriateness of environment in the prehospital settings.

Figure 1: Conceptual framework



(Source: Campbell, 2012)

Conclusion

This part of literature review has highlighted the key concepts and theories that guided the researcher. The conceptual framework has clarified the variables such as staffing quality and quantity, the availability and use of nursing guidelines and protocols and the infrastructural factors that promote or strengthen the provision of care in prehospital settings. The chapter has also presented the symptoms and anatomy of head injury and factors that may affect the outcomes of head injury. It was also demonstrated that the literature on prehospital management of head injury in developing countries and more particularly in Rwanda is still lacking.

CHAPTER 3: METHODOLOGY

3.1. Introduction

This section presented the methods and techniques used to gather and analyze the research data. It describes the research design, the population and sampling methods, the data collection techniques and instruments and data analysis techniques.

3.2. Research design

This study design was retrospective and descriptive in nature. It focused on prehospital care administered to head injured patients by EMS personnel in SAMU/Rwanda in a two years period (January 2014- December 2015). This study intended to describe the factors that affect the prehospital care in prehospital setting in Kigali/Rwanda. Those factors relate to environment, infrastructure and human factors such as knowledge and skills, practice and use of guidelines.

3.3. Research approach

This retrospective study is quantitative in nature as it analyzed data related to prehospital care of head injured patients and identified the factors that affect the pre-hospital management of head injured patients.

3.4. Research setting

The study was conducted at Emergency Medical Service (EMS) commonly known as SAMU. This service is a department of the Ministry of Health in charge of prehospital medical service in Rwanda. This EMS service was introduced in 2007 in Rwanda and currently SAMU possess 9 ambulances that are operational, 26 nurses, 13 Anesthetists and 18 drivers. This service is located in Kigali but can intervene in cases of mass casualty or disasters outside Kigali City. They also attend gatherings organized at national level such as international and national conferences, official ceremonies, sports activities to mention a few. EMS service is reachable through the free toll number 912 at the central ambulance dispatch center and the EMS team intervenes accordingly.

3.5. Population

The population of this study is grouped into two categories. The first category of data came from record reviews of cases administered by SAMU staff during the period of 2014-2015. In this, the

researcher targeted all cases of head injury that occurred during such period. Out of 6 557 cases administered by SAMU, the researcher found 1871 cases were head injuries. Data from patients' records helped the researcher to appreciate their identification and severity of their injuries and subsequent prehospital care administered to them at the prehospital stage. The second category of data was collected from all 39 EMS health care providers namely 26 nurses and 13 anesthetists. The EMS health providers helped the researcher to examine the factors that influenced the pre-hospital management of head injured patients.

3.6. Sampling

The sampling in this study depended upon the category of data and how they were collected. The record review has used a purposive sampling as the researcher was interested in identifying only head injury cases from all patients' records. This record review has given out 1 871 cases of head injuries that were wholly studied in this research. The second category of respondents did not necessitate any sampling since the population itself is relatively small and can easily be covered by the researcher. The emergency medical team of SAMU comprised 39 staff made of 26 nurses and 13 anesthetists.

3.6.1. Sampling strategy

This study used purposive sampling to identify all cases of head injury attended to by SAMU during January 2014- December 2015. This sampling identified 1 871 cases of head injury. On the other hand, a purposive sampling helped again to identify the medical team of SAMU from its entire population consisting of 17 drivers, 4 dispatchers, 26 nurses and 13 anesthetists.

Inclusion criteria

This study covered all records of head injured patients rescued by SAMU health care providers having sustained a head injury and rescued by SAMU health care providers during the period of study (2014-2015). All nurses and anesthetists were eligible to participate in this study as long as they consented to their participation.

Criteria for exclusion:

In this study, files of people who died before arrival of ambulance at the scene were excluded from the study. Staff members of SAMU other than emergency medical team were excluded from the study.

3.6.2. Sample size

The sample size was made of all 1 871 cases of head injury and 39 emergency medical personnel of SAMU.

3.7. Data Collection

This study collected data from health care providers namely nurses and anesthetists using a questionnaire. This questionnaire was adapted to WHO Prehospital trauma care systems manual 2005 with very minor modifications. In order to review the pre-hospital management, the researcher also used a checklist to gather data from head injured patients' records.

3.7.1. Data Collection instruments

Data were collected from two different sources; the first category of respondents comprised data from head injured patients' records to assess how prehospital management has been implemented by SAMU during the period under study using a checklist (in appendix). The second category of data was collected using a questionnaire (in appendix) administered to the 39 SAMU staff in order to examine other factors that affect the provision of prehospital care either related to knowledge and skills of the personnel, the use of guidelines and protocols and other environmental factors that may promote or hamper the quality of prehospital care in Rwanda. Given the fact that the researcher is familiar with the environment she is also familiar with the records kept by SAMU health providers and getting data from the patients' records was easier. The researcher evaluated all procedures performed by health care providers to head injured patients with regards to scene management, initial assessment and prehospital management.

Since the study is retrospective, the researcher constituted the dataset systematically during the period of study by recording raw information from patients' records. In addition, a cross sectional study was undertaken to investigate the factors affecting the prehospital management. In this regard, questionnaires have been designed for SAMU health care providers who filled

them and returned them to the researcher for data recording and analysis. These questionnaires were used to gather data from respondents in a bid to appreciate the procedures and practices administered to surveyed head injured patients, their knowledge and skills about prehospital care and other factors that influence the management of prehospital care in SAMU.

3.7.1.1. Instrument reliability

A checklist and a self administered questionnaire have been prepared based on WHO Prehospital trauma care systems manual 2005 with very minor modifications to study the research variables. These include:

a) Mechanism of injury
b) The staffing quantity and quality such
c) Prehospital management guidelines and protocols, and
d) The prehospital infrastructure, equipment, and environmental factors

A pilot study was conducted by giving self administered questionnaires to six EMS personnel. The content of the questionnaire was given to colleagues to independently assess the simplicity of questions, clarity of language, accuracy and adequacy of questions for the purpose of the study. A test and re-test was administered to EMS personnel to refine the questions in order to facilitate answering during data collection and confirm reliability of the tool.

