ASSESSMENT OF NURSES'KNOWLEDGE AND PRACTICE ON MEASURES TO PREVENT INCREASE IN INTRACRANIAL PRESSURE AMONG NEUROSURGICAL PATIENTS AT TWO SELECTED HOSPITALS.

Diogene TWAHIRWA

College of Medicine and Health Sciences

School of Nursing and Midwifery

Master of Sciences in Nursing

Year, 2019

UNIVERSITY *of* **RWANDA**

ASSESSMENT OF NURSES' KNOWLEDGE AND PRACTICE ON MEASURES TO PREVENT INCREASE IN INTRACRANIAL PRESSURE AMONG NEUROSURGICAL PATIENTS AT TWO SELECTED HOSPITALS.

By

Diogene TWAHIRWA

Registration Number 218000079

A dissertation submitted in partial fulfilment of the requirements for the degree of

MASTER OF SCIENCES IN NURSING (Critical Care and Trauma Nursing Track)

In the College of Medicine and Health Sciences

Supervisor: Professor Busisiwe Bhengu

Co-Supervisor: Evelyne NANKUNDWA

JUNE, 2019

DECLARATION

I Diogene Twahirwa hereby declare that this dissertation entitled: *Assessment of nurse's knowledge and practice on measures to prevent increase in intracranial pressure among neurosurgical patients* is a result my work and has not been submitted for any other degree at the University of Rwanda or any other institution.

.

Names:Diogene TWAHIRWA.   Number: 218000079

Signature:………….

DEDICATION

To the supreme God who enabled us to accomplish this work.

To my supervisors,

My appreciation is also offered to my parents, brothers,sisters ,relatives and others friends who provided help to accomplish this work,

Dedications also go to my colleagues for moral and spiritual support.

ACKNOWLEDGEMENTS

ABSTRACT

Raised intracranial pressure is a common condition among neurosurgical patients admitted in hospitals and imposes significant consequences to patient health and a burden to relatives. Research has shown that 50-75% traumatic brain injury and other neurosurgical cases presented with an increased intracranial pressure .Mortality rate resulting from the increase of ICP is estimated around 20% .ICP leads to disability or to death in post traumatic brain injury and in neurosurgical patients in general. The aim of this study was to assess nurses' knowledge and practice of measures to prevent increase in intracranial pressure among neurosurgical patients.

Methodology: This study utilized a quantitative research approach and a cross-sectional descriptive design among100 nurses at CHUK and RMH. The study participants were selected by convenient sampling technique. A self administered questionnaire and an observation check list were used to collect data and a response rate was 100%.Descriptive statistics in SPSS were used to generate frequencies, means and standard deviation. Pearson correlation coefficient (r) was calculated to test the correlation between nurses'knowledge, and practices. For correlation a p-value of 0.05 was considered as significant.

Results: The nurses overall mean knowledge score was (mean 49.18, SD=18.90) and 52 % of respondents scored below and were considered in the category of poor knowledge about general knowledge regarding increased ICP .Whereas the nurses overall mean knowledge score was(mean 60.60,SD=14.65) and 57 % of respondents scored below the mean percentage and were considered in the category of poor knowledge about knowledge of preventives measures regarding increased ICP.Among 20 nurses observed,the overall mean score for practices of respondents was 44.68 and SD=17.59and about 80 % of the respondents had score below mean score and considered having poor practices and the remaining 20% had good practices of intracranial pressure prevention. There was a negative correlation between the knowledge and the practices towards increased ICP prevention (r=-0.242, p=0.303).

Conclusion: Knowledge of the nurses regarding ICP signs, contributing factors and preventive measures were poor. Practice was also poor.

TABLE OF CONTENTS.

LIST OF ACRONYMS AND ABBREVIATIONS

ANOVA   Analysis of Variance

CHUK   Centre Hospitalier Universitaire de Kigali

CSF   Cerebral Spinal Fluid

ICP   Intracranial pressure

ICU   Intensive Care Unit

LMIC   Low and middle income country

mmHg   Millimeter of mercury

Pco2   Partial Pressure of Carbon dioxide Gaz

RMH   Rwanda Military Hospital

SPSS   Statistical Package for Social Sciences

TBI   Traumatic Brain Injury

UR   University of Rwanda

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

1.0. INTRODUCTION

This chapter covers introduction, background of the study, problem statement, and the aim of the study, research objectives, and research questions, significance of the study, definition of concepts and then the scope of the study.

1.1.BACKGROUND

Intracranial pressure (ICP) refers to the sum of all pressures exerted by the intracranial contents determined by the brain tissue, cerebrospinal fluid (CSF) and blood. The range of normal ICP is between zero to fifteen (0-15 mmHg) for an adult in supine position. Any person with increased ICP develops many complications necessitating hospital admission and requires medical and nursing intervention. The later can positively and negatively affect patient condition(Kawoos *et al.*, 2015).

Dewan *et al.*, 2017,p.3)highlighted an estimated 22.6 million patients suffer from neurological disorders and among them 13.8 million neurosurgical cases require surgery and nursing care and in these cases above 80% develop in low- and middle-income countries.African continent by projection is expected to have almost 2 million neurosurgical cases, as opposed to around 665,000 cases in the western countries such as United States of America and Canada.In Europe, the Eastern Mediterranean, and Latin America new neurosurgical cases will be around 1.1 and 1.8 million per year by projection.

All these neurosurgical conditions require special neurosurgical nursing care and surgery be it burr holes, craniotomy or craniectomy. Among these conditions requiring surgery traumatic brain injury is around 45%,whereas stroke in general accounts for 20%, hydrocephalus accounts for 7%, and brain tumors account for 5%.Vascular anomalies accounts for less with 2.2%, neural tube defects account for 0.3%and finally spinal tumors account for 0.1%(Dewan *et al.*, 2017,p.3).

In their study in Greece , Papageorgiou et al.(2017) demonstrated   that the majority (75%) of all cases with TBI(severe traumatic brain injuries) were admitted in intensive care units, and required intensive neuro- monitoring .The same author continued highlighting that among those cases of traumatic brain injury,50-75% presented with an increased intracranial pressure(Papageorgiou *et al.*, 2017,p.1).

In Africa especially Sub-Saharan Africa there is a lack of accurate trauma data and non traumatic pathologic condition on the contribution to elevated ICP versus knowledge on measures to prevent a rise in intracranial pressure especially in Rwanda where rare official records regarding the epidemiology of traumatic brain injury, neurosurgical conditions and raised intracranial pressure can be found.In Uganda the overall mortality rate for neurosurgical condition is around 12, 7% with a mortality rate of 9,7% for a patient who underwent a neurosurgical procedure(Abdelgadir *et al.*, 2017).

Currently there are no data from CHUK and Rwanda Military Hospital about management of intracranial pressure in post neurosurgical patients. Unpublished data from a registry of trauma patients at one referral level hospital (CHUK) revealed that the mortality rate of patients with neurosurgical conditions among others TBI was 58%(Ramesh *et al.*, 2014).

March & Hickey (2014) highlighted that changes in ICP can have a rapid onset and require an immediate response from the nurses. Increased ICP is an urgent condition that needs quick fixing on behalf of the nurse in terms of prevention, because ischemic cerebral cells become hypoxic following lack of perfusion and die in 4-6 minutes period after the cessation of blood supply. In about 5 to 10 minutes of complete cessation of blood supply there happens irreversible brain damage in humans. Mahday et al.(2016) stated that mortality rate resulting from the increase of ICP is estimated around 20%.The same author highlighted that a big number of evidence has demonstrated that routine nursing interventions have positive or negative impact on ICP, leading to better prognosis or worse prognosis. Nurses are in the right place in the management of patients and are responsible for quality care that may be implemented to reduce elevated ICP and be able to prevent secondary brain injury (Mahday et al. 2016).

Luzia *et al.*, (2018) noted that there are adverse events that take place in patients with raised intracranial pressure that nurses can anticipate and provide non-invasive care that helps to reduce intracranial hypertension thus contributing to the lessening of secondary brain lesions. This why nursing care for patients with raised ICP must be instituted to maintain adequate cerebral perfusion thus preventing further brain injury by maintaining ICP in the normal range, and limiting factors that are known to increase ICP(Luzia *et al.*, 2018).

LeCroy & McMahon, (2015) stated that nurses play an important role in the management of patients with neurosurgical conditions, as nurses are the main health care team members having various responsibilities while caring for neurosurgical patients throughout all phases of treatment and recovery.The same author added that increased intracranial pressure may be prevented by performing certain nursing interventions such as providing adequate oxygenation, appropriate patient positioning, avoiding isometric muscle contractions, limiting valsalva maneuvers, limiting noxious stimuli (LeCroy & McMahon, 2015).

In most African countries neurosurgical nursing as a specialty is rare because neurosurgical nursing is a specialty which is not found in school from many African countries. Only those nurses who did general nursing are employed in neurosurgical department. In addition to the above, neurosurgical patients are managed in a mixed intensive care or a mixed emergency department which may affect care rendered to neurosurgical patients. Knowledge of nurses should be improved while caring for neurosurgical patients because these patients require special care and nursing procedures that will lead to better recovery without complications (LeCroy & McMahon, 2015).

Knowledge is not its self enough because nurses also need practical skills to take care for those neurosurgical patients. Nursing knowledge and practices regarding prevention of the rise of intracranial pressure is limited due the fact nurses are not equipped with proper knowledge and practical skill. Thus Without proper knowledge and practice, nurses are to deliver ineffective nursing care to neurosurgical patient thus may not be able to prevent the rise of intracranial pressure (LeCroy & McMahon, 2015).

Mahday et al. (2016,p.57) stated that lack of training on how to care for those neurosurgical patients is one of the barriers to competency to care for those patients. This is the reason why to examine nurses' knowledge and practice is recommended to be sure that they are well equipped with the proper competence for their job. The same author went on adding that nursing staff needs to have a body of knowledge and practice to execute effective nursing care and implement measures to prevent increase in intracranial pressure. Therefore it is important to assess nurses' knowledge and practice on measures to prevent increase in intracranial pressure in those patients having any neurosurgical condition (Mahday et al. 2016,p.57).

In Rwanda, there is limited research evidence looking at nurses' knowledge and practice regarding measures to prevent increase in intracranial pressure. Therefore this study determined nurses' knowledge and examined nurse's practice on measures to prevent increase in intracranial pressure to examine nurse's practice, and finally factors associated nurse's knowledge and practice regarding preventive measures for increased intracranial pressure.

1.2. PROBLEM STATEMENT

There are many neurosurgical and neurological conditions and all these conditions may become deadly in case they are associated with increased intracranial pressure (ICP) which is their common complication. Intracranial hypertension can result into potentially deadly consequences such as permanent neurological damage, disability and death.Among neurosurgical patients presenting at hospitals with neurosurgical condition 50-75% develop increased intracranial pressure and the mortality rate is around 20% among those patients. Appropriate and quality nursing coupled with proper assessment, recording of observations and following guidelines are required to control the risk of further increases in intracranial pressure, morbidity and mortality(Mahday, Mersal and Hessien, 2016).

Abdelgadir *et al.*,(2017)highlighted that the overall Mortality rate of neurosurgical patients is around 12,5 percent in Uganda and 13.2 percent in Rwanda compared to the global mortality of 2.5-4,5% .Almost 80% of ICU patients are neurosurgical in Rwanda. Like in King Faisal Hospital Kigali in the month of January and February neurosurgical admission were at 81 percent and and evidence indicates that neurosurgical patients complicate with raised ICP.Nursing procedures are reported to either have a positive or negative impact on ICP depending on the competence of nurses involved. With reference to Ugras and Yuksel,(2015) statement, nursing care and procedures dedicated to a neurosurgical patient can help in prevention of the rise of ICP and thus help to reduce the risk of disability and mortality. With this in mind, the literature has shown that nurses are in the better position while preventing increase in intracranial pressure. However, this would be only significant if they have good knowledge, and proper practices(Abdelmowla, Essa and Abdelmaged, 2017).In response to this problem, this study assessed knowledge and practice of selected Rwandan nurses on measures to prevent increase in intracranial pressure among neurosurgical patients and generated data and evidence that can help in planning change in nurse's knowledge and

practice. Specialist training in Rwanda is new therefore very few IC nurses may be trained more so in relation to Neurosurgical nursing.In Rwanda there is no evidence of how nurses perform in preventing raised ICP.Therefore it would be of interest to assess the knowledge and practice of nurses working with neurosurgical patients regarding prevention of raised ICP.

1.3. AIM OF THE STUDY.

The aim of this study was to determine the nurses' knowledge and practice on measures to prevent increase in intracranial pressure at two selected referral hospital in Kigali ,Rwanda

1.3. 1.Research objectives

The objectives of the study were:

i.   To assess the nurses' general knowledge on intracranial pressure in two selected referral hospital in Kigali ,Rwanda

ii. To assess the nurses knowledge on preventive measures regarding increased intracranial pressure at two selected referral hospitals in Kigali, Rwanda.

iii. To establish the level of current practice of nurses on measures to prevent the rise in intracranial pressure in two selected referral hospitals

iv. To identify socio-demographic factors associated with nurse's knowledge and practice regarding preventive measures for increased intracranial pressure at two selected referral hospitals.

v.   To describe any relationship between nurses knowledge and practice of measures to prevent increase in intracranial pressure and their demographics

1.4. RESEARCH QUESTIONS

The research questions were:

1. What is the nurses' general knowledge on intracranial pressure in two selected referral hospitals in Kigali, Rwanda?

2. What is the level of knowledge on preventive measures regarding increased intracranial pressure among nurses working at two selected referral hospitals in Kigali, Rwanda?

3. What is the level of current practice of nurses in preventing the rise of intracranial pressure at two selected referral hospitals in Kigali, Rwanda?

4. What are socio-demographic factors associated with knowledge and practice of nurses with regard to prevention of raised intracranial pressure?

5. Is there any relationship between nurses' knowledge and practice with regards to prevention of increased intracranial pressure?

1.5. SIGNIFICANCE OF THE STUDY

Significance to the nursing profession and nursing practice:This research will enhance quality improvement of the practice of care delivery and improve the image of our profession by informing the strategies that will be adopted for quality improvement it will also help in establishing policies and guideline that will help in improving nursing care.

