Republic of Iraq
Ministry of Higher Education
and Scientific Research
University of Babylon
College of Nursing

Postoperative Complications for Patients in Intensive Care Units following Cranial Surgeries

A Thesis Submitted

By

Nasser Hussain Kadhim

To

College of Nursing, University of Babylon

in Partial Fulfillment of the Requirements for the Degree of

Master in Nursing Sciences

Supervised by

Prof. Dr. Shatha Saadi Mohammed

September 2022 A.D Safar 1444 A.H

بِسْمِ ٱللَّهِ ٱلرَّحْمَٰنِ ٱلرَّحِيمِ

هُوَ ٱلَّذِي بَعَثَ فِي ٱلْأُمِّيِّـۧنَ رَسُولًا مِّنْهُمْ يَتْلُواْ عَلَيْهِمْ ءَايَٰتِهِۦ وَيُزَكِّيهِمْ وَيُعَلِّمُهُمُ ٱلْكِتَٰبَ وَٱلْحِكْمَةَ وَإِن كَانُواْ مِن قَبْلُ لَفِي ضَلَٰلٍ مُّبِينٍ

صدق الله العلي العظيم

سورة الجمعة

اية:٢

Supervisor Certification

I certify that this thesis, entitled **(Postoperative Complications for Patients in Intensive Care Units following Cranial Surgeries)**, submitted by **Nasser Hussain Kadhim** was prepared under my supervision and guidance at the Department of Adult Health Nursing, College of Nursing, University of Babylon as a partial fulfillment of the requirement for the Degree of Master in Nursing Sciences.

Signature

Professor. Dr. Shatha Saadi Mohammed

Date: / / 2022

Signature

Professor. Dr. Shatha Saadi Mohammed

Head of Adult Nursing Department

College of Nursing / University of Babylon

Date: / / 2022

Certification

We, the examining committee, certify that we have read this dissertation **(Postoperative Complications for Patients in Intensive Care Units following Cranial Surgeries)**, which is submitted by **Nasser Hussain Kadhim** from the department of Adult Health Nursing, and we have examined the student in its contents, and what is related to it and we decide that it is adequate for awarding the degree of (Master) in nursing Sciences with specialty of (Adult Health Nursing) .

Signature:
Assist. Prof. Dr.
AbdulKareem Salman Khudair
Member
Date: / / 2022

Signature:
Assist. Prof. Dr.
Israa Harjan Mohsen
Member
Date: / / 2022

Signature
Professor. Dr. Salma Kadhim Jihad
Chairman
Date: / / 2022

Approved by the council of the college of nursing

Signature
Professor. Dr. Amean A. Yasir
Dean of the College of Nursing/ University of Babylon
Date: / / 2022

Dedication

I dedicate this work to:

Our heroes on the battle field

The pure souls of our martyrs

Dear mother the source of love and inspiration

Dear father for his support

Brothers and sisters

Dear wife for her support

My children

Dearer friends and relatives for their supports

Acknowledgement

Great thanks to Allah, the Glorious, the Merciful, and the Compassionate.

My thanks and gratitude to the Dean of the College of Nursing, University of Babylon. **Professor. Dr. Amean A. Yasir** .

I would like to express sincere thanks to my supervisor **Professor. Dr. Shatha Saadi Mohammed**, for her constructive instructions, scientific guidance &encouragement throughout the time frame of the study.

I wish to thank all of the experts who reviewed and evaluated the questionnaire. Thanks are due to the employees of intensive care units in Neurosurgery Teaching Hospital in Baghdad and AL-Shaheed Ghazi AL- Hariri Surgical Specialties Hospital in Medical City for facilitating my research and completing the study. Finally, I would like to express my appreciation to all patients who participated in this study.