3.7.1.2. Content in validity

Validity of the questionnaire was determined in consultation with the Professor in critical care. Below is a summary of objectives, research variables and items of the questions that helped to test the validity of the questionnaire and checklist;

Objectives	**Conceptual Framework**	**Items of questionnaire**
✓ To assess the prehospital management of head injured patients in SAMU/Rwanda.	Scene size-up Initial assessment • General impression • Loss of consciousness • Airway • Breathing • Circulation	Questions related to Knowledge, skills and practice related to management of head injured patients; [Tick the appropriate answer:] Do you perform these procedures for head injured patient: If you do not perform these procedures, do you refer patients to hospital?
✓ To identify the factors affecting the prehospital management of head injured patients in Rwanda.	Staff quality and quantity Infrastructure and equipment Environment	Do you have management Guidelines available for head injured patients? Do you have management protocols available for head injured patients? Did you have any training in pre- hospital care or first aid while in service? If you do not perform these procedures, what are the main reasons? ▪ Lack of skills ▪ Lack of functioning equipment ▪ Lack of supplies or medication ▪ Other, specify: ……. How easy is to transport a head injured patient to appropriate health care facility?

3.7.2. Data collection procedure

To collect data, the researcher was systematic in such a way that both categories of population were involved without any delay. Questionnaires to health care providers (nurses and anesthetists) in an envelope, and then it was returned within two hours. As far as patients' record review is concerned, a checklist was used to gather information related to pre-hospital management of head injury.

3.8. Data analysis

The data analysis was done with the help of SPSS (Statistical Package for Social Studies) version 20.0. This package helped the researcher to organize data, process them and generate the results. It also helped generate the results to be analyzed by use of statistical means such as frequencies, percentages, mean, etc. Data were presented in the forms of tables.

3.9. Ethical considerations

Before carrying out this study, its proposal was reviewed and approved by UR-CMHS Institutional Review Board and the Ministry of Health. All study participants (nurses and Anesthetists) and administration of SAMU were informed in details about the study methodology and procedures as well as its significance but also they were informed that they are free to withdraw at any time. In addition to these, individual nurses or Anesthetists voluntarily signed a written informed consent (in appendix) designed before participation to this study.

The researcher ensured participant's confidentiality by not showing respondent's names on the questionnaire and datasheet, storing information in a password-locked laptop and respondents' individual responses were kept strictly confidential. It is planned that overall findings of this study shall be communicated to the study participants, Ministry of Health, and UR-CMHS panel for research presentation.

3.10. Data management

This is also about storage of hard and soft copies. Hard copies will be kept under lock and key and destroyed after five years by shredding and incineration according to the University of Rwanda policy about records. The soft copies shall be kept in a password controlled PC and deleted after five years according to UR policy.

3.11. Data Dissemination

This study like any other academic work has to be systematically organized; this is possible only when an effective reporting is done. The researcher therefore has sent electronic parts of the work, reports or feedback to participating institutions, bound copy to UR library, and manuscripts to peer reviewed journals for publication. The same data could as well be presented to both national and international conferences always keeping the participants of this study anonymous.

3.12. Limitations and challenges

Since the researcher is well familiar with the emergency care environment, a few problems were encountered; time was very limited as data collection for this study had to be conducted within one month covering data of two years (2014-2015). The researcher has therefore dedicated extra efforts to ensure success of this work. In addition, the sample of respondents seemed to be small and may compromise the efforts to generalize. To overcome this limitation, a record review has been conducted to mitigate for the small sample.

3.13. Chapter conclusion

This chapter has presented the research design and methods of data collection and analysis. The study was descriptive and retrospective. Data were collected using a checklist to review records of patients and questionnaires were administered to SAMU staff. The analysis of data was done using SPSS version 20.0.

CHAPTER FOUR: RESEARCH FINDINGS AND DISCUSSION

4.0 Introduction

This chapter presents the findings of the study and discusses them in line with the research objectives. The data analyzed in this study were gathered from patients' records for head injury cases administered between 2014 and 2015. To enrich the study, respondents made of 39 SAMU staff were surveyed to study the factors affecting the prehospital management of head injured patients such as knowledge and skills on procedures, availability and use of guidelines, protocols of head injury and other factors that may affect the pre-hospital management of head injury. Analysis was done using SPSS version 20.0 and Microsoft Excel (2010).

The study was descriptive in nature. Mean and frequencies were used as the descriptive statistics in the analysis of data. The objective of the study was to examine the pre-hospital management of head injured patients and determine the factors that affect the pre-hospital management of head injured patients.

4.1 Presentation of findings

The findings of this study were presented according to objectives; they were mainly categorized into three; namely, those describing the types of procedures and measures administered to head injured patients, those describing the knowledge and skills of the EMS personnel with regards to the procedures, management of head injury cases in prehospital settings and finally the category analyzing other factors related to logistics or infrastructure that influence the prehospital management of head injury.

4.1.1 Demographic characteristics of respondents

Data were obtained from two sources. The review of patients' records for the period of 2014-2015 identified 6,557 patients managed by SAMU among whom 3,357 (51.2%) were injured and out of those injured 1871 (55.7%) were head injured. The second category of respondents was made of 39 SAMU staff out of whom 37 filled and returned the questionnaires. The response rate was 95%.

4.1.1.1 Distribution of head injured patients according to Socio Demographic Characteristics

The table 4.1 below presents head injured patients according to their age. It was found that the majority of cases are for adults 94.92% (n=1776). Children were represented by 5.07% (n=95) and 76.5% (n=1431) of cases were male head injured patients while 23.5% (n=23.5) were female.

Table 4. 1: Distribution of head injured patients according to Socio Demographic Characteristics

Characteristics (age group)	**Frequency (N=1871)**	**Percentage**
0-15	95	5.07
16-25	479	25.61
26-35	692	36.98
36-45	340	18.17
46-55	102	5.45
Above 55	163	8.71
Gender		
Male	1 431	76.5
Female	440	23.5

Source: Research findings, (2017)

4.1.1.2 Location of head injury accidents

The table 4.3 below presents the location of scene of injury. It was revealed that 84.17% (n=1575) of cases occurred within the City of Kigali whereas 15.82% (n=296) of accidents occurred outside Kigali.

Table 4. 2: Location of head injury accidents (N=1871)

District	Frequency	Percent
Kicukiro	366	19.56
Nyarugenge	607	32.44
Gasabo	602	32.17
Outside Kigali	296	15.82
Total	**1871**	**100**

Source: Research findings, (2017)

4.2.0 Findings related to prehospital management of head injury

This section presents data related to how prehospital management of head injured patients is handled. It shows the response time, the nature of injuries and the procedures of head injury performed.

4.2.1 Response time

On this specific item of response time, only 1,813 presented full data. Fifty eight cases had missing data. The table 4.4 below shows the time response between the call time and arrival time to the health facility. It was observed that the response time below 30 minutes was reported in 39.55% (n=740) of cases. Time response between 30 and 60 minutes was reported by 43.5% (n=814) of the cases surveyed. The present study reports that 83.05% (n=1554) of cases arrive to health facility in the time less than 60 minutes.