Significance to nursing research: The results from the current study will be used as reference data in conducting new research or in testing the validity of other related findings. This study will also serve as cross-reference that will give the staff at CHUK and RMH a background or an overview before generating new research topics. In addition, this study will be a resource for further research and it will be useful to researchers to do further research on raised intracranial pressure following neurosurgery such as testing association of specific interventions to intracranial pressure. This study can also assist to adopt evidence based practice based on local evidence because this study will also be published.

Significance to nursing education: It will enhance a review of the current nursing curriculum, and if possible they will make revisions and amendments with the current

curriculum to include instructions and strategies to improve care and management of neurosurgical patients who are likely to develop increased intracranial pressure.

Significance to nursing administration: Nurse Administrator may use research results to plan and educate nurses who are practicing to improve care and prevent illness and injury. Nursing research has enabled diverse changes in the practice of nursing, as it brings about new methods of care delivering to enhance patient safety, comfort and illness reduction. It may also inform protocols that may be developed to improve neurosurgical patient care.

In addition the Ministry of Health basing on the findings from the current study, may find ways to improve the knowledge and practices by setting up a specialty of Neurosurgical Nursing in schools together with formulating protocols and policy guidelines in hospitals. This study will enable referral hospitals in Rwanda to obtain guidelines and strategies needed for effective and better prevention of the rise in intracranial pressure among neurosurgical patients leading to a decrease in hospital stay and mortality.

Personal interest: For me as a staff nurse employed in a hospital this study will provide evidence on information regarding care to provide quality care rendered to neurosurgical patients suffering from raised intracranial pressure.

1.6. DEFINITION OF CONCEPTS

Knowledge: Refers to any information, understanding, or skill obtained from experience or education (Merriam webster, 2018).In this study knowledge refers to having awareness on intracranial pressure, factors that can increase ICP and methods for reducing ICP.

Good knowledge: In this study the nurses who scored above the mean score of the knowledge questions, were considered as having good knowledge on raised intracranial pressure, causes, and signs, contributing factors and preventives measure. But on the contrary,those who scored below the mean value were considered as having **poor knowledge** towards raised intracranial pressure, causes, signs, contributing factors and preventives measures.

Practices: is defined as the activity of doing something again and again by being professionally engaging in application or using an idea, belief, or method, as opposed to theories relating to it(Merriam webster, 2018). In this study it is being proficient in implementation of measures to reduce and control the rise of intracranial pressure.

Good practice: In this study it refers to the nurses who scored above the mean score of the practice questions related to prevention of increased intracranial pressure to have good practice. But on the contrary, those who scored below the mean score were considered as having **poor practice** towards prevention of increased intracranial pressure.

Traumatic brain injury(TBI)**:** is defined an inflicted blunt injury on the head or penetrating head injury that inflicts a disruption of brain functioning, thus impairing thinking and memory, and causing personality, sensory and motor changes(Zerfoss, 2016).In this study any patient having sustained head injury where brain trauma is involved will be considered as having traumatic brain injury.

Neurosurgery: it is a medical specialty dealing with prevention, diagnosis, surgical treatment and rehabilitation of disorders that affect parts of the nervous system such as brain, spinal cord ,peripheral nerves not forgetting extra cranial cerebral vascular system (Merriam webster, 2018).In this study it is a medical procedure involving brain and cerebral vascular system.

 Increased Intracranial Pressure: It refers to the increase in intracranial pressure which lowers the level of consciousness and can lead to brain herniation and brain death in not prevented and treated.(Carney *et al.*,2016). In this study it is a pathological rise of intracranial pressure manifested primarily by an onset of restlessness, nausea, vomiting, sensory deficits, headache, visual changes, seizures, pupil changes and, decreased motor function. At advanced stage there Cushing's triad characterized by significant changes in vital signs where there is elevated systolic blood pressure with no obvious cause, widening of pulse pressure and bradycardia.

Critical care unit: Special area in a hospital, where critically ill patients or highly dependent patients, who need close and frequent observation, can be cared for by qualified and specially

trained staff working under the best possible conditions(Marshall *et al.*, 2017). In this study critical care unit means an area in the referral hospitals in Rwanda where patients who sustained any condition affecting nerves, brain, spinal cord or who is critically ill receives specialized treatment requiring intensive care with specialized, technical and monitoring equipment that help to deliver care for critically ill patients. Patients requiring or likely to require advanced respiratory support, patients requiring support of two or more organ systems, and patients with chronic impairment of one or more organ systems who also require support for an acute reversible failure of another organ.

Critical care nurse:A licensed specialized registered employed nurse being responsible for caring for those patients with critical condition and their families by delivering a highly specialized nursing care (Marshall *et al.*, 2017).In this study any nurse assigned to work in general ICU, and High Dependency Unit at Centre Hospitalier Universities de Kigali(CHUK) and Rwanda Military Hospital (RMH).

Staff nurses: a person who works in a hospital or a nurse who is on the staff of a hospital and this person must be registered with the Rwanda Nursing and Midwifery Council.

1.7. STRUCTURE/ORGANIZATION OF THE STUDY

This study is divided into five chapters. Chapter one focuses on general introduction, definition of key concepts, background of the study, objectives and research questions, significance of the study and definition of concepts. Chapter two describes the literature review of the study including the theoretical and empirical literature ending up with a critical review and conceptual framework. Chapter three mainly covers the research methodology composed of study approach, study design, study area, study population, sample size and selection, and data collection instrument and its reliability and validity, data collection process, data analysis and ethical considerations. Chapter four presents the analysis and the research findings. Chapter five discusses the results of the present study in the light of other studies and conceptual framework. Finally chapter six deals with the general conclusion and recommendations

1.8. CONCLUSION OF CHAPTER ONE

This chapter covered introduction and background of the study, problem statement, objectives and research questions, significance of the study and definitions of the concepts. In general this chapter demonstrated that those in best position to manage patients are knowledgeable nurses in order to prevent the rise in ICP and prevent secondary brain injury. So it is crucial to enhance knowledge and practice in the nursing care of patients who are likely to have increased intracranial pressure to maintain current knowledge base and practice.

CHAPTER TWO: LITERATURE REVIEW

2.0. INTRODUCTION

The current study aimed at assessing nurses' knowledge and practice of measures to prevent increase in intracranial pressure in selected hospital in Rwanda. The present literature review helped the researcher to identify the existing evidence on what is known and what is not known about the research topic. It also served as guidance while choosing the method that was used for the research and interpretation of its findings. Therefore this chapter presents the overview from analysis of research sources of what is known and not known about intracranial pressure and its prevention. It covers introduction, data bases used to search the literature and search words, theoretical literature, empirical literature, conceptual framework, gap identification and conclusion.

2.1. DATA BASES USED TO SEARCH LITERATURE AND SEARCH WORDS

In this literature review Scholarly articles were considered using search engines such as Google scholar, Hinari, Pub med, medical online library, Online Journals of Nursing, Google search databases. Key words: neurosurgery, neurosurgical patient, intracranial pressure, prevention or reduction of intracranial pressure. Most articles used were within 5 years of publication, but also not more than 10 years.

2.3. THEORETICAL LITERATURE

2.3.1. Pathophysiology related to raised intracranial pressure

Brain is a vital organ that is found in the cranial vault and that is able to keep blood flow at a constant level. There may be changes in arterial blood pressure in terms of localized matching a localized cerebral blood flow in accordance to cerebral metabolism. All these operate within specific and limited parameters in people who are healthy. Thus a Mean Arterial Pressure (MAP) of 60-150mmHg is favorable; but below 60mmHg blood flow decreases and above 150mmHg Cerebral blood flow increases. Changes may be also such that the MAP becomes below 40mmHg where this is achieved through pressure controlled myogenic mechanisms, chemical-metabolic and neurogenic mechanisms. Blood flow to the brain is kept at a constant rate by arteriolar smooth muscle changing by stretching causing vasodilatation of the vessels to decrease intraluminal pressure or vasoconstriction to augment

intraluminal pressure and auto-regulatory mechanisms as above (Roytowski and Figaji, 2013, p.85)

Wilson (2016, pp.6-9) stated that at the level where the body is doing its best trying to overcome the increase in ICP, auto-regulation is the only option as compensatory mechanism by altering the diameter of blood vessels in the brain aiming to keep an unchanging blood flow during alteration in cerebral perfusion pressure. The relationship between pressure-volume in the brain, volume of cerebral spinal fluid, blood, brain tissue and cerebral perfusion pressure (CPP) to maintain ICP in normal limit is recognized as the Monro-Kellie Doctrine or the Monro-Kellie hypothesis (Wilson, 2016, pp.6-9).

According to Roytowski and Figaji, (2013, p.85) a rise in intracranial pressure (ICP) above normal physiological limit in neurosurgical patients leads to a life-threatening cranial compartment syndrome that necessitates urgent management. In case there is an increase of intracranial pressure (ICP), the patient affected suffers from complications that lead disability or loss of life. Fortunately this is reversible and can be also cured. Brain shifts and brain ischemia are two main complications of increased ICP (Roytowski and Figaji, 2013, p.85).

In adults, the cranial contents are protected by a rigid skull that is not compliant and cannot accommodate any increase in volume. So the onset of raised intracranial hypertension becomes terrifying and deleterious when it affects and reduces cerebral blood flow or the time it caused a mechanical compression to brain tissue leading to hypoxic brain and the patient is exposed to brain stem death (Levine, Levine and Goodman, 2016, p.410).

The intracranial space is made of three components which are brain substance accounting for 80%, CSF accounting for 10%, and blood accounting 10%. So under normal physiologic states, the mean intracranial pressure is kept below 15 mmHg. It has been noted that even if there are compensatory mechanisms they are limited. The body tries to reduce ICP by displacing CSF from the brain to the lumbar cistern, augmenting CSF absorption, and pushing blood to the low-pressure venous system (Kinoshita, 2016, pp.2-10).

2.3.2.Compensatory mechanisms to maintain normal ICP

In order to maintain normal ICP the body does this by shunting/displacing Cerebral spinal fluid from both ventricles and subarachnoid space via the foramen magnum into the spinal

basal subarachnoid cisterns but also by displacing venous blood out of the skull. Other compensatory mechanisms include keeping a low pressure venous system with much emphasis on the dural sinuses, augmenting cerebral spinal fluid absorption, decreasing cerebral spinal fluid production and vasoconstriction of the vessels in the brain. When compensatory mechanisms have been exhausted, shifting of the brain which is called brain tissue herniation toward open spaces in the skull. This results in perfusion deficits to parts of the brain (agland and Lee, 2016, pp.105-112).

2.3.3.Why control of ICP and what is CPP?

Primary reason for controlling and decreasing ICP is the maintenance of cerebral oxygenation by adequate cerebral blood flow, which is estimated clinically by the measurement of cerebral perfusion pressure(CPP) being the blood pressure gradient across and trough the brain.

2.3.4. Monro Kellie hypothesis

The Monro-Kellie hypothesis or doctrine explain well compensatory mechanisms by demonstrating that the cranial compartment is a closed and incompressible structure meaning that the volume inside the cranium is fixed. The cranial vault and its components which are blood, cerebral spinal fluid, and brain tissue create a kind of volume equilibrium such that that any increment in volume of one of the components in the cranium is compensated by a decrease in volume of the other. These compensatory mechanisms affect cerebral spinal fluid and, blood volume. The failure of compensatory mechanisms leads to the stage of herniation (Wilson, 2016, PP.6-9).

In the stage of herniation, brain tissue moves and herniates by shifting from high pressure areas to the area of lower pressure. The herniation process increases intracranial pressure. There are two types of herniation that can occur in patient depending on their conditions (Roytowski and Figaji, 2013, p87). One of them is uncal herniation named supratentorial herniation that occurs when the uncus or hippocampus gyrus, or both, are displaced from the middle fossa through the tentorial notch and migrate into the posterior fossa thus exerting compression of ipsilateral third cranial nerve and the mesencephalon. In case there is a displacement of the diencephalon it happens by shifting the diencephalon straightly

downwards through the tentorial notch,and this herniation is named central herniation (Roytowski and Figaji, 2013,p.87).

 In case the cingulate gyrus is displaced under the falx cerebri this types of supratentorial herniation is called cingulate gyrus herniation. But when the brain tissue is shifted through the skull fracture or surgical incision, it is named transcalvarial herniation. This external herniation occurs during craniotomy surgery where herniation prevents a flap of bone which was removed from being reattached. Apart from supratentorial herniation there is another herniation called infratentorial herniation where the cerebellar tonsils is shifted through the foramen magnum following the increased pressure within posterior fossa(Roytowski and Figaji, 2013,p.87).

2.3.5.Contributing factors to increased ICP
There are many factors that contribute to the pathological rise in ICP .These factors include space occupying lesions or masses such as haematomas, abscesses, tumours, aneurysms,cerebral oedema related to brain injuries or Reye's syndrome,conditions that cause obstruction of venous outflow, hyperaemia and hypercapnoea, conditions increasing cerebral spinal fluid such as increased production of cerebral spinal fluid from choroid plexus papilloma,decreased absorption of cerebral spinal fluid in case of communicating hydrocephalus or subarachnoid Haemorrhage and obstruction of flow of cerebral spinal fluid in case of non-communicating Hydrocephalus(Kinoshita, 2016,pp.2-10).

2.3.6. Non pathological and pathological factors causing increased intracranial pressure
From various reasons such as diseases, environment, emotion and abnormal bodily functions ICP can change. In case ICP is elevated above the accepted normal limits the patient may experience brain tissue damage leading to brain death or permanent disability.(Roytowski and Figaji, 2013,p.86)

2.3.6.1. Non pathological factors

2.3.6.1.1. Factors contributing to increased ICP
There are different physical factors that contribute to increased intracranial pressure. Among them are factors that decrease venous return, for instance kinking of jugular vein through position of head by neck flexion, pressure on the neck, for example, endotracheal tube harness strapping, Valsalva maneuver (Cough, Sneezing, Vomiting, straining on defecation)

and isometric muscle contractions (Tensing a muscle without shortening). Other physical factors include activities that increase cerebral metabolism such as seizure activity, arousal from sleep, hyperthermia, and shivering. Noxious stimuli (noise, bright light, painful nursing procedures, e.g. removing tape from the skin, suctioning) are also among physical factors that may increase intracranial pressure (Kinoshita, 2016, pp.2-10).