Researcher

Abstract

Patients endure delayed recovery and hospital discharge, as well as the possibility of life-threatening or life-altering consequences. Neurosurgery outcomes are negatively impacted by postoperative complications. The risk of postoperative complications can be decreased with proper examination and evaluation. The purpose of this study was to assess postoperative complications for patients in the intensive care units following cranial surgery and investigate the differences in postoperative complications with about to socio-demographic and clinical characteristics. A descriptive design of the study started from 18th January 2022 to the 23 June, 2022. Using purposive (non-probability) method of (115) patients, their age over (18) years, and underwent cranial surgeries . This sample is distributed throughout Neurosurgical Teaching Hospital , and AL- Shaheed Ghazi AL- Hariri Surgical Specialties hospitals regarding to the Al-Rusafa Health Baghdad Directorate and Medical City. The questionnaire consists of (33) items. The study was conducted to assess the complications for patients following cranial surgeries and to understanding the relation between demographical characteristics, clinical data, Glasgow coma scale, and postoperative complications. The instrument has been tested for validity and reliability. The findings revealed that most of the sample patients are male, the age range from (40 - 49) years, There were significant differences between postoperative complications according to demographic data except for gender, and according to clinical data except for the medication use for chronic diseases. There were significant differences between postoperative complications according to the level of consciousness (Glasgow coma scale).The dysphasia and seizure are highly neurological complications as showed by low mean of scores. The cranial surgery patients showed a high complications related to tachycardia and arterial

hypertension with mean difference as indicated by low mean of scores . and the overall complications indicate that the study sample after cranial surgery had moderate complications. In addition, significant differences exist between type and duration of surgery with respect to these complications. According to the present study, the researcher recommends to conducting specialized courses for medical and health professionals about postoperative neurosurgical complications so they may notice and prevent them. Establishing awareness brochures and educational videos on the wards to educate patients about neurosurgical problems.

List of Contents

List of figures

List of Tables

List of Abbreviations and Symbols

Abb.	Meaning
AAAIR	Average Annual Age-adjusted Incidence Rate
ADH	Antidiuretic Hormone
ANOVA	Analysis of Variance
BP	Blood Pressure
BT	Brain Tumor
COPD	Chronic Obstructive Pulmonary Disease
CNS	Central Nerve System
CS	Cranial Surgery
CT	Computer Tomography
CSF	Cerebral Spinal Fluid
CPAP	Continuous Positive Airway Pressure
ºC	Centigrade
DI	Diabetes Insipidus
Df	Degree of freedom
et. al.,	And others
F	Frequency
°F	Fahrenheit
GCS	Glasgow Coma Scale
ICU	Intensive Care Unit
ICR	Iraqi Cancer Registry
IVH	Intraventricular Hemorrhage
ICP	Intracranial Pressure
IT	Infratentorial Tumors

IPO	Immediate Postoperative
IV	Intravenous
LOC	Level of Consciousness
MS	Mean Score
NICU	Neurointensive Care Unit
NPE	Neurogenic Pulmonary Edema
No.	Number
N.S	Non-significant
PACU	Post Anesthesia Care Unit
PONV	Postoperative Nausea and Vomiting
POV	Postoperative Vomiting
RBCTs	Red Blood Cell Transfusions
ST	Supratentorial Tumors
SAH	Subareachnoid Hemorrhage
SPSS	Statistical Package for the Social Science
S	Significant
TBI	Traumatic Brain Injury
T	t- test
WHO	World Health Organization
<	Less Than
>	More Than
%	Percent

List of appendices

Chapter One

Introduction

Chapter One

1.1. Introduction:

The postoperative period starts when the patient is admitted to the post anesthesia care unit (PACU) or a nursing unit and finishes with the patient's postoperative evaluation in the doctor's office (Williams and Hopper, 2015).

Eckman *et al*., (2012) mentioned that the postoperative period initiates when the patient arrives in the PACU accompanying by the anesthesiologists or nurse-anesthetist. While (Gadler *et al.*, 2014) viewed that the postoperative period is initiated when a patient is moved from the operating room to the PACU and it is concluded when the patient has recovered from surgical complications.

However, the stages of recovery after surgery described by specialized doctors can be categorized according to the tools created by them into three stages: early, middle and late. The early stage is determined from 24 hours or the first seven days after surgery, the average recovery period the first twenty-eight days to two months after surgery , also the first six weeks or three months after surgery is considered a late course of postoperative recovery (Bowyer and Royse, 2016).

Every time a patient has surgery, they are at risk of potential complications these can vary from the mild side effects of surgery to major complications that may result in the death of the patient. Postoperative nursing care should involve closely monitoring the patient in order to identify early warning signs and prevent complications from occurring (Moyle, 2017).

Postoperative complications are a constant threat to the millions of people undergoing surgical interventions. Whether patients are managed in a

hospital setting, an ambulatory care facility, or in a free-standing operating suite, the development of postoperative complications can lead to long-term disability and possibly death (Norman and Keegan, 2014).