Table 4. 3: Response time (N=1871)

Call time to arrival to Health Facility	Frequency	Percent
< 30 min	740	39.55
30 to 60 min	814	43.5
> 60 min	259	13.84
Missing data	58	3.1
Total	**1871**	**100**

Source: Research findings, (2017)

4.2.2 Causes of head injury

The study has revealed that the most common causes of head injury were road traffic crashes as represented by 74.71% (n=1398), followed by fight/stabs/cuts represented by 10.63% (n=199) of the cases surveyed.

Table 4. 4: Causes of head injury (N=1871)

Cause of Accident	Frequency	Percent
Accident related to road traffic accidents	1398	74.71
Falls	167	8.92
Fight/Stabs/Cut	199	10.63
Others	107	5.72
Total	**1871**	**100**

Source: Research findings, (2017)

4.2.3 Types of head injury

Table 4.6 below presents the types of head injury for the cases surveyed. It was observed that the majority of cases (64.45%, n=1206) were wound. Hematoma came second with 25.49% (n=477).

Table 4. 5: Types of head injury (N=1871)

Type of injury	Observation	Percent
Wound	1206	64.45
Hematoma	477	25.49
Contusion	20	1
Bleeding	151	8
Skull fracture	5	0.2
Laceration	12	0.6
Total	**1871**	**100**

Source: Research findings, (2017)

4.2.4 Initial assessment of head injury

It was found from the patients' records that for patients with any head injury or subjective complaint of head pain, the breakdown of GCS ranged from 15 (70.4%) to 13-14 (11.1%) to 9-12 (14.7%) to 3-8 (3.8%). It was found out that only 71 (3.8%) of the 1871 patients with head injury had a GCS of 8 or lower, 10.3% were hypoxic and 36.66% were hypotensive. An SBP of < 90 mmHg was seen in 36.66% of cases at initial assessment and Oxygen saturation O_2<90% was identified in 10.3% of the cases. Head injured patients who had GCS below 13 were seen in 18.5%.

Table 4. 6: Initial assessment of head injury (N=1871)

Type of assessment	Variable	Frequency n=1871 (100%)
Heart Rate	>100 beats per minute	34 (1.80)
Respiratory Rate	>20 breaths per minute	26 (1.40)
Systolic blood Pressure	< 90 mmHg	686 (36.66)
Oxygen saturation	Sat O_2<90%	193 (10.3)
Glasgow Coma Scale	15	1317 (70.4)
	13-14	208 (11.10)
	9-12	275 (14.70)
	3-8	71 (3.80)
AVPU responsiveness scale	Alert	1313 (70.20)
	Verbal	357 (19.1)
	Pain	122 (6.5)
	Unresponsive	79 (4.2)

Source: Research findings, (2017)

4.2.5 Initial management of head injured patients

As regards to initial management of head injury, IV Fluid was given to 94% (n=686), oxygen for hypoxia 99.4% (n=193). Pain Medication was administered to 94% (n=1871) and C-Collar immobilization was given to 74% (n=1871) of head injured patients under study.

Table4. 7: Initial management of head injured patients (N is variable)

Procedures	Observation	Percentage
Resuscitation with ALS measures	10 (n=71) patients GCS < 8	14
Pain Management	1 758 (n=1871)	94
Wound care	1 206 (n=1218) patients with wound and lacerations	99.4
Oxygen supplementary	192 (n=193) Patients SPO2 < 90%	99.4
Fluid resuscitation	645 (n = 686)	94
Cervical collar immobilization	1385 (n = 1871)	74

Source: Research findings, (2017)

4.3 Distribution of SAMU staff regarding knowledge of symptoms for external evidence of head injury

Table 4.9 below shows that 91.89% (n=34) of SAMU staff have good knowledge of symptoms for external evidence of head injury. Two percent (2.70%, n=1) have poor knowledge.

Table 4. 8: Distribution of staff regarding their knowledge of symptoms for external evidence of head injury (N=37)

Knowledge	Frequency (37)	Percentage
Good knowledge	34	91.89
Satisfactory knowledge	2	5.40
Poor knowledge	1	2.70
Total	**37**	**100.00**

Source: Research findings, (2017)

4.3.1 Distribution of EMS personnel according to their use of guidelines and protocols of head injury

Table 4.10 below illustrates the knowledge of SAMU staff on guidelines and protocols of head injured patients as regards to prehospital management. A small majority (62.16%, n=23) of the respondents affirmed that they had and used guidelines and an even smaller majority (54.05%, n=20) confirmed that they have management protocols for head injured patients. Further, a larger

majority [89.19% (n=33)] of the respondents have had at least some training in prehospital care while in service.

Table 4. 9:Distribution of EMS personnel according to their use of guidelines and protocols of head injury

Questions related to knowledge and skills	Frequency		Percentage	
	Yes	No	Yes	No
Do you have management Guidelines available for head injured patients?	23	14	62.16	37.84
Do you have management protocols available for head injured patients?	20	17	54.05	45.95
Did you have any training in pre- hospital care or first aid while in service?	33	4	89.19	10.81

Source: Research findings, (2017)

4.3.2 Working experience of SAMU staff

This study has surveyed nurses and anesthetists of SAMU. It has also examined their working experience to ensure that they might have acquired relevant experience through working. Findings in the table 4.11 below show that 75.68% (n=28) had more than 5 years of experience. Twenty four percent (24.32%) fell between one and five years.

Table 4. 10: Working experience of SAMU staff (N=37)

Experience	Frequency	Percentage
Between 1 and 5 years	9	24.32
Above 5 years	28	75.68
Total	**37**	**100.00**

Source: Research findings, (2017)

4.3.3 Distribution of EMS personnel according to performance of procedures to head injured patients

The table 4.12 below describes the performance of procedures as reported by SAMU staff. Findings show that they performed excellently (above 90%) the following procedures; monitoring of vital signs (100%), assessing GCS (100%), pupil examination (100%), pain management (100%) oxygenation (100%), fluid resuscitation (100%), cervical spine

immobilization (100%), Evacuation & appropriate health care (100%), and manual cleaning (94.59%, assessment of oxygenation and blood pressure (97.30%), AVPU (97.30), and Wound dressing (97.30%).