Nyholm *et al.* (2014, pp.285-287) also highlighted that coughing, sneezing, bending, Valsalva maneuvers are non-pathological factors which may contribute to increased intracranial pressure but also stress, change in blood pressure, emotional responses, body position. The same authors added that some procedures like endotracheal suctioning cause an increase ICP by triggering the cough reflex. In addition when a patient is disconnected from ventilator there are some movements of the endotracheal tube that generates stimulation of tracheal mucosa and afferent neurons of larynx thus causing coughing. Thus the generated cough reflex results in more intrathoracic and intra-abdominal pressure which result in reduced venous drainage or return from the brain thus causing a rise of intracranial pressure (Nyholm *et al.*, 2014, pp.285-287).

Hussein et al. (2016) in their article emphasized on the contributions of Trendelenburg's and prone positions to the rise of ICP and also over flexion of the hip towards the abdomen, poor neck and head position whether flexion and extension highlighting that any of these body positions may cause a rise in intracranial pressure. It has been noted that any valsalva maneuvers for instance vomiting, straining at stool, coughing, sneezing, and enema may increase intracranial pressure. The same authors also highlighted that any noxious nursing interventions such as blood drawing, removal of adhesive tapes off the skin and invasive procedures such like lumbar puncture, cause stimulation of sympathetic nervous system. Sympathetic nervous system elevates systemic blood pressure and cerebral blood flow which in increases intracranial pressure (EL Hussein, Zettel and Suykens, 2016, p.6-12).

The same author highlighted that seizures and hyperthermia can also cause an increase in cerebral metabolism and cerebral blood flow resulting in raised ICP. Scientist have noted that an increase in body temperature by each one degree Celicius raises cerebral blood flow by 5-6% as well as ten percent(10%) of the metabolic demand. This is why it is important to maintain normothermia in neurosurgical patients. There are factors that can increase ICP that

each and every nurse should be able to recognize such as painful stimuli, patient anxiety, patient agitation, hyperthermia, shivering, lighting in patients room, sound in patient room, and all intervention among others patient bathing or repositioning in bed (Zerfoss, 2016,p.1).

2.3.6.2 Pathological factors

2.3.6.2.1.Secondary injury/causes of increased ICP

Secondary injury/causes of increased ICP include ischaemia related to decreased O_2 supply,inflammation,excitotoxicity,metabolic insults such as hypoxemia ,hypercapnoea acidosis and hyperthermia .There are also vasodilatating drugs that me induce the rise of ICP among others anesthetic drugs, antihypertensive drugs(Kinoshita, 2016,pp.2-10)

According to Wilson,(2016,pp.1338-1350) intracranial pressure can be elevated above the normal limit due to pathological factors such as traumatic brain injury and space occupying lesions. Among traumatic factors the main two highlighted by the same author are concussion and contusion whereas space occupying lesions are many and they may be related to hemorrhage in the cranium such as subdural hematoma,epidural hematoma,subarachnoid hemorrhage or a growing process in the cranium like hydrocephalus, tumor ,brain edema, accumulation of pus in case of abscess or infection.Elevated ICP can be influenced by primary factors which include ,elevated blood pressure,altered heart function,intra-abdominal/intrathoracic changes in pressures ,hyperthermia ,pain ,changes in carbon dioxide/acidosis and hypoxia (Wilson, 2016,pp.1338-1350).

Ugras and Yuksel(2015)highlughted that hypercarbia(PaCO2) above 45 mmHg cause dilation of blood vessels in the brain, thus causing congestion in blood flow in the brain a reason why PCO2 must be maintained in between 35-45 mmHg.The same authors added that Hypoxemia with (PaO2) less than 80 mmHg must be avoided because it may affect intracranial pressure because hypoxia rises cerebral blood flow and ICP thus increasing the risk of brain edema(Ugras and Yuksel, 2015,pp.2-3).

Nyholm, Howells and Enblad,(2017,pp.285-287) highlighted that giving oxygene is not harmful because Oxygen (O2) is not or a potent vasodilator when compared to carbon dioxide (CO2).The reason why maintaining PaO2 between 80-100 mmHg and oxygen saturation (SpO2) above 94% help to avoid cerebral hypoxia. In case cerebral PaO2 goes below 50 mmHg,it causes anaerobic metabolism and leads to accumulation of lactic acid and

acidosis. Lactic acidosis is a vasodilator and thus causes increase in cerebral blood flow and intracranial pressure(Nyholm, Howells and Enblad, 2017,pp.285-287).

2.3.7. Signs and symptoms of raised intracranial pressure.

The rise of intracranial pressure may be manifested by early signs characterized primarily by onset of restlessness, nausea, vomiting, sensory deficits, headache, visual changes, seizures, pupil changes and later on patient can present with low level of consciousness and decreased motor function. The later signs is known as Cushing's triad which is a group of signs characterized by significant changes in vital signs where there is systolic hypertension with no obvious cause, a wide pulse pressure and bradycardia (Tan, Cheng and Sim, 2015, pp.156-164).

2.3.8. Consequences of Prolonged Elevated ICP

There are different consequences related to increase in intracranial pressure such as poor cerebral perfusion leading to cerebral ischemia, risk of stroke due to hypertension,irreversible brain tissue damage and cerebral tissue hypoxia, brain tissue herniation and finally the patient may experience permanent physical disability or brain death leading to loss of life (Rodríguez-Boto *et al.*, 2015,pp.16-22).

2.3.9. Measures to prevent the rise of intracranial pressure among neurosurgical patient.

According to Zerfoss,(2016)preventing the rise of ICP requires team work. Noninvasive measures associated with conservative measures are used to prevent or reduce increase in ICP. Among the first many interventions that may be required are elevating the head of the patient's bed from 30 to 45 degrees and ensure that venous outflow is not impaired by keeping the head in a neutral position, avoiding a flexed neck, loosening constricting tape to those with a tracheotomy tube, or loosening cervical collar. Other measures include preventing shivering, avoiding hyperthermia, which can increase metabolic demand. In case of increase in intracranial pressure is suspected, patient's blood pressure must be optimized by avoiding both hypotension and hypertension. Nursing care must extend to avoidance of hypoxia and hypercabia by making sure that oxygen saturation is maintained above 90%,carbon dioxide between 35 to 45mmHg and blood glucose monitoring at admission plus maintenance of a normoglycemic status(Zerfoss,2016).

Normal intracranial pressure in adult person fluctuates below 15 mm Hg, but there may be transient increases related to coughing or sneezing (Ugras & Yuksel 2015). Intracranial-pressure that is above 22 mmHg is considered to be pathologic in adults and needs treatment in those who suffered traumatic brain injury (Ugras & Yuksel 2015).

During the care of these patients, interventions focus mainly on close observations and monitoring for any sign of raised ICP ,timely detection of symptoms and signs of increased intracranial pressure, collaboration with medical team, delivering appropriate treatment and care at a correct time. The aim is to avoid further brain tissue insults which may lead to herniation and thus decreasing morbidity and mortality risks(Nyholm *et al.*, 2014).The Nursing team in charge of delivering care to neurosurgical patients are obliged to be knowledgeable on factors that may cause the rise in ICP, be aware of different interventions for preventing intracranial pressure increase by understanding signs of increased intracranial pressure as early as possible(Ugras & Yuksel 2015).

The increase in ICP tends to be all of a sudden and needs a quick response from the nurses. Prevention of the rise in intracranial pressure requires a quick response on the part of the nurse and medical team because it has been found that brain cells which become ischemic start dying four to six minutes(4-6 minutes)after the cessation of blood supply and that about five to ten minutes(5 to 10 minutes) of complete cessation of blood circulation the brain tissues experience irreversible brain damage in humans(EL Hussein, Zettel and Suykens, 2016).

2.4. EMPIRICAL LITERATURE

2.4.1. Knowledge related to raised intracranial pressure prevention
 Management of raised intracranial pressure emphasizes on prevention and maintenance of intracranial pressure within normal limits requiring relevant knowledge and skills to prevent and alleviate damage to the brain tissue (Ragland & Lee 2016).
In a study that was carried out in Egypt by Abdelmowla et al. (2017), it was revealed that most of nurses (95%) had poor knowledge about nursing care regarding prevention of the rise in intracranial pressure. Only 5% had satisfactory knowledge. All nurses demonstrated poor assessment and care for patients following craniotomy in neurosurgery department. In another

study conducted by Santos et al. (2016) that included 127 participants of nurses employed in intensive care unit at university hospital in Brazil, a high percentage of nurses (80%) responded correctly to questions regarding their knowledge towards neurosurgical assessment, Glasgow Coma Scale (GCS) included. Although a high percentage of nurses in this study demonstrated good knowledge about GCS, there were nurses that had poor knowledge about the scale at 20% (Santos *et al.*, 2016).

In a quasi-experimental study that was conducted by Cook et al. (2013) in Cincinnati in the U.S. State of Ohio, findings revealed that nurses' knowledge was low and they had poor confidence in their practice. Results demonstrated that taking time and delivering a session to educate nurses resulted in improved nurses' knowledge regarding signs and symptom assessment (mean pretest: 33.6% vs. mean posttest score: 79.2%; 95%) (Cook et al. 2013, pp.108-117). From these findings it is clear that another research is needed to find out the situation in our country aiming to inform strategies to improve nurses' knowledge and their practic.

2.4.2. Practice related to raised intracranial pressure prevention

In the study conducted by Abdelmowla et al (2017) it was found that nurses had poor practice (90%) regarding caring for patients following craniotomy, where only 10% had adequate practice (Abdelmowla et al. 2017).

In an observational study by Olson *et al.* (2013) data were gathered from nurses at 16 different hospitals across the United States and the results showed that there were much more differences in the care of neurosurgical patients with raised ICP. They also found variations in practice and interventions to prevent or reduce increase of intracranial pressure which was not supported by any available scientific evidence (Olson et al. 2013).

Makasare & Makasare (2015) conducted a quasi-experimental study in Nagpur which assessed nurses' knowledge regarding care of patients with acute head injury. This was done by a teaching program. Pre-test findings demonstrated that there was deficient knowledge with care of acute head injury patients which was in various degrees within staff nurses. This study showed also that a big number of nurses 78.4% had inadequate knowledge on acute care of head injury patients. In total 75% nurses had moderate knowledge, 85% nurses had

adequate knowledge concerning general information regarding head injury in the post test (Makasare & Makasare 2015, p.1192).

From the all above findings it is clear that nurses are at the center of caring for patients post craniotomy or any surgical procedure that may have intracranial pressure as a secondary complication. This is the reason why the researcher found it necessary that each and every nurse in critical care, high dependency unit, accident and emergency department and neurosurgical units be educated about intracranial pressure prevention and its management.

The above findings are also supported by Yildiz et al. (2014) that noted that neurosurgical nursing is a field that requires to have advanced nursing knowledge and practice to be able to satisfy patient needs after having experienced a neurosurgical event. In their study nursing reported lack of knowledge, inadequate resources, limited staffing as barriers to providing adequate care in patients post traumatic brain injury (Tolu & Lyn. 2016).

2.5. GAP IDENTIFICATION.

Nurses participate integrally delivering care of admitted patients with traumatic brain injury (TBI), or post neuro-surgical condition by performing assessment, coordination of care and preventing complications. This is why it is a must that all nurses be equipped with knowledge that will enable them to care for patients with neurosurgical conditions, but also nurses must be updated with the current research findings that give evidence-based practice guidelines for symptom and sign assessment and management (Tolu & Lyn,2016).

From the finding of studies that were reviewed in this literature review nurses had poor knowledge regarding care provision of patients post traumatic brain injury or neurosurgical patient in prevention or reduction of increased intracranial pressure. The nurses deserve knowledge, skills, values and/or abilities to efficient caring of patients. This is why each nurse has to be trained in all corners regarding delivery of quality care. Intensive care unit (ICU) nurses and others nurses that care for neurosurgical patients make a part of the health care team and are the ones to detect and prevent other secondary brain injuries including increased intracranial pressure. But I can highlight that, nurses are different in their practice, and little is known on nurses' knowledge on measures to prevent the rise in intracranial

pressure. There are no current evidence-based protocols, in Rwanda that can facilitate target-driven nursing care that may be favorable to patients with ICP outcomes.

2.6. CONCEPTUAL FRAMEWORK

 The conceptual framework for this study was based on Bloom‟s cognitive taxonomy. Bloom‟s cognitive taxonomy deals with a human being learning expertise. In 1956 it was developed by Benjamin Bloom and edited changed by : Anderson and Krathwohl in 2001 (Anderson, Lorin W., Krathwohl, David R., 2001 & Linda Dunegan, 2011).