Several postoperative complications may occur in the PACU or later in the postoperative period. The reasons for these complications may be related to the operation, anesthesia, blood and fluid loss, immobility, unrelieved pain, or other infections the patient may have. Therefore, nursing care is required in order to prevent, notice, and care for these problems (Williams and Hopper, 2015).

The postoperative period is critical in neurosurgical patients, demands individualized and procedural specific care. The incidence of postoperative complications in this patient population is higher as compared to other surgical procedures (Noordzij PG *et al*.,2010).

In the initial hours after admission to the clinical unit, adequate ventilation, hemodynamic stability, incisional pain, surgical site integrity nausea and vomiting, neurologic status, and spontaneous voiding are primary concerns. The pulse rate, blood pressure, and respiration rate are recorded at least every 15 minutes for the first hour and every 30 minutes for the next 2 hours. Thereafter, they are measured less frequently if they remain stable. The temperature is monitored every 4 hours for the first 24 hours (Rudolphi, 2019).

It is essential to monitor central and peripheral neurological deficits based on prior lesions and/or techniques used. in cases of cranial surgery, neurosurgical complications should be monitored to eliminate motor lesions that can be induced by the procedure (Alcázar Sánchez-Elvira *et al*., 2020).

In the neurosurgery setting it is reported that patients, especially after craniotomy, have a relatively higher incidence of complications, including

neurological adverse events (motor deficit, dysphasia, seizure, deterioration of consciousness), hemodynamic adverse events(bradycardia, hypertension, hypotension), respiratory adverse events, postoperative nausea and vomiting, metabolic adverse events, hemorrhage, hyperthermia, pain, and reoperation (Chen and Liu, 2021).

The care of neurosurgery patients is generally complex, and virtually all patients require monitoring in intensive care units (ICUs) during the postoperative period (Mekitarian Filho *et al*., 2012).

The investigator did prospective, observational research on patients hospitalized in intensive care unit following cranial surgeries. The initial goal was to assess the frequency and timings of neurologic and non-neurologic problems in the first 72 hours. Our second aim was to determine risk factors for a neurologic event.

1.2. Importance of the study:

Postoperative complications might endanger the patient's life; however, the risk of postoperative complications can be decreased with proper examination and evaluation. As a result, the incidence of problems and long-term impairment can be reduced. Neurosurgery outcomes are negatively impacted by postoperative complications. Patients may endure delayed recovery and hospital discharge, as well as the possibility of life-threatening or life-altering consequences. The annual cost from postoperative complications is expected to be millions of dollars (Dimick *et al*., 2004).

In neurosurgery procedure the staff caring for the patient in the postoperative environment may have the greatest impact on preventing complication development. Awareness of complication development is the first step in risk reduction (Buchman, 2015).

Almost 41,000 procedures were performed for the treatment of intracranial neoplasms in 2009 in the United States. In spite of the progress in neurosurgery and neurocritical care, morbidity and mortality remains high. Although morbidity rates range from 9 to 40 % and mortality rates from 1.5 to 16 %, there are no available guidelines for postoperative care after brain tumor (BT) resection (Popugaev & Lubnin, 2015).

Furthermore, data on 1,777,035 patients for the years 2006-2011 were acquired from the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) database. Neurosurgical cases were extracted by querying the data for which the surgical specialty was listed as "neurological surgery." over 38,000 neurosurgical cases were analyzed, with complications occurring in 14.3%. Cranial cases were 2.6 times more likely to have complications than spine cases, and African Americans and Asians/Pacific Islanders were also at higher risk. The most frequent complications were bleeding requiring transfusion (4.5% of patients) and reoperation within 30 days of the initial operation (4.3% of patients), followed by failure to wean from mechanical ventilation postoperatively (2.5%). Significant predictors of complications included preoperative stroke, sepsis, blood transfusion, and chronic steroid use (Rolston *et al*., 2014).

The average annual age-adjusted incidence rate (AAAIR) in the United States for all malignant, non-malignant brain tumors and other central nervous system tumors was 24.25 per 100,000 between 2014 and 2018,There were 83,029 deaths attributed to malignant brain and other CNS tumors in the same period. This represents an average annual mortality rate of 4.43 per 100,000, and an average of 16,606 deaths per year caused by malignant brain and other CNS tumors (Kruchko *et al*., 2018).