Table 4. 11: Distribution of EMS personnel according to performance of procedures to head injured patients

Do you perform these procedures for head injured patients?	Frequency (n=37)		Percentage	
	Yes	No	Yes	No
Manual cleaning	35	2	94.59	5.41
Head tilt chin lift	27	10	72.97	27.03
Jaw thrust	28	9	75.68	24.32
Pulling out tongue with tongue depressor	25	12	67.57	32.43
Use of suction devices	28	9	75.68	24.32
Monitoring of vital signs	37	0	100.00	0.00
Assessment of oxygenation and blood pressure	36	1	97.30	2.70
Assessing Glasgow Coma Scale	37	0	100.00	0.00
AVPU	36	1	97.30	2.70
Pupil examination	37	0	100.00	0.00
Resuscitation with advanced life support measures	29	8	78.38	21.62
End tracheal intubation	23	14	62.16	37.84
Wound dressing	36	1	97.30	2.70
Pain management	37	0	100.00	0.00
Give oxygen	37	0	100.00	0.00
Blood glucose test	25	12	67.57	32.43
Give Fluid resuscitation	37	0	100.00	0.00
Cervical spine immobilization	37	0	100.00	0.00
Evacuation & appropriate health care	37	0	100.00	0.00

Source: Research findings, (2017)

4.3.4 Distribution of participants according to availability of materials ready for use

Table 4.13 below presents the assessment of SAMU staff on the availability and use of materials. Generally, 66.43% of the respondents affirmed that equipments are available, sufficient and ready for use every time. There are equipments that were mostly unavailable like eye protection material as material as mentioned by 35.14% (n=13), light reflector clothing 32.43% (n=12), fire extinguisher 27.03% (n=10), torches by 37.84% (n=14), and head immobilization devices as mentioned by 45.95% (n=17).

Table 4. 12: Distribution of participants regarding availability of materials ready for use (N=37)

Type of material	Absent		Insufficient equipment or available but not ready for use some times.		Available, sufficient and ready for use every time	
Equipment	**Frequency (N=37)**	**Percent**	**Frequency (N=37)**	**Percent**	**Frequency (N=37)**	**Percent**
Radio and mobile phone		0.00	9	24.32	28	75.68
Gloves	0	0.00	6	16.22	31	83.78
Protection equipment	12	32.43	14	37.84	11	29.73
Cleaning solution and Disinfectant:	0	0.00	7	18.92	30	81.08
Scissors	8	21.62	9	24.32	20	54.05
Sterilizer	9	24.32	17	45.95	11	29.73
Monitor for vital signs	0	0.00	5	13.51	32	86.49
Suction machine with catheter	1	2.70	17	45.95	19	51.35
Resuscitator bag valve mask	1	2.70	1	2.70	35	94.59
Syringes with needles	0	0.00	0	0.00	37	100.00
Cervical collar	0	0.00	7	18.92	30	81.08
Stretcher (wooden, plastic or clothes device)	2	5.41	7	18.92	28	75.68
Portable oxygen	0	0.00	9	24.32	28	75.68
Mask of oxygen adult	0	0.00	10	27.03	27	72.97
Oropharyngeal airway adult size	2	5.41	10	27.03	25	67.57
Magill's forceps	0	0.00	5	13.51	32	86.49
Laryngoscope with bulbs, batteries and endo-tracheal tube	1	2.70	7	18.92	29	78.38
Intravenous Fluids infusion and cannels	0	0.00	2	5.41	35	94.59
Glucometer	0	0.00	22	59.46	15	40.54
Sedative	3	8.11	9	24.32	25	67.57
Medication for pain	0	0.00	5	13.51	32	86.49
Chart for documentation	0	0.00	5	13.51	32	86.49
Average	**3.27**	**8.54**	**9.26**	**25.02**	**24.58**	**66.43**

Source: Research findings, (2017)

4.3.5 Repartition of participants regarding the facility of transporting head injured patients

Table 4.14 below shows how SAMU staff perceived assessment of transport of head injured patients. A fair majority of respondents 72.97% (n=27) revealed that transport facility is easy while 27.03% (n=10) of the respondents affirmed that it is difficult.

Table 4. 13 :Distribution of participants regarding the facility of transporting head injured patients (N=37)

Responses	Frequency	Percentage
Very easy	6	16.22
Easy	21	56.76
Difficult	8	21.62
Very difficult	2	5.41
TOTAL	**37**	100.00

Source: Research findings, (2017)

4.3.6 Reasons for not performing some procedures

The study established the reasons for not performing some procedures by SAMU staff. Findings have shown that lack of functioning equipment and counter-indication are the major reasons for not performing some procedures as respectively affirmed by 59.46% (n=22) and 54.05% (n=20) of the respondents. Lack of skills was also confirmed by 48.65% (n=18) of the respondents. Further, external factors were also examined to see how they affect the prehospital care at prehospital stage. A large majority (86.49%, n=32) affirmed that traffic jams was an external factor that affected prehospital care. A fair majority also (67.56%, n=25) affirmed that limited facilities at the receiving health facilities was one of the major obstacles to prehospital care. And even a smaller majority (51.35%, n=19) agreed that situation prevailing at the scene affect the prehospital care.

Table 4.14 :Reasons for not performing some procedures

Reason for not performing EMS procedure	Source [Internal &External]	Frequency		Percentage	
		Yes	No	Yes	No
Lack of skills	Internal	18	19	48.65	51.35
Lack of functioning equipment	Internal	22	15	59.46	40.54
Lack of supplies or medication	Internal	10	27	27.03	72.97
Counter-indication	Internal	20	17	54.05	45.95
Traffic jams	External	32	5	86.49	13.51
Limited facilities of receiving hospitals	External	25	12	67.56	32.44
Situation at the scene	External	19	18	51.35	48.65

Source: Research findings, (2017)

5. Linkage between procedures, availability of equipment, and leading factors from interview and record review

Table 4.16 below links the procedures and the reasons for not performing some of the procedures. Findings revealed that 72.97% (n=27) of the respondents performed Head tilt chin lift while it is counter-indicated for head injured patients. Other procedures that necessitate skills are jaw thrust and pulling out tongue. Respondents who affirmed that they performed them weree respectively represented by 75.62% (n=28) and 67.57% (n=25). Findings also revealed that 78.38% (n=29) of respondents perform resuscitation as a procedure, 62.16% (n=24) do intubation and cervical collar was performed at 100% (n=37) as affirmed by respondents.