The highlighted model is the most universally used and provides an organization of different form of human thinking into six levels (Forehand. M., 2005).
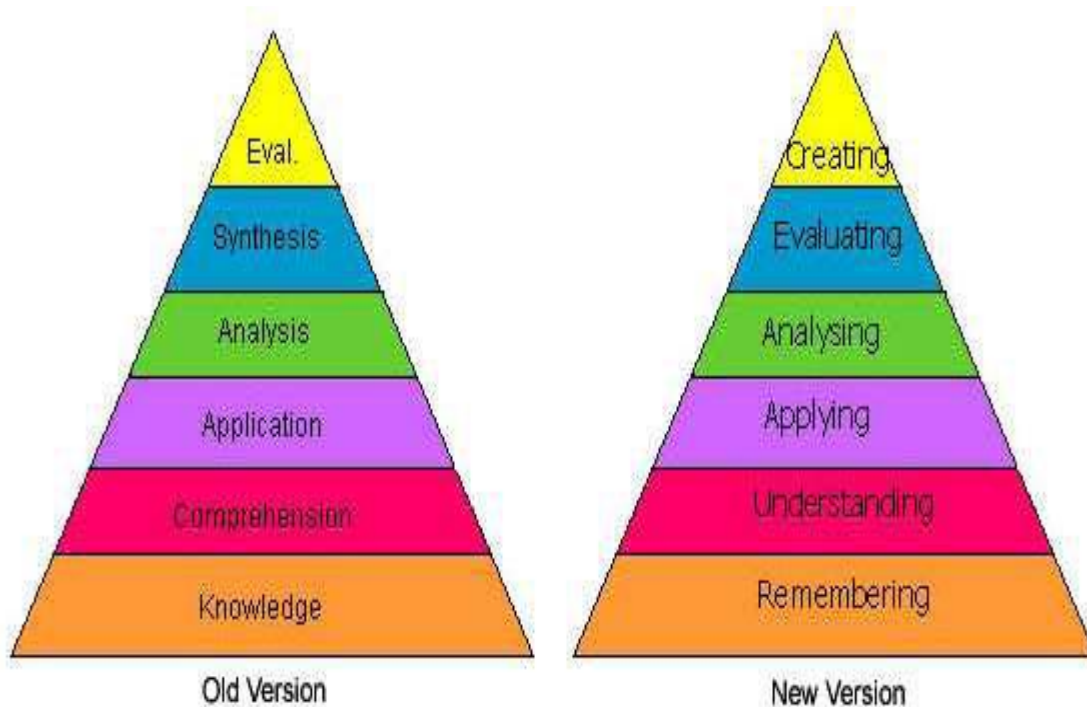
Figure 1Figure 1. Bloom taxonomy: old and new version.(Forehand. M, 2005)
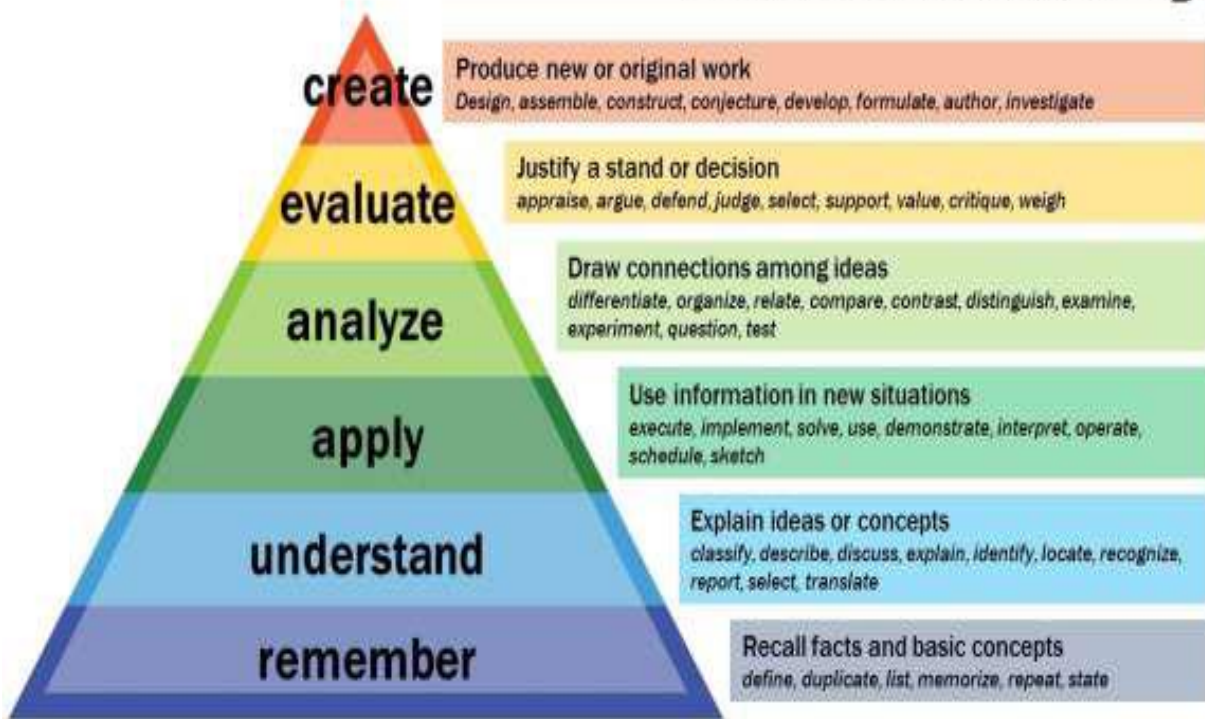
Figure 2.Bloom taxonomy: revised version with explaining verbs (Forehand. M, 2005).

The bloom taxonomy is categorized into six educational goals, using nouns such knowledge, comprehension, application, analysis, synthesis and evaluation. When we consider this as knowledge hierarchy, the lowest level of knowledge begins with simple remembering of facts to high level of creating and brings elements together to form a coherent or functional whole (Anderson, Lorin, Krathwohl & David, 2001).

Bloom Benjamin has classified knowledge into three major domains which a cognitive, affective and psychomotor domains. Thereafter he clarified that for learning to take place, knowledge (Cognitive) should be a critical prerequisite to acquire practical skills and abilities (psychomotor) and the learner should display positive attitude (affective) towards learning process. While trying to analyze the learning process, Bloom further gave explanations stating that there is an important role of the environment and the learner characteristics in the learning process reason why a conducive environment and motivated learner are the factors that have to be present to facilitate learning.

In the current study, the researcher adapted the Bloom taxonomy of educational objectives and was found to be useful for this study. Knowledge and practice are the main related independent variables and fall into two of three domains of human learning expertise: cognitive, affective and psychomotor domains respectively (Krathwohl, 2016) . The cognitive and psychomotor domains regarding increased intracranial prevention start with the lowest level of remembering and understanding (1st and 2nd level) basic concepts concerning intracranial pressure (such as raised intracranial pressure, causes, signs, contributing factors) to the level of applying the acquired knowledge in provision of preventives measures to the rise of intracranial pressure.

The high levels such as analyzing, evaluating and creating are also concerned as far as the nurses have to examine, imitate and judge the clinical situation of both the patient and the working environment. This will help him to create solutions or alternatives in preventing the rise of intracranial pressure. The nurses' values reflecting the affective domain are very important as far as increased ICP prevention is concerned. This will influence and give guidance on how nurses respond to different neurosurgical cases that need increased ICP prevention.
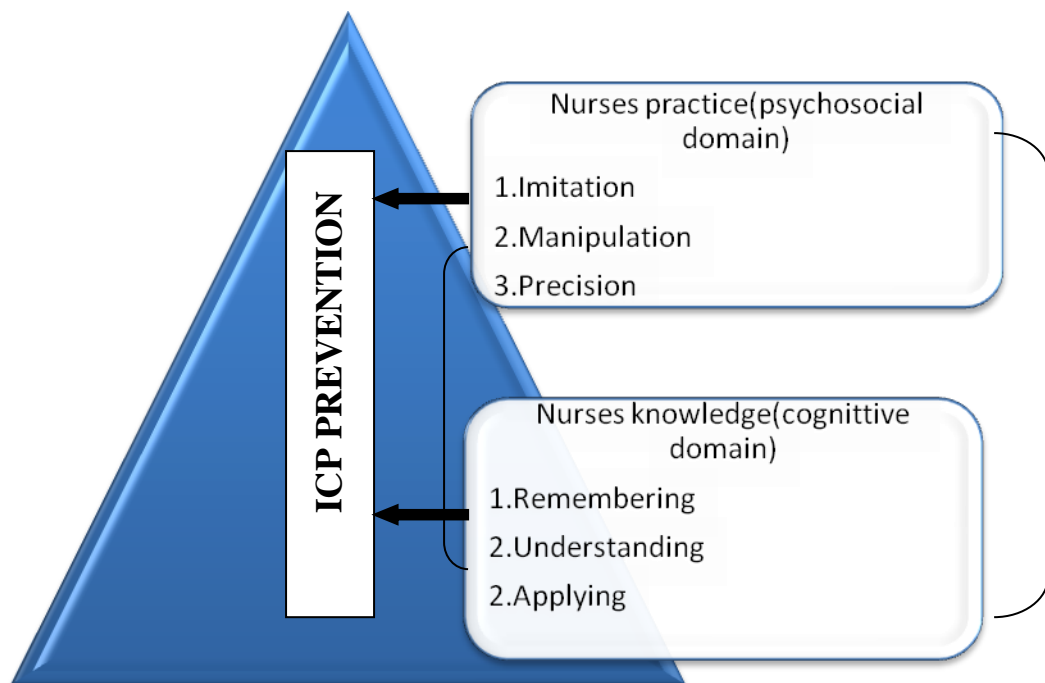
Figure 3. Conceptual framework of nurses' knowledge, and practice on increased prevention adapted from Bloom taxonomy of educational objectives. (Bloom, 1956)

Conclusion

This chapter on literature review described the theory of intracranial pressure in neurosurgical patients, other study findings on knowledge regarding measures to prevent the rise of intracranial pressure, signs and symptoms related to the increase of intracranial pressure and conceptual framework. In the above literature, it was noticed that few studies are available in the area of nurses' knowledge and practice of measures to prevent increase in intracranial pressure and were done in the developed world. Also few studies were done in Africa and were limited in Ethiopia. There is little evidence in Rwanda and East Africa.

CHAPTER THREE: METHODOLOGY

3.0 .INTRODUCTION

This chapter describes the methodology used. It describes the study area, study design, study population, study sample, sampling strategies, ethical considerations, data collection methods, and procedures used. It also indicates how data were analyzed including problems and limitation encountered.

3.1. RESEARCH APPROACH

In this research, the researcher used quantitative approach. Quantitative methods are research techniques that are used to gather quantitative data, data that can be sorted, classified and measured (Bacon-shone, 2015). This approach was selected because it helped the researcher to gather numerical data and facilitate quantitative analysis by use of statistical procedures in order to examine nurses' knowledge and determine practices on measures to prevent the rise of intracranial pressure in neurosurgical patients among nurses. It also assisted with identification of barriers to prevention of the rise of intracranial pressure at both University Teaching Hospital of Kigali (CHUK) and Rwanda Military Hospital (RMH) in Emergency, neurosurgical and critical care units.

3.2. RESEARCH DESIGN

The research design is the conceptual structure within which the research is conducted; it constitutes the blueprint for the collection, measurement and analysis of data. So the research design can be defined as a master plan for the determined methods, structure, and strategy of a research study to find out alternative tools to solve the problems, and to minimize the variances(Bacon-shone, 2015).

To meet the research objectives the researcher utilized a descriptive cross-sectional study design. Cross-sectional surveys are used to gather information on a population at a single point in time(Bacon-shone, 2015).

 This is the most appropriate design for this study because across sectional study helped the researcher to systematically assess knowledge and determine practices among staff nurses at one point in time.

3.4. RESEARCH SETTING

This study was conducted in both University Teaching Hospital of Kigali (CHUK) and Rwanda Military Hospital (RMH) specifically at emergency, neurosurgical, and in intensive care units where most neurosurgical patients are admitted. University Teaching Hospital of Kigali (CHUK) is a public university hospital in Kigali and is located in the centre of Kigali in Nyarugenge District in Gitega sector. CHUK was built in 1918 and has 509 beds. Its main activities are patient care, education, research and community health services. As the main public health institution in Rwanda CHUK provides care and serves more than one million individuals coming from different areas in Rwanda. CHUK is one of four referral hospitals in Rwanda among others like Butare University Teaching Hospital, King Faisal Hospital and Rwanda Military Hospital. At CHUK the study was conducted in 3 units including intensive care, neurosurgical unit and accident and emergency. It was likely that patients who were at risk of developing increased intra cranial pressure would be admitted in these wards.

Rwanda Military Hospital (RMH) was built in 1968 as a Military Referral Hospital. It continued to provide health care services to the military and their immediate families until after 1994 when doors were opened to the general population. RMH currently treats 80% civilian and 20% military patients. While RMH has been offering secondary and tertiary level health care services, its new strategic direction focuses on referral hospital and teaching activities. At RMH the study was conducted in two units among others intensive care unit and accident and emergency. There is no neurosurgical unit at RMH.

3.5. STUDY POPULATION

Population can be defined as the potential respondents that interest the researcher (Bacon-shone, 2015). The population of this study comprised all bedside nurses working in trauma and emergency department, neurosurgical unit and intensive care unit at both referral hospitals, CHUK and RMH. At CHUK, 41 nurses are employed in trauma and emergency in direct patient care, 10 nurses in neurosurgical unit and 31 nurses in intensive care. At Rwanda military hospital (RMH), 26 nurse's worked in intensive care and 16 nurses in accident and emergency (trauma side). Intensive care unit, neurosurgical unit and accident and emergency units are chosen because those are the units where neurosurgical conditions are admitted. The total population was124 nurses.

3.6. Sampling criteria

3.6.1. Inclusion criteria

All nurses working in intensive care unit, neurosurgical unit and accident and emergency at both hospitals RMH and CHUK, who were present in the period of the study (from March to April, 2019), registered with Rwanda Nurses and Midwives Council, having at least 6 months of working experience in the   respective units, having roles and responsibilities connected with direct patient care and consenting to participate in the study, were included in the study.

3.6.2. Exclusion criteria

The nurses who were in their annual or maternity leave and those who refused to participate in the study.

3.7. SAMPLING

A sample is defined by Bacon-shone (2015) as respondents that are chosen from study population. In this study, nurses who were available during the period of data collection were sampled and participated in the study.

3.7.1. Sampling strategy

 This study used a convenience sampling method. In this sampling strategy the participants were selected because   they were accessible to the researcher on the day of data collection.

3.7.2.Sample size

Taro Yamane (1967) provides a simplified formula to calculate sample size and this formula was used to obtain the sample size for this study. A confidence interval of 95% and 5% of margin error (Yamane, 1967).

$n = N / 1 + N (e)^2 =$

$124 / 1 + 124 * (0.05)^2 = 94$ .So the recommended sample size is 94.