Also a prospective study was conducted in a university hospital in São Paulo, Brazil. a sample of 202 patients was calculated in a period of 10 months in January 18, 2017 One hundred and twenty seven patients were included in elective surgery group and 75 patients in non-elective surgery group. The elective group had more vomiting and the non-elective group presented more intracranial hypertension , anisocoria , cerebral vasospasm , light-unresponsive pupil and reoperation . The mortality rate was 5.5% in the elective surgery group and 26.7% in the non-elective surgery group (Siqueira and Diccini, 2017).

In Germany, specifically at the University Hospital Heidelberg, 118 patients who underwent cranial surgeries during years 2013–2017 were included. In 95 cases, was performed cranial surgeries (CS) as a primary surgical intervention ,in 23 cases as a surgical reintervention for a postoperative complication of previous cranial surgery at least one early surgical postoperative complication occurred in 87 (73.73%) patients, the most frequent being a development of an extraaxial fluid collection in 41 (34.75%) patients. subcutaneous, extradural hematomas, postoperative seizures and meningitis. An overall need for reoperation was 13.56% (Hanko *et al*., 2021).

In the period from 2011to 2012, a prospective observational analytic study was conducted in a University Hospital In France . This study enrolled 188 patients admitted to the ICU after brain tumor surgery. All postoperative clinical events during the first 24 hours were noted and classified. Readmission causes and timing were also analyzed. Twenty-one (11%) of the patients were kept sedated after surgery; the remaining 167 patients were studied. Thirty one percent of the patients presented at least one complication (25% with

postoperative nausea and vomiting (PONV), 16% with neurologic complications). The occurrence of neurological complications was significantly associated with the absence of preoperative motor deficit and the presence of higher intraoperative bleeding. Seven patients (4%) were readmitted to the ICU after discharge; 43% (n = 3) of them had a posterior fossa surgery (Lonjaret *et al*., 2017).

All stroke and traumatic brain injury patients with refractory raised Intracranial Pressure (ICP) operated with an acute Decompressive craniectomy between January 1, 2003 and June 30, 2013 at Oslo University Hospital, Ullevl were included in Norway. Decompressive craniectomy was carried out in 125 patients, of whom 33 died, 4 were lost to follow-up, and 1 (an infant) later underwent cranial remodeling . A cranioplasty procedure was performed in the remaining 87 patients. Post-operative complications were recorded in 31 (36 %) patients . Surgical site infection (SSI) and bone flap resorption(BFR) were the two most common complications, affecting 8 (9.2 %) and 14 (19.7 %) patients, respectively (Brommeland *et al*., 2015).

In Anesthesiology Institute, Cleveland Clinic Abu Dhabi, United Arab Emirates; A study was conducted to analyze the incidence of the primary complications related to surgery and their impact on neurological outcome in a consecutive series of patients undergoing elective surgery Four hundred twenty-five patients were included in the analysis. Venous air embolism occurred in 90 cases (21%) and it made no significant statistical difference length of stay in neurointensive care unit , hospital length of stay , and neurological outcome. although 46 patients (11%) experienced at least 1 surgery-related complication or more and length of stay in neurointensive care unit and hospital length of stay were significantly prolonged in this group.

Neurological outcome was significantly worse for patients with complications($p<0.0001$) (Saladino *et al*., 2017).

During 6-year between 2010 and 2016, a cross-sectional study was conducted in southern Iran. All patients with a very small (3 mm) intracranial aneurysm who underwent surgery at our center were included. All patients were operated on by a single neurosurgeon. Preoperative and postoperative computed tomography angiography and intraoperative imaging with indocyanine green video angiography were performed in all cases. The short-term and long-term outcome were determined by Glasgow Coma Scale (GCS) and modified Rankin Scale. A total of 65 Very small intracranial aneurysms in 52 patients were treated during the study period. There were no remnants and the complete occlusion rate was 100%. None of the patients experienced rebleeding. The 6-month mortality was 0% in unruptured Very small intracranial aneurysms , 3.8% in ruptured , and 5.7% in ruptured intracranial aneurysms other than Very small intracranial aneurysms. Most patients had a favorable outcome (84.6%). An unfavorable outcome was associated with increased age ($P = 0.027$), higher rates of hypertension ($P = 0.022$) and ischemic heart disease ($P = 0.023$), lower GCS score on admission ($P < 0.001$), higher Hunt and Hess grade ($P < 0.001$), higher rate of preoperative ventriculoperitoneal shunt insertion ($P = 0.040$), and subarachnoid hemorrhage ($P = 0.015$) (Rahmanian *et al*., 2017).