Table 4.15 Linkage between procedures, availability of equipment, and leading factors from interview and record review

Types of procedures	Percentage of performance (n=37) (%)	Availability of equipment (n=37) (%)	Procedure administered to patients (%)	Reason for not performing the procedure
Head tilt chin lift	72.97	N/A	N/A	Lack of skills @ 48.65%
Jaw thrust	75.62			
Pulling out tongue	67.57			
Resuscitation	78.38	66.43	(n=71) 14	Lack of functioning equipment @ 59.46% Lack of medication @ 27.03%
Intubation Tube & Laryngoscope	62.16	66.22	(n=71) 14	
Cervical collar	100	81.08	(n=1871) 74	

Source: Research findings, (2017)

Conclusion

The present study has gathered data from two sources; from 1871 records of patients to assess the types of procedures and prehospital interventions they received, and 37 EMS personnel who filled the questionnaires to examine their knowledge, skills and practices they administer to head injured patients in prehospital setting. Data have shown that the majority of head injuries were caused by road traffic accidents (74.71%) and they affected male most (76.50%). EMS personnel perform prehospital procedures at 88.76% and affirmed the availability of equipment at 66.43%.

CHAPTER FIVE: DISCUSSION

5.0 Introduction

This section discusses the findings of the study in line with the research questions. It also alludes to the conceptual framework of the present study so as to arrive at a comprehensive conclusion. The conceptual framework presented the four major independent research variables namely the scene size-up describing the types and causes of injury, demographic characteristics of patients, response time, etc. The second independent variable highlighted the human factors such as staff quality as reflected in their knowledge, skills, procedures and practices, training, and use of guidelines and protocols. The third independent variable comprised the equipment and infrastructural factors namely ambulances, assessment and resuscitation equipment, support equipment, communication and protection equipment and medical supplies. Finally, the last but not least independent variable referred to environmental factors that might affect the prehospital management such as road and traffic conditions, population at the scene and weather conditions.

5.1 Scene size-up as a factor of prehospital management

The scene size describes the types and causes of injury and demographic characteristics of patients. Findings have shown that the majority of cases are adults 94.92% (n=1776). Children were represented by only 5.07% (n=95).

The fact that the majority of head injuries affected adult population can be explained by the fact that they are the ones who are in activity and are always in contact with road crashes. It was also found in the present study that 74.71% of head injury cases were caused by road traffic accidents. The low percentage of 5.07% for children under 15 can be understood as they are always at schools and there are also measures to protect them from road traffic accidents during their peak hours while they go to or get back from schools.

The above findings are in line with those of Mohammed et al (2015) a study conducted on injury characteristics and outcome of road traffic accidents in Ethiopia, in which 53.5% of RTA victims were adult made of laborers and adult students. Similarly, findings of the present study concur with those of Nsereko (2010). that reported 52% of injuries due to road traffic collisions in Rwanda. Similarly, Kenyanjui (2016). in his study of Traumatic brain injury in Kenya, reported that 82% of cases were due to road traffic accidents. Mohamed et al (2015). reported 75.8% of

cases that were due to road traffic accidents. Twagirayesu et al (2008) reported 50.7% as injuries due to road traffic accidents. Most of the studies explain the causes of traffic accidents as a result of alcohol, excessive speed, and improper use of road safely signals. Similarly, Gururaj (2008) as cited by Mukul (2010), revealed that road traffic accidents were the leading factors of TBI (60%) followed by falls (20%-25%).

As regards to demographic characteristics of head injured patients, it was found that 76.5% (n=1431) of cases were male while 23.5% (n=23.5) were female. It was revealed that 84.17% (n=1575) of cases occurred within the City of Kigali whereas 15.82% (n=296) of accidents occurred outside Kigali. This predominance in Kigali city can be explained by the fact that the study was exclusively conducted in Kigali where the prehospital service is operational.

The dominance of males who sustained head injuries can be associated with their involvement in most of the activities. The findings of the present study concur with those of Mohamed et al (2015) who found that 71.7% were male against 28.3% of females in Ethiopia. Charlotte et al (2014) in their study of increase in nursing competence in ambulance services and how it impact on prehospital assessment and interventions in Sweden, have found that 77% of the respondents who had sustained severe head injury were male. Twagirayesu et al (2008) in their study on road traffic injuries at Kigali University Central Teaching hospital found that 78.7% were males. As regards to location of injury, a higher percentage is found in Kigali because it is where SAMU is headquartered. Those cases from outside Kigali were mainly those of mass casualties and others that occur in rural areas neighboring the city of Kigali.

It was observed that the response time below 30 minutes was reported in 39.55% (n=740) of cases. Time response between 30 and 60 minutes was reported in 43.5% (n=814) of the cases surveyed. The present study reports that 83.05% (n=1554) of cases arrived to health facility in the time less than 60 minutes. Findings on response time may seem not satisfactory as the shorter the response time the better chances of improving the prehospital care. As explained below, the traffic jams and situation at the scene significantly affect the response time. The above findings are in harmony with the findings of Brorsson et al (2011) in the study on severe TBI consequences in Sweden, who reported that 60% of cases reached the hospital within 60 minutes of the injury time. Although the present study did not examine the distance covered from the site of ambulance dispatch to the scene, Dash (2008) suggested that an ambulance should cover a

distance of 5 km to augment the transfer of patients to an appropriate receiving hospital. Furthermore, Dash (2008). emphasized that optimal evacuation requires choosing the right patient at the right time and using the right means of transportation to the right hospital.

The study has also examined the dominant types of head injuries. It was observed that the majority of cases (64.45%, n=1206) were wound type of injury. Hematoma comes second with 25.49% (n=477). This can be understood that wound and hematoma were found most occurring types of head injury in the present study. This can be explained by the causes of head injury that generally end up causing wound and hematoma such as road traffic accidents, falls and fights. Guoxin (2007). in his study of prehospital trauma care in Ontario found that 41.3% of injuries were wound while 40% were contusions.

5.2 Human related factors to prehospital management

This part describes the procedures administered to head injured patients. It was found from the patients' records that for patients with any head injury or subjective complaint of head pain, the breakdown of GCS ranged from 15 (70.4%) to 13-14 (11.1%) to 9-12 (14.7%) to 3-8 (3.8%). It was found that only 71 (3.8%) of the 1871 patients with head injury had a GCS of 8 or lower, 10.3% were hypoxic and 36.66% were hypotensive. An SBP of < 90 mmHg was seen in 36.66% of cases at initial assessment and Oxygen saturation ($SpO_{2)}$ <90% was identified in 10.3% of the cases. Head injured patients who had GCS below 13 were seen in 18.5%. The study of Rt. Petroze et al. (2014) conducted on patterns of injury at two university teaching hospitals in Rwanda, have found similar results as they highlight a significantly higher proportion of severely injured patients, represented by those with an initial GCS of 3-8 with 9.76% at CHUK against 3.25% at CHUB.