The proportional allocation to size was estimated as follows:

Figure1.proportion allocation to size.
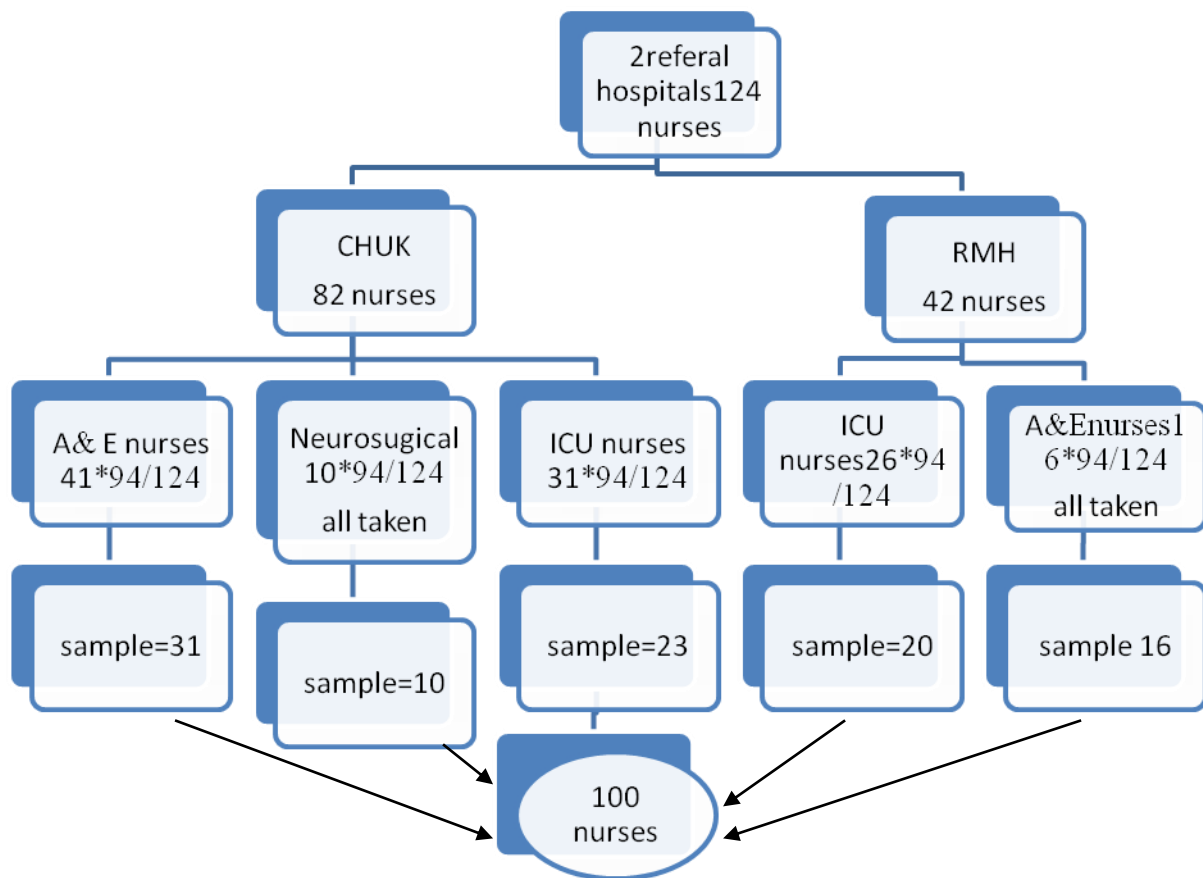
The research wanted to increase the number of sample size so as to ensure strength of the study that is why in neurosurgical unit at CHUK and Accident and Emergency at RMH all the nurses were included in the sample as they were few and available. This the reason why the target sample increased from 94 to a 100 nurses. Thus the sample size was 100 nurses from both hospitals meaning 64 from CHUK and 36 from RMH.For practice the researcher considered nurses from critical care, because it in this department where the researcher found enough numbers of neurosurgical patients that were cared for by nurses continuously. An online calculator helped the researcher to find the sample size. The total number of nurses working in intensive care was 31, so the calculated sample size was 29 at margin error of 5% with a confidence level of 95% and population proportion level at 50%. But the research could not observe all completely. He only observed completely 20 participants. So 20 nurses were observed for practice.

3.8. DATA COLLECTION

3.8.1 .Data collection instruments

A self-administered questionnaire was written in English and Kinyarwanda (Appendix1). The English questionnaire was translated into Kinyarwanda by an expert in linguistics. English and Kinyarwanda being the national languages are used in implementing education instructions as well as in professional communications in hospitals. The questionnaire was organized in the following four sections: The first section has five items concerning socio-demographic data and characteristics of the participants. These include: sex, age, level of education, work experience, and marital status.

The second section measures nurses' general knowledge about raised intracranial pressure, causes, signs and contributing factors. The researcher used a research tool (questionnaire) that was developed by Abdelmowla et al. in 2017. The tool has been used in Egypt. The researcher has requested permission to use the tool and was allowed to adapt it to this study with some modifications in the questionnaire to be relevant to the research area. The tool used for general knowledge in this study has of 11 items. The general knowledge items were multiple choice questions where correct answer was given a score of '1' and incorrect answer was given a score of '0' with a total score of 11. After recoding participants' answers into correct and wrong answers, the mean score and standard deviation were calculated for each item. A score of their Knowledge was summed up by adding up each answer scores for 11 items. Thereafter, total individual scores were transformed into percentages. It is the percent score that allowed classifying the participant's knowledge into good knowledge (This means that nurses scored above the mean score of the knowledge) or poor knowledge being those who scored below the mean value with the regard to the mean percent of group score.

The third section has 20 items describing nurses' knowledge regarding preventive measures towards increased intracranial pressure. Participants had to judge whether each of these items was either useful, not useful or indicate that they did not know if it's a preventive measure. Answers were coded as correctly judged or incorrectly judged or don't know with reference to the pre-established marking guide. The correct judgment was recorded as 1 whereas the wrong judgment or don't know were recorded into 0. Therefore, for each item, the minimum score was either 0 or 1. Total score was 20. Total individual scores were transformed into percentages. It is the percent score that allowed to classify the participant's knowledge into

good knowledge (being those nurses who scored above the mean score of the knowledge) and poor knowledge those who scored below the mean value. The questions had also 9 item regarding barriers that affect nurse's ability to deliver care to a patient with increased intracranial pressure.

3.8.2. Observation checklist for only intensive care nurses.

The observation checklist used in this study was also developed by Abdelmowla et al. in 2017 after reviewing extensive literature and it was adapted by the researcher after getting permission and was modified for this study. This checklist was made of items used to assess nurses' practice in preventing increase intracranial pressure. Two point scales 1 and 0 have been used to assess nurses' practice where one point was awarded to those which were correctly answered at each question and 0 to those answered incorrectly or not answered. Practice items can be seen on the observation checklist (Appendix2).

3.9. RELIABILITY AND VALIDITY OF THE RESEARCH TOOL

A research tool is said to be valid when it really measures what it intends to measure. A research tool must have validity to ensure that the research objectives are met (Taherdoost and Group, 2017). A research tool must also have content validity meaning that an instrument has right items for the concept to be measured (Taherdoost and Group, 2017). In the current study, the content validity was emphasized by crosschecking each item on data collection instrument against the study concepts and objectives with regards to conceptual framework to make sure they measured each item to be examined. The table has been elaborated below to show the content validity of the research tool.

Table 3.1.Illustrating content validity relating objectives, conceptual frame work and questionnaire.

Objectives	Conceptual framework	Questionnaire
To assess the nurses' general knowledge on intracranial pressure in two selected referral hospital in Kigali, Rwanda	**Cognitive domain** Recalling basic concepts Ability to understand ICP: • Meaning of ICP • Decernate ICP normal ranges • Recognizes early signs of increased ICP • Recognizes contributing factors to increased ICP	Questions from section A(1,2,3,4,5,6,7,8,9,10 and 11 related to raised intracranial pressure, causes, signs, contributing factors
To assess the nurses knowledge on preventive measures regarding increased intracranial pressure at two selected referral hospitals in Kigali, Rwanda.	**Cognitive domain** Recalling basic concepts Preventives measures: • Air way management • Oxygenation • Promoting venous return • Reducing stimulation • Control of intrathoracic pressure • Decrease metabolic demand	Questions from section(B 1,2,3,4,5,6,7,8,9,10,11,12,13 ,14,15,16,17,18,19and20) related to measures used to prevent increase in intracranial pressure.
To establish the level of current practice of nurses on measures to prevent the rise in intracranial pressure in two selected referral hospitals	**Psycho-motor domain:**impliment Acquired knowledge Preventive practice: • Avoid hypoxia, hypercabia, fever and prevent shivering, • spacing out nursing care and procedures • postionning and put patient in comfort • minimizing stumilation	Observation check list for preventive practice
To identify socio-demographic factors	In accordance to Bloom, in order to learn, different factors are	Questions from section A(1,2,3,4,5,6,7,8,9,10 and 11

associated with nurse's knowledge and practice regarding preventive measures for increased intracranial pressure	involved and must be considered such as individual, environmental and so on.	

In terms of reliability of the instrument the reliability is when there is a degree of consistency or accuracy to which an instrument measures an attribute (Polit and Beck, 2014). In order to assess and test for reliability, the research tool was reviewed and checked by the researcher and his supervisor. A pilot study was done to confirm its understandability by participants to obtain consistent results.The researcher controlled the reliability by handing the questionnaire to 10 participants meeting the criteria for inclusion for piloting to improve the methodology and ensure the questionnaire is useful. Thereafter, the researcher with the help of SPSS calculated the internal consistency reliability coefficient. The questionnaire was made of 31 items and the calculated Cronbach's alpha test was 0.73. This value shows that items were interrelated to at 73%.

3.10. DATA COLLECTION PROCESS

After ethics clearance was sought and obtained from the University of Rwanda precisely form CMHS/IRB and the permission from the RMH and CHUK research committees, the researcher worked closely with the unit managers, to reach the participants in an easy manner. The nurses were approached during their morning staff meeting and even after noon during pause time. The researcher explained to participants the research title, its main objective and checked if nurses fulfill criteria to participate in the study. The consent form was handed to each participant and signed by each nurse before completing the questionnaire. Self administered questionnaire with two versions of English and Kinyarwanda was administered to each participant who had an option to fill it in one of those languages. The participants were instructed to individually fill in the questionnaire without consulting a third reference (colleague, book or internet) and use their time such as lunchtime. The researcher scheduled three days a week: Monday, Tuesday and Wednesday, to collect filled in questionnaires. After completing the questionnaire the participant was asked to keep it while

waiting for the researcher to come. Filled questionnaires were examined to make sure they were completed and clearly answered by the researcher immediately.

3.11. DATA ANALYSIS

The researcher used SPSS version 21 which is a Statistical Package for the Social Sciences for data entry, cleaning and data analysis. Descriptive statistics using frequency tables were used to summarize demographic characteristics. Calculation of mean scores and standard deviations were also performed to summarize data related to nurses' knowledge and practice on measures to prevent increase in intracranial pressure. Total knowledge scores were calculated by adding up the corresponding items. The total score was then calculated per cent for each of the subscales of knowledge and for the nurses' scores on their practices towards increased intracranial pressure prevention. The researcher used Independent samples t-test to compare two mean scores for the variables demographic characteristics and knowledge scores. Pearson correlation coefficient (r) was calculated to test the correlation between nurses' overall knowledge and practices. A p-value of 0.05 was considered as significant.

3.12 .ETHICAL CONSIDERATIONS

The current study proposal was presented to the CMHS research Committee by the researcher to obtain ethical clearance. The researcher to obtain ethics clearance. The researcher also obtained the approval from the hospital Research Ethics Committee of both hospitals, RMH and CHUK. Written informed consent (Appendix 3) was signed by each participant as proof of his/her voluntary participation in the study. Participants received explanation regarding their freedom to accept to participate in the study or to refuse to do so. They were also informed that they have the right to withdraw from the study at any time without any penalty. They also had the right to ask any question or report any concern about the study. They were also told that the information provided would remain anonymous and confidential forever and that information would only be used for the purpose of the current study. Some benefits from participation in the study were explained. This included to have an overview Nurses 'knowledge and practice on measures to prevent increase in intracranial pressure among neurosurgical patients, to contribute to the improvement of quality care in terms nursing neurosurgical patients through allowing to find out the gaps and to finally overcome them. Each participant was given a code number for identification to maximize the privacy and confidentiality.

3.13 DATA MANAGEMENT

Scripts were be kept and stored safely in a locked area and the researcher also kept the key. Pre-coded data were immediately captured and recorded into a laptop file by creating a data set. Data were saved in a laptop and protected by a password that is only known by the researcher. Data were stored in hard and soft copies. Hard copies were kept in a locked cupboard in well controlled room. All data from this study will be stored for a period of 5 years as they can be used later for audit. After five years hard copies (filled questionnaires will be destroyed by incineration and the softcopies shall be deleted.

3.14. DATA DISSEMINATION

The findings of this study are to be presented by means of a report. A report from this study was presented to CMHS/UR as partial fulfillment of the requirements for the award of Master's degree in Nursing, track of Critical Care and Trauma Nursing. The results of the study will also be presented to CHUK, RMH and to the Ministry of Health. The researcher will organize a dissemination meeting with nurses and leaders at CHUK and RMH respectively. The researcher will strive to attempt publication of the findings in a peer reviewed scientific journal and make presentations in scientific conferences, seminars, and workshops as funds become available.

3.15. LIMITATION AND CHALLENGES

This study was a cross sectional study and participants were recruited from two hospitals which resulted in non-generalizable research findings due to a limited sample size of a hundred nurses. Objectives of the present study have been achieved but the researcher encountered some limitations and challenges such as financial issues where the researcher had to move to both hospitals at different times which costed a lot of money for transport. In addition this study was done at only two referral hospitals and the determined knowledge and examined practice cannot be generalized to other nurses who are employed in other hospitals.

3.16. CONCLUSION TO CHAPTER THREE

A quantitative approach and a cross sectional design was utilized in this study which was conducted at both CHUK and RMH. Participants were nurses working in critical care neurosurgical unit and accident and emergency. The researcher used self administered questionnaire to collect data from participants on their consent. Permission was warranted by University of Rwanda (CMHS/UR) and both hospitals (CHUK and RMH). Data were analysed using SPSS.

CHAPTER FOUR: RESULTS

4.0. INTRODUCTION

This chapter summarizes the research findings regarding nurses' knowledge and practices on measures to prevent increase in intracranial pressure among neurosurgical patients at CHUK and RMH in Rwanda. On one hundred (100) questionnaires distributed to participants, from 25th February to 29th April 2019. All questionnaires were filled in and returned to the researcher. This represented a response rate of 100%. The results were presented in tables

4.1. DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

The mean age percentage of participants was36,18 years and Majority 65(65%) of participants were aged between 31 to 40 years. While27 (27%) of the nurses were in the age of 41 or above. The findings also indicate that with regard to marital status, 86(86%) participants were married. In addition, 64 participants (64%) worked at CHUK while the remaining participants were from RMH. Regarding working experience, 41% of participants had been working 1 to 5 years where as 40% of participants had been working 6 to 10 years. The average number of years since qualification was 5, 5 years. Lastly advanced diploma level was the mostly completed level of education (58%). See Table 4.1.for the summary of Socio-demographic characteristics of participants (N=100).

Table 4.1. Socio-demographic characteristics of participants .

Socio-demographic characteristics of participants (N=100).