In Iraq (except the Kurdistan region), there were 1160 newly diagnosed brain and CNS cancers cases in 2015, where the incidence had increased over the study period, from 2.882% in 2000 to 5.53% in 2015. The Iraqi Cancer Registry (ICR) was established in 1974 through close cooperation of Ministry of Health and the Iraqi Cancer Society (AL-Hashimi and Alkhateeb 2020).

In the time from January 2010 to January 2012, A retrospective study conducted d included 21 patients with intracerebral hematoma caused by ruptured middle cerebral artery aneurysm at Neurosurgery teaching hospital in Baghdad, Iraq Parameters included five broad categories: demographic, clinical, radiological, surgical, and outcome. We found the following factors significantly related with unfavorable patient outcome: Preoperative cranial nerves deficit, dysphasia, severe contralateral weakness, presence of dilated ventricles in Computer Tomography (CT) scan, presence of Intraventricular Hemorrhage (IVH) in (CT) scan, aneurysm location in the dominant (left) hemisphere, high modified-Fisher grade, duration of surgery more than six hours, occurrence of intraoperative aneurysm rupture, poor postoperative (GCS), occurrence postoperative vasospasm, more severe postoperative contralateral weakness, and the presence of postoperative seizure. While the good initial GCS and early surgery significantly related to favorable patient outcome (Sehba *et al*., 2012).

In AL-Hilla City, a study included the investigation of traumatic injuries associated with fractures, covering the period from 2010 to 2015. Knowledge of these associated injuries provides useful strategies for patient care and prevention of further complications. Eighty-three males and twenty-seven females (age range 15-75 years) were included in the study. Injuries were randomly distributed over the body surface and were located predominantly in the skeletal [n = 60 (66%)], but those with contusions [n = 1 (0.91%)], the head [n = 41 (37.21%)] , visual [n = 2 (1.18%)], and oral[n=1(0.91%)] (Mekhlef *et al*., 2017)**.**

1.3. Statement of the problem:

Postoperative Complications for Patients in Intensive Care Units following Cranial Surgeries at Neurosurgical Hospital in Baghdad.

Assess Postoperative Complications regarding Patients in Intensive Care Units following Cranial Surgeries at Neurosurgical reduce the chance of rehospitalization of Patients in Intensive Care Units, which subsequently will effect on the reduction Patients in Intensive Care Units following Cranial Surgeries at Neurosurgical morbidity and mortality.

1.4. Objectives of the study are to:

1. Assess postoperative complications for patients followed cranial surgery.
2. Investigate the differences in postoperative complications with regards socio-demographic and clinical characteristics.

1.5. Definition of Terms:

1.5.a. Postoperative :

Theoretical Definition:

A time period begins when the patient exits the operation site and concludes when the patient has his or her subsequent follow-up appointment with the neurosurgeon (Rodriguez, 2015).

Operational Definition:

A time that begins when a patient is transported from surgery to an intensive care unit or a nursing ward and ends when the patient is discharged from medical care.

1.5.b. Complications:

Theoretical Definition:

A problems that can happen after you have had surgery but which were not intended (Mary and Adrian, 2017).

Operational Definition:

Is a deviation from a normal course that develops within the first 24-72 hours or more after surgery.

1.5.c. Cranial surgeries:

Theoretical Definition:

It is an opening made in the skull either through: shunt, craniotomy, or craniectomy, to approach the brain and cranial nerves for correction pathological conditions, aspirate abscesses and hemorrhage, and remove tissue biopsy for diagnosis (Phillips, 2018).

Operational Definition:

It is an opening made in the skull either through: shunt, craniotomy, or craniectomy, to approach the brain and cranial nerves for correction pathological conditions, aspirate abscesses and hemorrhage, and remove tissue biopsy for diagnosis.

1.5.d. Patient:

Theoretical Definition:

A person who is the recipient of health care (WHO, 2011).

Operational Definition:

The individual who is afflicted with disorder and requires special attention.