Further, IV Fluid was given to 94% (n=686) of patients and oxygen for hypoxia 99.4% (n=193). Pain Medication was administered to 94% (n=1871) and C-Collar immobilization was applied to 74% (n=1871) of head injured patients under study. Findings of this study are in agreement with Dash (2008) who suggested in his study of initial assessment to first assess the severity of injury, to immediately provide care of the airway and breathing, prompt restoration and maintenance of hemodynamic stability, provide optimal environment for the brain by taking care of intracranial pressure (ICP), take adequate and proper care of associated injuries and finally, transport the patient to the most appropriate multidisciplinary hospital.

Findings from interview have shown that they perform excellently the following procedures; monitoring of vital signs (100%), assessing GCS (100%), pupil examination (100%), pain management (100%) oxygenation (100%), fluid resuscitation (100%), cervical spine immobilization (100%), Evacuation & appropriate health care (100%), and manual cleaning (94.59%, assessment of oxygenation and blood pressure (97.30%), AVPU (97.30), Wound dressing (97.30%). The above two sets of results show that what SAMU staff perform as procedures and what they affirm in the interview tend to be the same. They are therefore in agreement with what was said by Mukul (2010). from different studies that, early resuscitation and prehospital care are pivotal to better outcomes in TBIs. Transportation of severely injured patients from the scene directly to Level I trauma centers is associated with a reduction in mortality and morbidity. Resuscitation of head injured patients at the accident site is paramount in minimizing morbidity. It can be presumed therefore that head injured patients rescued by SAMU staff get better outcomes.

Similarly, findings have shown that SAMU staff have excellent knowledge (100%, n=37) on altered consciousness as an external evidence of head injury. Findings have also shown that SAMU staff had good knowledge on the six symptoms as external evidence of head injury namely otorrhagia (89.19%), Rhinoorrhagia (89.19%), vomiting (81.08%), altered pupils (83.78%), cerebrospinal fluid leakage (81.08), and agitation (86.49%). It was also revealed that they have poor knowledge on external skin contusion (48.65%) and shock (50.05%). Furthermore, s small majority (62.16%, n=23) of the respondents affirmed that they had use guidelines and an even smaller majority (54.05%, n=20) confirmed that they had management protocols for head injured patients. A larger majority (89.19% (n=33) of the respondents had had at least some training in prehospital care while in service.

Furthermore, findings have shown that 75.68% (n=28) have more than 5 years of experience. Twenty four percent (24.32%) fell between one and five years of working experience in prehospital management. This entails that prehospital health providers stand more chance of administering quality care as they had had enough time to experience and learn from each other and mistakes that might have happened during regular staff meetings. According to Heather (2013), experience is the best teacher as she outlined in her four pillars; experiences are

extremely impressionable, we learn from experience, experience teaches what you want and what we don't want and finally, "experience transforms us into professionals".

5.3 Infrastructure and equipment as factors to prehospital management

There are equipments that were mostly unavailable like eye protection 35.14% (n=13), light reflector clothing 32.43% (n=12), fire extinguisher 27.03% (n=10), torches 37.84% (n=14), and head immobilization devices 45.95% (n=17). A fair majority of respondents 72.97% (n=27) revealed that transport facility is easy while 27.03% (n=10) of the respondents affirmed that it is difficult. Findings have shown that lack of functioning equipment and counter-indication were the major reasons for not performing some procedures as respectively affirmed by 59.46% (n=22) and 54.05% (n=20) of the respondents. Lack of skills was also confirmed by 48.65% (n=18) of the respondents as one of the reasons.

This is an alarming situation that can be associated with poor maintenance or carelessness of the EMS personnel as you would not find most of the materials and supplies out of stock. The same findings were reported by Kou Kou (2015, p.85) on practices and knowledge levels of prehospital doctors on TBI management in Hubei, China, whereby he examined the external barriers to prehospital management. His study found that 50% had reported inadequate equipment and 30.8% reported inefficient communication equipment. Furthermore, lack of skills can simply be understood by the fact that even though training was offered, it was generic in prehospital management and not given in very specialized areas. Similarly, since respondents were combined at the time of filling questionnaires, there is a procedure of intubation that is often performed by anesthetists that might have been reported by nurses as lacking.

Further, the barriers that were cited to possibly affect the prehospital management were lack of functioning equipment (59.46%) and lack of medications (27.03%). These barriers could be attributable to human related factors or carelessness at the time of requisition. Most of equipment may not be functioning properly due to poor maintenance or short supply of some utilities on one hand or the rescue team may lack medications while they are available in stock on the other due to improper requisitions.

5.4 External factors that affect prehospital management

The present study also examined external factors to see how they affect the prehospital care at prehospital stage. Findings have indicated that, a large majority (86.49%, n=32) affirmed that traffic jams was an external factor that affected prehospital care. A fair majority also (67.56%, n=25) affirmed that limited facilities at the receiving health facilities were one of the major obstacles to prehospital care. Even a smaller majority (51.35%, n=19) agreed that the situation prevailing at the scene affect the prehospital care. The study of Kou Kou (2015, p.86) reported that the top three external barriers that affected the prehospital treatment were human related factors (75%), inadequate agents (57.7%) and inadequate equipment (50%). The situation at the scene has affected the promptness in administering the prehospital care when for instance the rescue team found the scene overpopulated or low level of cooperation on the side of stakeholders like caregivers, patients' relatives, security staff and alike.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

This chapter presents the summary of findings in accordance with the objectives, relevant conclusions and recommendations. The study sought to examine the prehospital management of head injured patients and the factors that affect the prehospital management of head injury. The study surveyed on cases of head injury that occurred during 2014-2015, the knowledge and skills of the current prehospital personnel, and the infrastructural and environmental factors that may affect the quality of prehospital care in Rwanda. The conclusions below are aligned with the specific research objectives. The recommendations refer to suggestions for further study or proposal for change.

6.1 Conclusions

This part draws a conclusion of the study from the research findings. The study was meant to examine the prehospital management of head injured patients in prehospital setting in Kigali and to examine the factors that promote or strengthen the prehospital management of head injuries. The researcher examined 1871 cases of head injury and the study also involved EMS personnel care providers to give additional information related to human related factors with respect to procedures and practices and other external factors that might affect prehospital management.

The researcher was guided by the research variables and questions to arrive at the conclusion. It was found that surveyed patients were properly managed at prehospital stage. Procedures and practices were adequately administered. SAMU staffs have moderate knowledge on the symptoms of head injury and administer correctly the required procedures. It was also found that they take maximum care of the vital signs and other measures to assess the severity of the injury.