		Frequency	Percent
SEX	male	34	34.0
	female	66	66.0
	Total	100	100.0
Marital status	single	14	14.0
	Married	86	86.0
	Total	100	100.0
Work area	CHUK	64	64.0
	RMH	36	36.0
	Total	100	100.0

Age group(years)	21-30	8	8.0
	31-40	65	65.0
	41 and above	27	27.0
	Total	100	100.0
Work experience in years	less than one year	7	7.0
	1-5 years	41	41.0
	6-10 years	40	40.0
	more than 11 years	12	12.0
	Total	100	100.0
Highest level of education	advanced diploma	58	58.0
	BSCN	39	39.0
	Masters degree	3	3.0
	Total	100	100.0

4.2 PRESENTATION OF FINDINGS AS ALIGNED WITH THE OBJECTIVES

4.2.1 Nurses' general knowledge regarding increased intracranial pressure, causes, signs, contributing factors.

The knowledge of nurses regarding increased intracranial pressure was assessed using11 items. Participants had to choose the correct answers. The participants knew most the questions on Projectile vomiting as an early sign of raised ICP, consequence of prolonged raised ICP as irreversible brain damage, a patient with SAH being at risk of increased ICP. However, many participants (78%) could not relate intraabdominal and intrathoracic pressures with raised ICP and Decreased pulse pressure not being related to ICP while 70% did not know the ICP normal range of 0-15mmHg.

Table 4.2.Nurses'knowledge regarding increased intracranial pressure, causes, signs, contributing factors N=100

Knowledge variables	Responses				Total
	Right		wrong		
	Freq.	%	Freq	%	
ICP is a pressure in the cranial vault	41	41	59	59	100
ICP ranges between 0-15mmHg	30	30	70	70	100
Brain, blood and cerebral spinal fluid influence ICP	62	62	38	38	100
Projectile vomiting is an early sign of increased ICP	88	88	12	12	100
Intrabdominal or intrathoracic pressures increase ICP	22	22	78	78	100
PCO2 cause vasodilatation and increase ICP	37	37	63	63	100
A patient with SAH is at risk of increase ICP	71	71	29	29	100
Decreased pulse pressure is not related to ICP	22	22	78	78	100
Cushing triad refers to Systolic hypertension, widened pulse pressure and bradycardia	48	48	52	52	100
Prolonged high ICP leads to irreversible brain damage	77	77	23	23	100
Systolic hypertension widened pulse pressure and bradycardia are late sing of increased ICP	43	43	57	57	100

Total individual scores were transformed into percentages. Overall participants had poor knowledge (mean= 49.18, SD=18.90. In this study the nurses who scored above the mean score of the knowledge questions, were considered as having good knowledge on raised intracranial pressure, causes, and signs, contributing factors and preventives measure. But on the contrary, those who scored below the mean value were considered as having poor knowledge towards raised intracranial pressure, causes, signs, contributing factors and preventives measures.

Table 4.3. Marks of respondents from 11 questions that assess nurses' knowledge regarding increased intracranial pressure, causes, signs, contributing factors.

Variable	Knowledge score%	N	Percent%	Level of knowledge
knowledge				
	9	3	3.0	Poor knowledge
	18	6	6.0	
	27	12	12.0	
	36	10	10.0	
	45	21	21.0	
	55	16	16.0	Good knowledge
	64	14	14.0	
	73	12	12.0	
	82	5	5.0	
	91	1	1.0	
	Total	100	100.0	

More than a half of participants 52(52%) had a poor knowledge regarding increased intracranial pressure, causes, signs, contributing factors while 48(48%) had good knowledge

Table 4.4.Summary of nurses' knowledge class with regard to the Percent score group Mean (n=100)

Variable	Frequency	Percent
Poor knowledge(below or equal to percent score group mean 49.18)	52	52.0
Good knowledge(above percent score group mean 49.18	48	48.0
Total	100	100.0

4.2.4 Nurses' knowledge of preventive measures regarding the increase of intracranial pressure.

Results revealed that 89% participants knew that maintaining a patent airway is a preventive measure while 84% of the respondents were aware that minimizing airway stimulation (coughing, suctioning) is one of preventive measures. In addition, 82% of the respondents were aware that maintaining adequate oxygenation between suction passes is a preventive measure. Seventy seven (77%) of the respondents were aware that avoiding hyperthermia is a

preventive measure. Also fifty nine 59(59%) respondents were aware that suction duration less than 10 seconds is a preventive measures. Sixty six (66%) respondents were aware that avoiding obstruction of venous return is a preventive measure. Sixty three (63%) respondents were not aware that neck flexion is not a preventive measure. Seventy eight (78%) respondents were aware that avoiding hypoxia is a preventive measure of on increased ICP. Fifty one 51 (51%) respondents were aware that suction for 30 seconds is not a preventive measure. Other findings can be seen in table 4.5 below. Most participants did not know that arousing the patient to assess the level of consciousness (84%), maintaining PCO_2 above 45mmHg (74%), frequent suctioning to keep airway open (67%) and neck flexion (63) are not preventive measures.

Table 4.5.Nurses' knowledge of preventive measures regarding the increase of intracranial pressure (n=100).

Preventives measures Knowledge variables	Responses correct		wrong		Total
	Freq.	**%**	**Freq**	**%**	
Minimizing airway stimulation (coughing,suctionning)	84	84	16	16	100
Maintaining PCO2 above 45mmg(hypercapnea)	26	26	74	74	100
Maintaining a patent air way	89	89	11	11	100
Maintaining adequate oxygenation between suction passes	82	82	18	18	100
Avoid hyperthermia	77	77	23	23	100
Suction duration less than 10seconds	59	59	41	41	100
Avoid obstruction of venous return(elevate head ,head in neutral position	66	66	34	34	100
Neck flexion	37	37	63	63	100
Avoiding hypoxia	78	78	22	22	100
Suction for 30 seconds	51	51	49	49	100
Trendelenburg positioning	55	55	45	45	100
Frequent suctioning to keep air way open	33	33	67	67	100
Elevate the head of the patient's bed 30 to 45 degrees	93	93	7	57	100
Ensure venous outflow isn't obstructed from a kinked neck or a constricting tape	52	52	48	48	100
Tightening cervical collar	37	37	63	63	100
Take steps to prevent shivering.	50	50	50	50	100
Keep arousing the patient to assess level of consciousness	16	16	84	84	100
Avoid seizures	85	85	15	15	100
Maintain a blood glucose range above normal ranges	47	47	53	53	100
Pain management	95	95	5	5	100

The mean percent score of participants was (60.60, SD=14.65).Fifty seven (57%) participants had poor knowledge regarding preventives measures for increased intracranial pressure while the remaining 43 had good knowledge. In this study the nurses who scored above the mean score of the knowledge questions, were considered as having good knowledge on raised intracranial pressure, causes, and signs, contributing factors and preventives measure. But on the contrary, those who scored below the mean value were considered as having poor knowledge towards raised intracranial pressure, causes, signs, contributing factors and preventives measures.

Table 4.6.Nurses' knowledge percent score of preventive measures regarding the increase of intracranial pressure.

Variable	Preventive knowledge percent score **%**	N	Percent	Level of knowledge
Knowledge of preventive measures				
	20	1	1.0	Poor knowledge
	25	1	1.0	
	40	9	9.0	
	45	6	6.0	
	50	11	11.0	
	55	19	19.0	
	60	10	10.0	
	65	13	13.0	Good knowledge
	70	12	12.0	
	75	4	4.0	
	80	6	6.0	
	85	2	2.0	
	90	4	4.0	
	95	2	2.0	
	Total	100	100.0	

The mean percent score of participants was (60.60, SD=14.65).Fifty seven (57%) participants had poor knowledge regarding preventives measures for increased intracranial pressure while the remaining 43 had good knowledge.

Table 4.7.Nurses' knowledge on prevention measures class with regard to the Percent score group Mean (n=100).

Variable	Frequency	Percent
Poor knowledge on prevention(below or equal to percent score group mean 60)	57	57.0
Good knowledge on prevention(above percent score group mean 60)	43	43.0
Total	100	100.0

4.2.5 Nurse's practice regarding prevention of increased intracranial pressure

This study also assessed nurses' practice about prevention of increased intracranial pressure. Maintaining adequate oxygenation between suction passes was most correctly done at 73(73%) as a preventive measure. Evidence of anti-seizure medication given, suction duration less than 10 seconds, when suctioning, only one to two passes respected, Blood pressure controlled MAP>65mmHg, minimizing noxious stimuli (light control) were most incorrectly done with 18(90%) participants. The group mean score was 44.68 and SD=17.59. Eighty percent (80%) of participants had poor practice regarding preventive measures for increased intracranial pressure. See Table 4.8 below.

Table 4.8.Nurses' practice regarding prevention of increased intracranial pressure(n=20)

Observed practices	Correct (%)	Incorrect (%)	Total (%)
Maintain a Patent air way	13(65%)	7(35%)	20(100%)
Maintaining adequate oxygenation between suction passes	73(73%)	27(27%)	100(100%)
Suction duration less than 10seconds	2(10%)	18(90%)	20(100%)
When suctioning , only one to two passes respected	2(10%)	18(90%)	20(100%)
Blood pressure controlled MAP>65mmHg	2(10%)	18(90%)	20(100%)
Evidence of Anti-seizure medication given	2(10%)	18(90%)	20(100%)
Effort to keep the body temperature in normal ranges	17(85%)	3(15%)	20(100%)

Head position at least 30 to 45 degrees	14(70%)	6(30%)	20(100%)
Head position in neutral position	4(20%)	16(80%)	20(100%)
Avoid hip flexion	3(15%)	17(85%)	20(100%)
Minimizing noxious stimuli(light control)	2(10%)	18(90%)	20(100%)
Minimizing noxious stimuli(noise control)	4(20%)	16(80%)	20(100%)
Space nursing activities appropriately	5(55%)	15(75%)	20(100%)
stool softener administered as prescribed	19(95%)	1(5%)	20(100%)
Maintain glycerin in normal range	15(75%)	5(15%)	20(100%)
Maintain comfort(bandage not tight	18(90%)	2(10%)	20(100%)

In this study nurses who scored above the mean score of the practice questions related to prevention of increased intracranial pressure to have good practice. But on the contrary, those who scored below the mean score were considered as having poor practice towards prevention of increased intracranial pressure

Table4.9. Distribution of marks of respondents from 16 items that were observed for nurse's practice regarding prevention of increased intracranial pressure(n=20).

Variable	Practice score%	N	Percent%	Level of practice
Knowledge				
	25	2	2.0	Poor practice
	31	4	4.0	
	38	4	4.0	
	44	6	6.0	
	69	1	1.0	Good practice
	75	1	1.0	
	81	2	2.0	
	Total	20	20.0	

Overall, participants had poor practice (mean= 44.69, SD=17.589).Table 9 show that 16 (80%) of participants had poor practice regarding preventives measures for increased intracranial pressure.

Table 4.10.Nurse's practice regarding prevention of increased intracranial pressure

Variable	Frequency	Percent
Poor practice (below or equal to percent score of group mean 44.69)	16	80.0
Good practice(Above percent score of group mean44.69)	4	20.0
Total	20	100.0

4.2.2.Distribution and association of nurses' knowledge with their demographic characteristics

To compare the knowledge score of females to that of males, an independent samples t test was performed. It was revealed that male nurses (n=34), scored mean=52.41, SD=15.51 thus was significantly higher than that of female nurses (n=66), mean=47.52, SD=20.34), t=1.227, p=0.023. The analysis of the knowledge score per marital status was also done using independent sample t test. This test yielded significant differences between the mean score of single (n=14, mean=59.09, SD=15.02), married (n=86, mean=47.57, SD=19.05) p=0.034. The analysis of the knowledge score per work place was done using also independent sample t test. This test yielded no significant differences between the mean score of those working at CHUK (n=64, mean=48.01, SD=19.19), and those in RMH (n=36, mean=51.16, SD=18.45) t=-0.824, p=0.412. The analysis of the knowledge score per work experience was also done using independent sample t test. This test yielded significant differences between the mean score of 1-5 years of experience (n=41,mean=55.43,SD=17.699), less than one year of experience (n=7,mean=49.35,SD=13.744), 6-10 years of experience (n=40, mean=45.91, SD=19.307) and more than 11 years of experience (n=12, mean=38.64, SD=18.641, $F_{(3,96)}=3.363$, p<0.022.

Table4.11. Nurses' general knowledge per socio-demographic characteristics.

variable		Overall knowledge		
		N	Mean	SD
Sex				
	male	34	52.41	15.51
	female	66	47.57	20.34
	total	100		
	P value	0.223		
Marital status				
	Single	14	59.09	15.02
	Married	86	47.47	19.05
	total	100		
	P value	0.34		
Work area				
	CHUK	64	48.01	19.19
	RMH	36	51.01	18.45
	total	100		
	P value	0.412		
Age				
	21-31	8	37.50	19.09
	30-40	65	54.19	16.02
	41 and above	27	40.74	21.30
	Total	100		
	P value	0.01		
experience				
	Less than 1year	7	49.35	13.74
	1-5 years	41	55.43	17.69
	6-10years	40	45.91	19.30
	Over 11 year	12	38.64	18.64
	Total	100		
	P value	0.22		
Education				
	A1	58	47.81	19.38
	BSCN	39	49.88	18.16
	Masters	3	66.67	13.88
	total	100		
	P value	0.233		

4.2.3 Nurses' general knowledge ,knowledge of preventive measures with regards to practice

Table 4.12 below showed that there was a positive correlation between the nurses knowledge and their knowledge on prevention (r=0.730, p=0.001), and a negative correlation between the knowledge and the practice of increased ICP prevention (r=-0.242, p=0.303). Table 4.12 shows that nurses knowledge on preventive measures were also negatively correlated with their practices (r=-0.378, p=0.100).

Table 4.12.Correlation matrix between the General knowledge, knowledge on prevention and practices (N=20).

Variable	General knowledge	Knowledge on prevention	Practice
General knowledge	1		
Knowledge on prevention	0.730	1	
Practice	-0.242	-0.378	1

4.2.4.CONCLUSION

In this study nurses' knowledge towards raised intracranial pressure, causes, signs, contributing factors and preventive measures were found to be poor in general .Practice was also poor.

CHAPTER FIVE: DISCUSSION

Nursing care has a great impact on neurosurgical patient outcome in terms of increased intracranial pressure prevention. The general aim of this study was to assess nurses 'knowledge and practice on measures to prevent increase in intracranial pressure among neurosurgical patients. More specifically the current research was aimed to examine nurses' knowledge regarding increased intracranial pressure, to determine nurse's knowledge regarding preventive measures for increased intracranial pressure, examine nurses' practice of measures to prevent the rise intracranial pressure. Furthermore different socio-demographic characteristics were described and the research was curious to associate knowledge and practices. Therefore this chapter discusses the finding from the current research basing on the objective of the study in the light of different studies done before and available literature.