1.5.e. Intensive Care Unit (ICU):

Theoretical Definition:

It is a special unit designed to provide postoperative care, using the latest technology and managed by well qualified nursing staff (Marshall *et al*., 2017).

Operational Definition:

It is a special unit designed to provide early postoperative care following intracranial surgery.

Chapter Two

Review of Literature

Chapter Two

Review of Literature

2.1. Historical overview of cranial surgeries

The history of cranial surgeries is littered with accounts of heroic surgeons undertaking surgery even against odds in order to promote patient outcomes. Because the significant danger of death from bleeding and other postsurgical complications, it was once more typical not to surgery on brain disease (Ormond and Hadjipanayis, 2014).

The contemporary healthcare safety and quality movements may be linked back hundreds of years. Florence Nightingale with Ernest Codman were earliest adopters. A nurse named Florence Nightingale used statistical techniques to link sickness to unsanitary circumstances. She then used the information to develop sanitation-related actions. Codman, a surgeon from the United States, pioneered the notion of a final outcome record, which is used to track patient outcomes after surgery (Allesee and Gallagher, 2011).

Nurses, who make up the majority of healthcare employees, are critical to providing high-quality treatment. The availability of expertise nurses who can do excellent neurologic assessments was shown to be crucial to providing good neurological critical care through an international investigation (Markandaya J, *et al*.,2012).

To function most effectively with the patient in NICU, the nurse must have a grasp of the anatomy and functions of the human body system nervous system and the manifestations of its disorders, neurosurgical assessment, neurological procedures. In addition to general nursing knowledge, and the predicted postoperative complication.

2.2.The Cranium and Intracranial:

Hippocrates (400-300 B.C.) is far a head of the known fact for his time when he stated ; "Men ought to know that from the brain, and from the brain only, arise our pleasure, joyous, laughter and just, as well as our sorrow, pains, grieves, and tears. Through it ... We think, see, hear, and distinguish the ugly from the beautiful, the bad from the good, the pleasant from the unpleasant". The(CNS) , which comprises the brain and the spinal cord, and also the peripheral nerves system, which involves the cranil nerves, spinal nerve, and autonomic, are the two primary components of the nerves. The nerve system's job is to regulate motor, sensorial, autonomic, cognition, and behavioral functions (Sole and Klein, 2012).

2.3. Protective structures for the brain:

The brains, which is among the most delicate and susceptible body systems, is protected by the skull, which is also a bones structure. The brain is housed within a hard skull that safeguards it from harm. The front, temporal, parieital, occipital, etc and sphenoid bone are really the primary bones of the skull. These bones connect the suture lines and make the skeleton's base. Fossils were indentations found at the root of the cranium. The frontal lobe is located in the anterior fossa, the temporal lobe is located in the middle posterior aspect, and also the cerebellum plus brainstem are located within posterior fossa (Roostaei et al., 2014); (Iglesias *et al*., 2015);(Borden *et al*., 2015)**.**

2.4. Cranial surgeries:

Cranial surgeries are performed to remove all of the tumor or as much as possible, (meningioma, acoustic neuroma, cystic glioma of the cerebellum), or

partial tumor removal as infiltrating gliomas. Cranial surgery defined as an opening made in the skull, in order to approach the brain and cranial nerves for correcting pathological conditions, aspirating abscess and hemorrhage, removing tissue biopsy for diagnosis, and relieving increased ICP that is not responded to medical therapy (Phillips *et al*., 2018) .

2.5. Most frequent cranial surgeries:

2.5.1. Craniotomy:

It is an opening of the skull, performed by elevation a flap of bone which is then replaced at the end of operation. It is done to correct or remove of brain tumors, abscess, hematoma, and biopsy, temporal lobectomy for seizure control, and elevation of depressed skull fractures. To expose various areas of the brain, several kinds of neurosurgical incision are performed. A craniotomy may indeed be front, parieital, occipital, temporal, or a mix of 2 of each of those methods, based on the area of the pathological lesion (Singla *et al*., 2014).

2.5.2. Craniectomy:

It is an incision made by removing a part of the skull ranging in size from a hole (1-2 cm) to a large bony part (2-5 cm). A puncture hole made for aspiration of cerebrospinal fluid, blood, or pus, or for a biopsy. Large skull cuttings performed to correct middle fossa lesions (supra-tendon abscess, small acoustic neuromas), or posterior fossa lesions (large acoustic neuromas, gliomas of the cerebellum and fourth ventricle, A craniectomy could be used to treat head trauma with increase (ICP) and allow the brain to expand (Phan *et al.,* 2017).