The study has also identified factors that affect the prehospital management; some were identified as human related such as lack of skills on specific procedures of head injury, lack of functioning equipment due probably to poor maintenance or improper requisition of materials and medical supplies. External barriers were identified as traffic jams and limited facilities at the receiving health facilities that may prolong the response time. It was also revealed that the majority of patients were taken to appropriate hospitals within 60 minutes.

Conclusively therefore, the present study has found the prehospital management of head injured patients at satisfactory level but has underlined the major areas that may need improvement to ensure better outcomes of head injured patients in Rwanda.

However, this study could not tackle all aspects of prehospital management in Rwanda. It has not linked the administered procedures to the outcomes when patients reached hospitals. It has neither examined quantity wise whether ambulances are enough against their dispatch sites to determine a reasonable distance of intervention in a bid to significantly minimize the response time. In addition, this study was geographically limited in the city of Kigali while a prehospital service is needed across the entire territory. The study has not also highlighted on the mortality and morbidity of the transported patients as it was out of scope.

6.2 Recommendations

The study findings have indicated some areas that may need to be strengthened to ensure adequate prehospital management in Rwanda. The prime role should be played by the Ministry of Health/SAMU;

- ✓ To inculcate in the EMS personnel the habit of using guidelines and protocols and share experiences during regular staff meetings involving prehospital mortality and morbidity meetings which other disciplines conduct like perinatal mortality meetings to learn from mistakes and debrief.
- ✓ To accord due care and management to the equipment, materials and supplies required in any prehospital intervention to ensure quality care at prehospital stage by enforcing timely and regular requisitions of materials and medical supplies used in interventions
- ✓ To organize regular training in specialized areas of prehospital management to uplift the skills and knowledge of EMS personnel in the areas of ACLS, APLS and ATLS for the country through establishment of the resuscitation Council affiliated to the ones in other countries where the prehospital is fully functioning.
- ✓ To introduce specialized prehospital courses in the curriculum of nursing schools of Rwanda to increase the number of qualified prehospital professionals across the country.

- ✓ To increase the public awareness about the prehospital care by informing the public particularly road users about their responsibility of facilitating the access and transportation of the patient.
- ✓ To strengthen a well structured referral system and coordinating structure to monitor availability of beds and direct transportation of patients so that no hospital refuses to admit a patient.
- ✓ To increase the number of ambulance dispatch sites to minimize the distance between the scene and receiving health care facility so as to reduce the response time.

6.3 Suggestion for further research

- ✓ A study linking the prehospital management and patient outcomes
- ✓ Factors affecting the prehospital management at the scene
- ✓ Determinants of response time in the prehospital settings in Rwanda.

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CHECKLIST

Instruction: This checklist will be filled by the researcher

==========

I. Head injured patient identification

- Age:
- Gender:
- Location of accident:
- Response time:

Call time		Arrival time		Arrival time to hospital	

- Type/Nature of injury:

Contusion	Hematoma	Laceration	Concussion	Skull fracture	Bleeding

- Cause of accident:

Falls	Road traffic accident	Fight/Stabs/Cut	Others [Specify]:	

- Mechanisms of trauma:

Blunt trauma	Penetrating trauma	Others (specify):

II. Questions related to procedures of head injured patient:	**Measures**
Heart rate	
Respiration rate	
Saturation	
Blood pressure	
Assessing Glasgow Coma scale	
Pupil examination	
Resuscitation with advanced life support measures	
End tracheal intubation	
Wound dressing	
Give oxygen	
Give Fluid resuscitation	
Cervical spine immobilization	
Appropriate health care	

QUESTIONNAIRE

This questionnaire will be filled by SAMU staff

It was adapted to WHO Trauma Support Systems Manual 2005.

I am Jacqueline Mukagasasira, a student in the Master of Science in Nursing, Critical Care and Trauma track at the University of Rwanda, College of Medicine and Health Sciences, School of Nursing and Midwifery. As an academic requirement, I am doing a research entitled "**Prehospital management of head injured patients in Rwanda**". I would appreciate if you would kindly take a little of your time to fill this questionnaire. Any information provided from you is purely for academic purposes and all responses will be treated with strictest confidence. Your cooperation is most valued and appreciated.

I take this opportunity to thank you in advance for your quick return of your completed questionnaire.

Emergency Medical Service staff [To be filled by SAMU prehospital health care providers]

A. Questions related to Knowledge, skills and practice related to management of head injured patients; [Tick the appropriate answer:]

1. Which of the following symptoms do you consider as external evidence of Head injury*? (Tick the appropriate answers)*

Symptoms		**Symptoms**	
Altered consciousness		Cerebrospinal fluid leakage Rhinorrhea & Otorrhea)	
Headache		Scalp wound	
Otorrhagia		External skin Hematoma	
Rhinoorrhagia		Agitation	
External skin Contusion		Dyspnea	
Vomiting		Shock	
Altered pupils		Others (specify)	

Please circle with YES or NO in the questions below

2. Questions related to knowledge and skills	**Yes**	**If yes, date**	**No**
Do you have management Guidelines available for head injured patients?			
Do you have management protocols available for head injured patients?			
Did you have any training in pre- hospital care or first aid while in service?			
Working experience	<1 yr	1 to 5 yrs	>5 yrs

3. **Do you perform these procedures for head injured patient:**	Yes	No
Manual cleaning		
Head tilt chin lift		
Jaw thrust		
Pulling out tongue with tongue depressor		
Use of suction devices		
Assessment of oxygenation and blood pressure		
Assessing Glasgow Coma scale		
Pupil examination		
Resuscitation with advanced life support measures		
End tracheal intubation		
Wound dressing		
Blood glucose test		
Give oxygen		
Give Fluid resuscitation		
Cervical spine immobilization		
Evacuation & appropriate health care		

Tick the appropriate answer (answers can be more than one)

3.1. If you do not perform these procedures, what are the main reasons?

- Lack of skills
- Lack of functioning equipment
- Lack of supplies or medication
- Counter-indication
- Other, specify: ……..

If you do not perform these procedures, do you refer patients to health care facility?	Yes	No

3.2. What are the external barriers to prehospital management?

- Traffic jams
- Limited facilities of receiving health facility/hospitals
- Situation at the scene
- Others, specify……

How easy is the transport of a head injured patient to appropriate health facility?