The findings indicated that the majority of participants were female. This may be due to the fact that, the nursing profession in its origin was considered to be a profession of women whereby female were the most candidates in nursing education this is in line with a study that was done in Egypt where the majority of participants were female nurses(Abdelmowla, Essa and Abdelmaged, 2017). his result disagreed with study conducted by Al-Sai'di (2008) who found that the majority of nurses were male in Bgdad,

The participants were generally young adults; most of them were falling within age group of 31-40 years. This is an age group of young adults who are still strong and productive. In addition, the majority of the participants were working at CHUK, while the remaining participants originated from RMH. This is due to the fact that CHUK has a greater number of admissions with a wide space for emergencies depending on disease categories. It also due to the fact that CHUK provides many services such as emergency resuscitation room considered as an ICU, post recovery room, neurosurgical unit, intensive care unit high dependency unit where as RMH has only emergency and intensive care

The most attained educational level was advanced diploma (A1) This low educational levels and the reason behind may be that advanced diploma most of nursing school were delivering course only at this level before private school came the great contribution of university of Rwanda to initiate bachelor's level and master's level. This result is inconsistent with Phipps,

et, al (2003) study which has indicated that the majority of nurses had bachelor's degree in nursing.

The researcher noted that few studies have been conducted regarding nurses' knowledge and practice on prevention of increases in intracranial pressure. In this study nurses' knowledge towards raised intracranial pressure, causes, signs, contributing factors were found to be poor in general. Per categorization of knowledge related to raised intracranial pressure, signs and symptoms of intracranial pressure were the least known aspect of knowledge by nurses followed by primary factors that may increase intracranial pressure, and normal range of intracranial pressure (ICP). These findings are in line with a study that was conducted in the United States of America by Tolu and Lyn (2016) where nurses reported multiple concerns about caring for patients with neurosurgical problems especially in recognizing clinical manifestations.

Nurses also did not understand the effect of increased $PaCO_2$ (partial pressure of carbon dioxide gas) on ICP. Most of them could not recognize intracranial pressure, the late signs of increased intracranial pressure nor recognizing patient with Cushing's Triad even recognizing three components contributing to variation in intracranial pressure. As they are nurses working in recognized teaching referral hospitals, and are expected to be practicing well, this level of knowledge and practice is below the anticipated.The above findings are not in line with the current literature where nurses providing care for neurosurgical patients should be well aware of the factors affecting intracranial pressure, care interventions to prevent intracranial pressure increase, as well as a thorough understanding of the early signs of increased intracranial pressure(Ugras and Yuksel, 2015).

Each and every nurse has to closely assess and follow up neurosurgery patients in order to find out those at risk for increase intracranial pressure thus perform preventive intervention. This will allow the treating team to recognize any changes on time and avoid complications by timely interventions. Nurses must be able to alert and act quickly to any signs and symptoms of increased intracranial pressure that can be recognized through timely and regular neurological assessment (Layon et al. 2013).

Identified poor overall knowledge among nursing staff about raised intracranial pressure, causes, signs, contributing factors is linked to low educational background (advanced diploma) and the lack of specialization program for neurosurgical nursing(Yildiz et al. 2014). Regarding poor nurses' knowledge towards raised intracranial pressure, causes, signs, contributing factors, several research studies in Egypt, Brazil, Cincinnati in the U.S. state of Ohio, across hospitals in the United States and in Nagpur India, support the current finding where the findings demonstrated that the majority of nurses were found to have unsatisfactory level of knowledge regarding patient care in post craniotomy patients.

Planning nursing interventions: One of the factors associated with increased ICP is clustering of all nursing interventions within the same time period. Spacing of nursing interventions may prevent transient increases in ICP. In addition, patients should be turned slowly and moved gently to prevent pain and agitation. The first step in the management of increased ICP and primary re- sponsibility of a nurse is supplying adequate oxygenation in order to support brain functions.Excessive rotation or flexion of the neck, which has been re- ported to cause pressure on the jugular veins and increases ICP, should be avoided(Ugras and yuksel, 2015).

Nurses' Practices in regards to prevention of increased pressure: Generally the current findings revealed that nurses had poor practice with low percent score group meanfor the following nursing measures: Suction duration less than 10 seconds, when suctioning, only one to two passes respected, blood pressure controlled MAP>65mmHg, evidence of anti-seizure medication given, head position in neutral position, avoiding hip flexion, minimizing noxious stimuli (light control), minimizing noxious stimuli(noise control, spacing nursing activities appropriately. The above results supports those found in a study conducted in Egypt by Abdelmowla, Essa and Abdelmaged (2017) who also found that nurses practice was poor regarding increased intracranial pressure prevention.

 The least performed practices in increased intracranial pressure preventive measures were maintaining a patent air way, maintaining adequate oxygenation between suction passes, effort to keep the body temperature in normal ranges, head position at least 30 to 45 degrees, stool softener administered as prescribed, maintain glycaemia in normal range and maintain comfort (bandage not tight). Ugras and Yuksel, (2015) supported all interventions aiming to prevent the rise of ICP. In case they are neglected neurosurgical patient my face an increased

intracranial pressure resulting in disability or death.Literature has shown that all nurses caring for a neurosurgical patients need to avoid factors that may increase intracranial pressure, such as, increased neuronal oxygen consumption which increases from pain, anxiety, agitation, fever, and shivering. In addition light on bed side, sound, nursing procedures, such as, bathing, repositioning in bed and seizures may increase metabolic rate and lead to increased ICP (Zerfoss, 2016).Nurses allocated in neurosurgical nursing departments have to be empowered in general practice before they do their in specialty practice. Any specialty practice departs from the knowledge of fundamental nursing science and then adds advanced knowledge and practice to provide any specialized care to neurosurgical patients (Hickey 2013).

Interventions and procedures that are undertaken to prevent and reduce ICP are started even when ICP is not elevated and it is advised that nurses don't rely entirely on the ICP value as a cue to initiate an intervention. This finding is in line with the literature, as critical care nurses often rely on additional physiological parameters such as oxygen saturation, brain oxygenation, and cerebral perfusion pressure when making decisions about interventions to prevent secondary brain injury(Olson *et al.*, 2013).

In conclusion it is clear that nurses needs to be equipped with knowledge and skills so that they deliver quality care to neurosurgical patients.

CHAPTER SIX: CONCLUSION AND RECOMMANDATION

6.1. CONCLUSION

Knowledge of the nurses regarding about raised intracranial pressure, causes, signs, contributing factors and regarding preventives measures was poor. Nurses' practice regarding prevention of raised intracranial pressure was also poor

6.2. RECOMMANDATION

The recommendation to improve knowledge and practice of nurses has been addressed to the following:

To the researchers,

To organize further interventional study to enhance nurses' knowledge to generally improve the practice with regard to prevention of the rises of intracranial pressure among neurosurgical patients as a non-negligible number demonstrated poor knowledge and poor practice. Knowledge and practice of nurses can be improved through an educational program, continued education and follow up. This will be reflected on enhancing patients' outcomes by preventing or reducing increase in intracranial pressure and promoting early improvement. Neurosurgery educational programs must be developed and shared nationally. Nurses must be certified in neurosurgical nursing practice to demonstrate high level of knowledge and commitment to patient care. Neurosurgical nurses must be prepared for the increased and intense complexity of the future and actively participate in the redesign of the new health care system.

To the University of Rwanda,

Specifically for schools of nursing to revise and update the curriculum within regards to neurosurgical nursing to enhance students nurses' knowledge before they reach the clinical setting or to start neurosurgical nursing as a specialty.

To the hospitals,

It is highly recommended to conduct continuous professional development (CPD) and monitor its effectiveness on a regular basis. Protocols, guidelines and assessment tools are also needed and should be availed in services and be taught to nurses for their best utilization

and ultimately for the best nursing care with regard to neurosurgical nursing specifically prevention and management of increased intracranial pressure but also reinforcing interprofessional collaboration can help to enhance patient care with regard to neurosurgical nursing.

REFERENCES

Abdelgadir, J. *et al.* (2017) 'Outcomes and Predictors of Mortality in Neurosurgery Patients at Mbarara Regional Referral Hospital, Mbarara, Uganda', *Annals of Global Health*. Elsevier Inc, 83(1), pp. 18–19. doi: 10.1016/j.aogh.2017.03.040.

Abdelmowla, R., Essa, A. and Abdelmaged, E. (2017) 'Role of the nurse in preventing or reducing increase intracrani-al pressure following craniotomy', *International Journal of Advanced Nursing Studies*, 6(2), p. 92. doi: 10.14419/ijans.v6i2.8293.

Bacon-shone, J. (2015) *Introduction to Quantitative Research Methods*. doi: 10.13140/2.1.4466.3040.

Carney, N. *et al.* (2016) 'Guidelines for the Management of Severe Traumatic Brain Injury, Fourth Edition', *Neurosurgery*, 24(Suppl 1(suppl 1), p. 1. doi: 10.1227/NEU.0000000000001432.

Dewan, M. C. *et al.* (2017) 'ABBREVIATIONS HICs = high-income countries; LMICs = low and middle-income countries; PGSSC = Program in Global Surgery and Social Change; TBI = traumatic brain injury; TSI = traumatic spinal injury; WFNS = World Federation of Neurosurgical Societies Globa', *J Neurosurg*, p. 1. doi: 10.3171/2017.11.JNS171500.

Ed, P. *et al.* (2017) 'The Use of Therapeutic Hypothermia in Increased Intracranial Pressure after Traumatic Brain Injury : A Randomized Clinical Trial', 4(3), pp. 1–5. doi: 10.19080/OAJNN.2017.04.555637.

EL Hussein, M. T., Zettel, S. and Suykens, A. M. (2016) 'The ABCs of managing increased intracranial pressure', *Journal of Nursing Education and Practice*, 7(4). doi: 10.5430/jnep.v7n4p6.

Kawoos, U. *et al.* (2015) 'Advances in intracranial pressure monitoring and its significance in managing traumatic brain injury', *International Journal of Molecular Sciences*, 16(12), pp. 28979–28997. doi: 10.3390/ijms161226146.

Kinoshita, K. (2016) 'Traumatic brain injury: Pathophysiology for neurocritical care', *Journal of Intensive Care*, 4(1), pp. 1–10. doi: 10.1186/s40560-016-0138-3.

Levine, J. M., Levine, N. and Goodman, D. (2016) *Chapter 41 - Increased Intracranial Pressure*. Second Edi, *The Intensive Care Unit Manual*. Second Edi. Elsevier Inc. doi: 10.1016/B978-1-4160-2455-2.00041-4.

Luzia, M. *et al.* (2018) 'Management of intracranial hypertension in patients neurocriticos : integrative review', 5(3), pp. 116–122. doi: 10.15406/ncoaj.2018.05.00131.

Mahday, N. E., Mersal, N. A. and Hessien, Z. (2016) 'Increased intracranial pressure: effect of educational nursing guidelines on nurses' performance in neuro-critical care unit', *Life Science Journal*, 13(1s), pp. 56–70. doi: 10.7537/marslsj1301s1607.Key.

Marshall, J. C. *et al.* (2017) 'What is an intensive care unit? A report of the task force of the World Federation of Societies of Intensive and Critical Care Medicine', *Journal of Critical*

Care. Elsevier Inc., 37, pp. 270–276. doi: 10.1016/j.jcrc.2016.07.015.

Merriam webster (2018) *Definition of knowledge*. Available at: https://www.merriam-webster.com/dictionary/knowledge.

Nyholm, L. *et al.* (2014) 'Secondary insults related to nursing interventions in neurointensive care: A descriptive pilot study', *Journal of Neuroscience Nursing*, 46(5), pp. 285–291. doi: 10.1097/JNN.0000000000000077.

Nyholm, L., Howells, T. and Enblad, P. (2017) 'Predictive Factors That May Contribute to Secondary Insults With Nursing Interventions in Adults With Traumatic Brain Injury', 49(1). doi: 10.1097/JNN.0000000000000260.

Olson, D. M. *et al.* (2013) 'Significant Practice Pattern Variations Associated With Intracranial Pressure Monitoring', pp. 186–193. doi: 10.1097/JNN.0b013e3182986400.

Ragland, J. and Lee, K. (2016) 'Critical Care Management and Monitoring of Intracranial Pressure', 9(2), pp. 105–112.

Ramesh, A. *et al.* (2014) 'Challenges and Solutions for Traumatic Brain Injury Management in a Resource-Limited Environment: Example of a Public Referral Hospital in Rwanda', *Cureus*, 6(5), pp. 1–9. doi: 10.7759/cureus.179.

Rodríguez-Boto, G. *et al.* (2015) 'Basic concepts about brain pathophysiology and intracranial pressure monitoring', *Neurología (English Edition)*. SEGO, 30(1), pp. 16–22. doi: 10.1016/j.nrleng.2012.09.002.

Roytowski, D. and Figaji, a (2013) 'Raised intracranial pressure: What it is and how to recognise it', *Continuing Medical Education*, 31(11), pp. 390–395. Available at: http://www.cmej.org.za/index.php/cmej/article/view/2909/3284.

Santos, W. C. *et al.* (2016) 'Assessment of nurse's knowledge about Glasgow coma scale at a university hospital', *Einstein (São Paulo)*, 14(2), pp. 213–218. doi: 10.1590/S1679-45082016AO3618.

T., O. and L.S., T. (2016) 'Nurses' concerns about caring for patients with traumatic brain injury', *Archives of Physical Medicine and Rehabilitation*, 97(10), pp. e87–e88. doi: 10.1111/jocn.14298.

Taherdoost, H. and Group, H. (2017) 'Validity and Reliability of the Research Instrument ; How to Test the Validation of a Questionnaire / Survey in a Research', (September). doi: 10.2139/ssrn.3205040.

Tan, T. K., Cheng, M. H. and Sim, E. Y. (2015) 'Options for managing raised intracranial pressure', *Proceedings of Singapore Healthcare*, 24(3), pp. 156–164. doi: 10.1177/2010105815598444.

Ugras, G. altun and yuksel, serpil (2015) 'Factors Affecting Intracranial Pressure and Nursing Interventions', (February).

Wilson, M. H. (2016) 'Monro-Kellie 2 . 0 : The dynamic vascular and venous pathophysiological components of intracranial pressure', pp. 6–9. doi:

10.1177/0271678X16648711.