2.5.3.Shunt :

Shunt is a procedure done to drain of excess CSF on a continuing basis. It performed for hydrocephalus, or to reduce ICP prior to or in conjunction with other surgical procedure .The neurosurgeon determines the type of shunt and the location of implantation. The front, parieital, and occipital routes to ventricular implantation are the three options. Although the peritoneal, through open dissecting, has been the most frequent drainage location for an internal shunting device, there are alternative choices. If peritoneal draining is not possible caused by infection or scar tissue, alternative shunting options include ventrieculovenous, ventriculoatrial, ventriculopleiural, and lumboperitoneal shunting (NIGIM *et al.*, 2015);(Booker, 2015).

Regarding duration, duration of surgery combined with comorbidity and acquired neurological deficit is an independent risk factor for cranial complications after brain tumor surgery. For example, retrospective review of the hospital in the Department of Neurosurgery, St. Olaf University Hospital, Trondheim, Norway, from January 2008 through December 2013, showed that the average of all surgeries per surgery took 4 to 10 hours The duration of surgery varies according to the disease state (Golebiowski *et al* ., 2015).

So, the care of neurosurgical patients is generally complex, and almost during in the postoperative time, all patients must be observed in (NICU) (Mekitarian Filho *et al.*, 2012)**.**

2.6. Intensive Care Unit:

Florence Nightingale is largely recognized for establishing the intensive care unit as we know it today . During in the Crimean Wars in 1854, she and a

group of nurses established a section of the military nearby hospital where the most badly injured men could get more specialized healthcare services. Intensive care was largely intense nursing care as from time of Nightingale through the mid-1950s. After Second World War, this modern form of the ICU came into focus with the advancement of hemodialysis procedures and the broad use of mechanical breathing. In Denmark, Ibsen is the first to utilize extended mechanical breathing to help the victims of 1952 polio epidemic, and then in 1953, he founded the first critical care center. In 1954, France became the first country in the world to create intense care unit (Harper, 2011); (Reisner-se, 2011); (Vachon, 2011).

High pressure ventilation, kidney dialysis, and intrusive cardiovascular monitor were spearheaded in Baltimore through 1957 and Toronto inside the late 1950s as separate geographic areas inside the hospital, bringing together developing techniques for organ help such as pressurized ventilation, hemodialysis, but also invasive cardiovascular monitor. Within a decades, the ICU had evolved into a unique medical sub-specialty, as intensive care was becoming an integral component of hospital-based healthcare (Weil and Tang, 2011).

ICU is a special room designed to provide postoperative care, managed by qualified nursing staff, and provides the complex medical and nursing care required by patients (Marshall *et al.*, 2017).

Once a patient is admitted to the (ICU), successful management should aim not only at patient survival, but also at ensuring good quality of life post-ICU and maximizing the quality of the dying process in patients who succumb (Myburgh *et al.*, 2016).

Chauhan *et al*.,(2019) stated that the standard of postoperative care and monitoring should ideally be established prior to surgery. The decision to transfer a patient to the intensive care unit for mechanical ventilation or extubation within the operating room depends on several factors, including the following:

- Preoperative status of patient.
- Site of the surgery.
- Surgical factors such as bleeding, and any brainstem handling.
- Specific anticipated postoperative needs of the patient.

2.7.The Intracranial Lesion:

Brain tumors are not uncommon amongst other body organs. They can in the top ten tumors in our country, Cancer Registry (2015). They constitute large proportion of admission to a neurological services than other disease CNS,(Bui et al., 2011).

There are two types of the brain tumor: primary brain tumors arise in the brain parenchyma (for example, gliomas, which include astrocytomas, oligodendrogliomas, and ependymomas; medulloblastomas) or in external structures (for example, tumors, meningioma, acoustic ganglion cysts, and some other schwannomas) and secondary brain tumor (brain metastases) occur in tissues outside of the brain and spread (metastasize) and Primary tumors are around ten times more prevalent than secondary tumors (Abiwinanda *et al*.,2019).