- Very easy
- Easy
- Hard
- Very hard

Comment on your answer if it is hard or very hard to transport a head injured patient:

……

B. Questions related to the availability of equipments in Emergency Medical service?

Please indicate with "0' for Absent, "1" for Available with frequent shortage or difficulties, and "2" for Available for all patients all the time:

Type of material	**0** **Absent**	**1** **Insufficient equipment or available but not ready for use some times.**	**2** **Available, sufficient and ready for use every time**
Communication equipment: • Radio, • Mobile phone)			

Protection materials: • Gloves, • Eyes protection, • Light reflector clothing, • Fire extinguisher • Torch			
• Cleaning solution and Disinfectant: • Soap, water			
Scissors			
Sterilizer			
Monitor for vital signs			
Stethoscope Suction machine with catheter			
Resuscitator bag valve and mask			
Syringe with needles			
Cervical collar			
Head immobilization device			
Stretcher (wooden, plastic or clothes device)			
Portable oxygen			
Mask of oxygen adult			
Orpharyngeal airway adult size			
Magill forceps			
End tracheal tube all size			
Laryngoscope Macintosh blades with bulbs and batteries			
Intravenous Fluids infusion			
Glucometer			
Sedative			
Intravenous cannels			
Chart for documentation			

Thank you for taking your time to complete this form

THE FORM FOR SUBMISSION OF THE DISSERTATION

UR-COLLEGE OF MEDICINE AND HEALTH SCIENCES
P.O.BOX 3286 KIGALI

DECLARATION AND AUTHORITY TO SUBMIT THE DISSERTATION

Surname and First Name of the Student

MUKAGASASIRA Jacqueline

Title of the project

PREHOSPITAL MANAGEMENT OF HEAD INJURED PATIENTS IN SAMU/KIGALI

a. *Declaration by the Student*

I do hereby declare that this ***dissertation*** submitted in partial fulfilment of the requirements for the degree of **MASTERS OF SCIENCE in NURSING**, at the University of Rwanda/College of Medicine and Health Sciences, is my original work and has not previously been submitted elsewhere. Also, I do declare that a complete list of references is provided indicating all the sources of information quoted or cited.

Date and Signature of the Student

The 9th June 2017 .....

b. ***Authority to Submit the dissertation***

Surname and First Name of the Supervisor

.....

In my capacity as a Supervisor, I do hereby authorize the student to submit his/her **dissertation**.

Date and Signature of the Supervisor/Co-Supervisor

.....

12.06.2017 CO-SUPERVISOR

UNIVERSITY OF RWANDA

COLLEGE OF MEDICINE AND HEALTH SCIENCES

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 07/01/2017
Ref: CMHS/IRB/005/2017

MUKAGASASIRA Jacqueline
School of Nursing and Midwifery , CMHS, UR

Dear MUKAGASASIRA Jacqueline

RE: ETHICAL CLEARANCE

Reference is made to your application for ethical clearance for the study entitled ***"Pre-Hospital Management Of Head Injured Patients In SAMU/Kigali."***

Having reviewed your protocol and found it satisfying the ethical requirements, your study is hereby granted ethical clearance. The ethical clearance is valid for one year starting from the date it is issued and shall be renewed on request. You will be required to submit the progress report and any major changes made in the proposal during the implementation stage. In addition, at the end, the IRB shall need to be given the final report of your study.

We wish you success in this important study.

Professor Kato J. NJUNWA
Chairperson Institutional Review Board
College of Medicine and Health Sciences, UR

IRB Vice - Chair

Cc:
- Principal College of Medicine and Health Sciences, UR
- University Director of Research and Postgraduate studies, UR

EMAIL: researchcenter@ur.ac.rw P.O. Box: 3286, Kigali, Rwanda WEBSITE: http://cmhs.ur.ac.rw/

MUKAGASASIRA Jacqueline

University of Rwanda, CMHS

C/O SAMU/Kigali

Tel No. 0788865505

Email: jackygasasira@gmail.com

Date: January 24, 2017

Honorable Minister,

Ministry of Health

Kigali-Rwanda

Dear Honorable Minister,

Re: request for permission to conduct research in SAMU/MoH

I am a Master student in Critical Care and Trauma at the University of Rwanda, College of Medicine and Health Sciences, School of Nursing and Midwifery under the sponsorship of the Ministry of Health for the two year program of 2015-2017.

I am now at the stage of writing a research dissertation and have already obtained a clearance from the Institutional Review Board of the University. My research topic is "Prehospital management of Head injured patients in SAMU/Kigali.

The purpose of this letter is to therefore request your permission to gather data from SAMU Kigali.

Looking forward to hearing from you,

Yours Sincerely,

MUKAGASASIRA Jacqueline

Republic of Rwanda

MINISTRY OF HEALTH

National Health Research Committee
Ref: NHRC/2017/PROT/010

To: **Mukagasasira Jacqueline**
Principal Investigator

Scientific Review Approval Notice

With reference to your request for approval of the Research Protocol entitled; **"Pre-hospital Management of Head Injured Patients in SAMU/Kigali"**; We are pleased to inform you that, following a thorough review and critical analysis of your proposal **(NHRC/2017/PROT/010)**, your Research Protocol has been approved by National Health Research Committee.
However,

1) Changes amendments on approach and methodology must be submitted to the NHRC for review and approval to validate the changes.

2) Submission to NHRC of final results is mandatory

3) Failure to fulfill the above requirements will result in termination of study

Once again National Health Research Committee appreciates your interest in research and requests you to submit this proposal to the National Ethics Committee or IRB and then share a copy of the approval letter from them.

Your final approval reference number is **NHRC/2017/PROT/010.**

Sincerely,

Dr. Parfait UWALIRAYE
Chairperson of NHRC

Date: 28/02/17

UNIVERSITY OF RWANDA

COLLEGE OF MEDICINE AND HEALTH SCIENCES

SCHOOL OF NURSING AND MIDWIFERY

Kigali, on 30 / 01 /2017

Ref. No: 359/ UR-CMHS/SoNM/17

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

Re: Request to collect data

Referring to the above subject, I am requesting for permission for **MUKAGASASIRA Jacqueline**, a final year student in the Masters of Science in Nursing at the University of Rwanda/College of Medicine and Health Science to collect data for his/her research dissertation entitled "**Prehospital management of head injured patients in SAMU/Kigali**"

This exercise that is going to take a period of 2 months starting from 13th February 2017 to 12th April 2017 will be done at SAMU/Ministry of Health, Kigali.

We are looking forward for your usual cooperation.

Sincerely,

Dr. Donatilla MUKAMANA, RN, PhD
Dean, School of Nursing and Midwifery
College of Medicine and Health Sciences

Email: schoolofnursingandmidwifery@ur.ac.rw, P.O.Box: 3286 Kigali-Rwanda, Website: www.ur.ac.rw