Zerfoss, C. L. (2016) 'Reducing intracranial pressure in patients with traumatic brain injury', *official journal of american nursies association*, 11(10). Available at: https://www.americannursetoday.com/reducing-intracranial-pressure-patients-traumatic-brain-injury.

APPENDIX

APPENDIX I ENGLISH VERSION QUESTIONNAIRE

Dear participant,

My name is Diogene Twahirwa,I am a Rwandan postgraduate student enrolled in critical care and trauma nursing master's program at college of medicine and health sciences/University of Rwanda. I am conducting a research as part of requirement for master's program in critical care and trauma nursing. The title of my study is **Nurses' knowledge and practice on measures to prevent increase in intracranial pressure among neurosurgical patients**.

I kindly request your participation by completing the questionnaire. Your participation is voluntary and any information given will be kept confidential. No names will be written on the questionnaire .For any question here are phone no**0788756320**, Supervisor: **0788528683**

QUESTIONAIRE

 Code: …….   Area of work …………………………..

Instructions: Read each question carefully and tick (√) against the option that best suits your response.

1. DEMOGRAPHIC DATA

a. **Gender**

   1. Male ☐   2. **Age:1)** 21-30 ☐ **2)**31-40 ☐ **3)** 41 and above ☐

     .

   2. Female ☐

b. **Work experience in your unit**

   1. Less than 1 years ☐

   2.   1-5years ☐

   3. 6-10 years ☐

   4. More than 11 years ☐

c**. Level of education**

   1. Advanced Diploma ☐

   2. BSCN ☐

   3. Masters degree ☐

d. **Marital status**

   1. Single ☐   2.Married ☐   3.Divorced ☐

2. SECTION A: Questions related to what nurse know about raised intracranial pressure, causes, signs, contributing factors .Circle appropriate response.

a) Intracranial pressure (ICP) is:

1. Pressure in the peritoneum
2. Pressure in the cranial vault
3. Pressure in the cardiac ventricles
4. Pressure in the cerebral blood vessels

b)A normal intracranial pressure(ICP) ranges between

1. 60-150mmHg
2. 0-15mmHg
3. 70-100mmHg
4. 6-12cmH$_2$O

c) Three components contributing to variation in intracranial pressure

1. Brain, ventricles and blood
2. Cerebrum, cerebellum and brain stem
3. Brain, blood and cerebrospinal fluid
4. Blood,Cerebrospinal fluid and diencephalon

d) When assessing a patient with a neurosurgical condition, the nurse recognizes that an early sign of increased intracranial pressure is:

1. Projectile vomiting
2. Shivering
3. Sweating
4. Sluggish papillary response to light

e) One of the following is primary factors that may increase intracranial pressure

1. Head in neutral position
2. On time feeding
3. Intrabdominal/intorathoracic pressure
4. Head of bed elevated 30 to 45 degrees

f) The patient has an intracranial pressure (ICP) of 20 mmHg. As the nurse you know that increased PaCO2 (partial pressure of carbon dioxide gaz) level above normal ranges will?

1. Cause vasoconstriction and decrease the ICP
2. Promote diuresis and decrease the ICP
3. Cause vasodilatation and increase the ICP
4. Cause vasodilatation and decrease the ICP

g) Which patient below is most at risk for increased intracranial pressure?

1. A patient who is on insulin.
2. A patient who has subarachnoid hemorrhage
3. A patient who is on antihypertensive drugs
4. A patient post-op nose surgery

h) One of the following signs and symptoms is not related to an increased ICP

1. Decorticate posturing
2. Decrease in pulse pressure
3. Cheyne-stokes respiration
4. Decerebrate posturing

i) Which patient below with ICP is experiencing Cushing's Triad? A patient with the following:

1. Hypertension,hypokalaemia
2. Fever,hyperleucostosis ,bradycardia
3. Systolic hypertension, widened pulse pressure, bradycardia.
4. Sepsis,hypotension,poor capillary refill

j) Among the following are consequences of prolonged elevated ICP

1. Coughing, Sneezing.
2. Irreversible brain damage and cerebral hypoxia
3. Valsaver maneuver (such as constipation)
4. Both pupils reacting to light

k) Among the late signs of increased intracranial pressure include

1. GCS above 10
2. Normal blood sugar
3. Systolic Hypertension with widened pulse pressure, bradycardia
4. Peri- orbital hematoma

3. SECTION B: Questions regarding measures used to prevent increase in intracranial pressure?

n) Knowledge of preventive measures regarding the increase of intracranial pressure

Useful preventive measures	Useful	Not useful	Don't' know
1. Minimizing airway stimulation (coughing,suctionning)			
2.Maintaining PCO2 above 45mmg(hypercapnea)			
3. Maintaining a patent air way			
4. Maintaining adequate oxygenation between suction passes			
5. Avoid hyperthermia.			
6. Suction duration less than 10seconds			
7. Avoid obstruction of venous return(elevate head ,head in neutral position			
8. neck flexion			
9.Avoiding hypoxia			
10. Suction for 30 seconds			
11. Trendelenburg positioning			
12. Frequent suctioning to keep air way open			
13. Elevate the head of the patient's bed 30 to 45 degrees			
14.Ensure venous outflow isn't obstructed from a			

kinked neck or a constricting tape			
15.Tightening cervical collar			
16. Take steps to prevent shivering.			
17. Keep arousing the patient to assess level of consciousness			
18. Avoid seizures			
19. Maintain a blood glucose range above normal ranges			
20. Pain management			

This questionnaire was adapted from(Abdelmowla, 2017) with permission

Thanks from your participation

APPENDIX 2. OBSERVATION CHECK LIST.

Code: _____   Facility: _____

Nurse's practice regarding prevention of increased intracranial pressure

Mark as follows:

1. Incorrectly done

2. **Excellent: correctly done** staff nurse demonstrates excellent skills/strengths in this area.

NA: Not applicable. Used when you consider the indicator inappropriate given the purpose and context of the session

Demonstrated Knowledge/Skills	Correctly done	Incorrectly done	Not applicable: (NA)	comments
Respiratory support				
Maintain a Patent air way				
Maintaining adequate oxygenation between suction passes				
Suction duration less than 10seconds				
W hen suctioning , only one to two passes respected				
Hemodynamic control				
Blood pressure controlled MAP>65mmHg				
Seizures control				
Evidence of Anti-seizure medication given				
Temperature control(demonstrate effort to keep the body temperature in				

Demonstrated Knowledge/Skills	Correctly done	Incorrectly done	Not applicable:	comments
normal ranges				
Positioning				
Appropriate head position at least 30 to 45 degrees.				
Head head position in neutral position				
Avoid hip flexion				
Minimizing noxious stimuli				
light control				
Noise control				
Environment				
Space nursing activities appropriately				
Glycemia control(demonstrate effort to keep glycemia in normal ranges)				
Avoid valsava maneuver				
Straining at stool(stool softener administered as prescribed				
Comfort(bandage not tight				

This check list was adapted from(Abdelmowla, 2017) with permission

APPENDIX 3. INFOMED CONSENT

I ……………. agree to participate in the study entitled "**Assessment of nurse's knowledge and practice on measures to prevent increase in intracranial pressure among neurosurgical patients** at CHUK that is to be conducted by Diogene Twahirwa studying in UR/CMHS/REMERA Campus.

It comes to my understanding that the information I will provide will be protected and kept confidential and that it will serve only for the purpose of the current study. I also understand that I can withdraw from this study, which is my right, at any time and ask explanation if there is anything unclear.

Here are phone numbers you can call in case you have a concern:

Myself Diogene Twahirwa: **0788756320**

Supervisor: **0788528683**

If you are concerned about the process of the study, you can contact the research office chairperson CMHS IRB number is: **0788 490 522** and the Deputy Chairperson number is **0783 340 040**.

I agree to participate in the research: Yes ☐   No ☐

 Initial and Signature of participants: ....

Date: ....

Names of the researcher: Diogene Twahirwa

Signature………

APPPENDIX 4.CONTACT DETAILS OF THE SUPERVISORS

1. Evelyne Nankundwa, RN (Co-Supervisor)

Masters program-Critical care and Trauma Nursing Track

University of Rwanda

College of Medicine and Health Sciences

School of Nursing and Midwifery

Kigali, Rwanda

Phone: +250 788 528683

Email: nankeve@yahoo.yr

2. Professor Busisiwe Bhengu(Supervisor)

Human Resources for Health (HRH)

Masters Program – Critical Care Track

Kwazulu natal University-South Africa

E-mail: bhengub2@ukzn.ac.za

For any concern about this project, please contact the Institutional Review Board (IRB)

B. Contact details of the ethical board

Institutional Review Board

Research Office

University of Rwanda

Kigali, Rwanda

Tel+250 788 563 312

Email: researchcenter@ur.ac.rw

APPENDIX 5: ETHICAL CLEARANCE LETTER

UNIVERSITY OF RWANDA

COLLEGE OF MEDICINE AND HEALTH SCIENCES

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 14/01/2019
Ref: CMHS/IRB/002/2019

TWAHIRWA Diogene
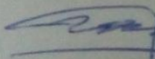**School of Nursing and Midwifery, CMHS, UR**

Dear TWAHIRWA Diogene

RE: ETHICAL CLEARANCE

Reference is made to your application for ethical clearance for the study entitled *"Assessment of Nurses 'Knowledge and Practice on Measures to Prevent Increase in Intracranial Pressure among Neurosurgical Patients at Two Selected Hospitals"*

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 Jean Bosco GAHUTU
Chairperson Institutional Review Board,
College of Medicine and Health Sciences, UR

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

j

APPPENDIX 6: APPROVAL LETTER FROM CHUK

CENTRE HOSPITALIER UNIVERSITAIRE
UNIVERSITY TEACHING HOSPITAL

Quality Health Care
Training & Research

Ethics Committee / Comité d'éthique

February 25th, 2019   Ref.: EC/CHUK/033/2019

Review Approval Notice

Dear Diogene Twahirwa ,

Your research project: "**Assessment of nurses 'knowledge and practice on measures to prevent increase in intracranial pressure among neurosurgical patients at CHUK**".

During the meeting of the Ethics Committee of University Teaching Hospital of Kigali (CHUK) that was held on 25th February, 2019 to evaluate your request for ethical approval of the above mentioned research project, we are pleased to inform you that the Ethics Committee/CHUK has approved your research project.

You are required to present the results of your study to CHUK Ethics Committee before publication.

PS: Please note that the present approval is valid for 12 months.

Yours sincerely,

Dr.Emmanuel Rusingiza
The Chairperson, Ethics Committee,
University Teaching Hospital of Kigali
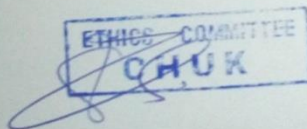
<<University teaching hospital of Kigali Ethics committee operates according to standard operating procedures (Sops) which are updated on an annual basis and in compliance with GCP and Ethics guidelines and regulations>>

B.P. :655 Kigali- RWANDA www.chk.rw Tél. Fax : 00 (250) 576638 E-mail :chuk.hospital@chukigali.rw

APPPENDIX 7: APPROVAL LETTER FROM RMH

UNIVERSITY OF
RWANDA **COLLEGE OF MEDICINE AND HEALTH SCIENCES**

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 14/01/2019
Ref: CMHS/IRB/002/2019

TWAHIRWA Diogene
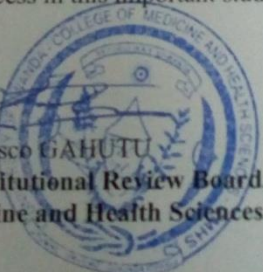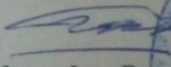**School of Nursing and Midwifery, CMHS, UR**

Dear TWAHIRWA Diogene

RE: ETHICAL CLEARANCE

Reference is made to your application for ethical clearance for the study entitled *"Assessment of Nurses 'Knowledge and Practice on Measures to Prevent Increase in Intracranial Pressure among Neurosurgical Patients at Two Selected Hospitals"*

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 Jean Bosco GAHUTU
Chairperson Institutional Review Board,
College of Medicine and Health Sciences, UR

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

APPPENDIX 8: PERMISSION TO USE RESEARCH TOOL

Requesting for Data collection instruments. (3)

Personnes
Diogène TWAHIRWA <namino123@yahoo.fr> Dear sir/madam RE/Requesting for Data collection instruments. I am Diogene Twahirwa and I am a student at university of Rwanda located in Rwanda Kigali East Africa.Iwas interested in your study on role of the nurse in preventing or reducing increase in intracranial pressure following craniotomy. In fact I am preparing my dissertation which has the following topic: Effect of Educational nursing intervention on Nurses' knowledge and practice on prevention and reduction of Increased Intracranial Pressure in

À
rashaali249@yahoo.com
01/30/18 à 12:29 AM
Répondre Répondre à tous Transférer Plus
rasha ali <rashaali249@yahoo.com> Data was delete from my computer but I want to help you, Data in table 2,3,4 and 5 represent (Tool III. Patients` assessment sheet ) Regarding (tool I) pre/post test for nurses` knowledge: you can put different questions regarding definition of increase intracranial pressure, causes, risk factors, clinical manifestations, complications and nursing role to prevent or reduce postoperative increase intracranial pressure in the form of (list, definition, complete, multiple choice, or true or false). Regarding (tool II) observation checklist for nurses: from the literature, collect steps (nursing care) to prevent or reduce increase intracranial pressure and accordingly prepare this tool. Dr. Rasha Ali Ahmed Abdelmowla Lecturer in Medical Surgical Nursing Department, Faculty of Nursing, Assiut University
À
Diogène TWAHIRWA
01/31/18 à 3:25 AM
Data was delete from my computer but I want to help you,

Data in table 2,3,4 and 5 represent (Tool III. Patients` assessment sheet)

Regarding (tool I) pre/post test for nurses` knowledge: you can put different questions regarding definition of increase intracrania pressure, causes, risk factors, clinical manifestations, complications and nursing role to prevent or reduce postoperative increase intracranial pressure in the form of (list, definition, complete, multiple choice, or true or false).

Regarding (tool II) observation checklist for nurses: from the literature, collect steps (nursing care) to prevent or reduce increase intracranial pressure and accordingly prepare this tool.

Dr. Rasha Ali Ahmed Abdelmowla
Lecturer in Medical Surgical Nursing Department, Faculty of Nursing, Assiut University