Although the brain and other CNS cancers are rare, they cause morbidity and mortality that is disproportionate to their incidence (Fitzmaurice *et al.*, 2015).

In 2016, there were 330000 incident cases of brain and CNS cancers and 227000 deaths globally(Hussain and Lafta, 2021).

2.7.1. Classification of Intracranial Tumor:

Wells and Packer (2015) classify the brain tumors according to the location into supratentorial (ST) tumors, arising within the contents of anterior and middle fossa above the tentorium cerebelli, and infratentorial (IT) tumors, arising from the contents of posterior fossa below the tentorium cerebelli.

According to WHO classification of CNS tumors is updated in 2016 with addition of genetic basis of tumorigenesis or molecular marker (Louis *et al.*, 2016):

- Diffuse astrocytomas and oligodendrogliomas.
- 2 - Ependymal tumours.
- Choroid plexus tumours.
- Other glial cells.
- Neuronal and, mixed glial cells tumours.
- Pineal area tumours .
- Embryonal tumours.
- Tumours of the cranial and spinal nerves.
- Meningiomas.
- Mesenchymal and, non meningothelial tumours.
- Melanocytic tumours.
- Lymphomas.

2.7.2. Incidence:

In some countries the incidence of all malignant and non-malignant brain and other CNS tumors is about 24.25 per 100,000 population per year, In Iraq there were 1160 newly diagnosed brain and CNS cancers cases in 2015 (AL-Hashimi and Alkhateeb, 2020).

Regarding age incidence, all types of brain tumors may initiate symptoms at any age. However they occur predominantly in early adult life or in middle age. They are infrequent before the age of ten and after the age of seven. Few general statements may be made concerning sub-classifications of tumor, e.g. most common brain tumor in childhood and first two decades of life are gliomas of the cerebellum, brainstem, 4th ventricle and optic nerve, and pituitary adenoma Tumors of adult life and early middle age are meningiomas. gliomas of cerebral hemispheres, and pituitary adenoma. In the late middle life, metastatic tumors are most frequent. Concerning gender incidence, in general brain tumors are slightly more common in men (e.g. cerebral gliomas), while in women meningiomas and acoustic neuromas (Miller *et al*., 2021).

2.7.3. Etiology:

The exact cause of intracranial tumor is unknown, but there are many precipitating factors may contribute in developing it. Trauma, individual cases have been reported after an interval of months or years, (particularly meningioma), developed in the neighborhood of injured intracranial structure. Late month of pregnancy lead to infrequent of meningioma due to dehydration of the brain. Infections (syphills, tuberculosis, and fungi) may form granulomas. Carcinoma of the breast and lung may lead to metastasize to the brain. inheritance plays no significant role except in rare conditions (e.g.

tuberous sclerosis). Occupation with special hazards (e.g. exposure to toxins, fumes, physical or mental strain) (Laprovitera *et al*., 2021).

2.8. Preoperative Nursing Assessment:

Ideal preoperative assessment begins with admission to the hospital, it includes history, clinical manifestations, and diagnostic tests. This enabling patients to reach the operation theatre with correct diagnosis, and in an optimal surgical condition (Fuji *et al.*, 2013).

Obtain an accurate history before the physical exam, enables the patient to express his or her dilemma in his or her own terms, depending on the nature of onset, as well as any circumstances surrounding the initial event. Explore specific details of the present illness (e.g. intensity, improvement). Directly questions about numbness and tingling sensations, headache, or seizures. Medical and surgical history should be taken, as well as family history, sociocultural data, and past and present occupational status. If the patient is unable to provide accurate or complete information, obtain the data from a family member (Alvarez, *et al*., 2018).

2.9. Intraoperative assessment:

When surgery is scheduled, the operating room nurses should be available to assist, reassure, and answer patient's questions, when the patient arrives in the operating room essentially three groups are existing for his care: the anesthesiologist and assistants who administer the anesthetic agents and place patient in proper positioning on the operating table. The surgeon and assistants who scrub and perform the operation. In addition to the intraoperative nurses who manage the operating room, coordinate many activities of operating personnel, and provide care through enacting "scrub

nurse" and circulating activities. During the course of operation, information must be shared by these three groups, in order to assure optimum patient care. In addition, Any development of undue hemorrhage, unexpected findings, fluid and electrolyte problems, shock, or respiratory difficulties, that are related to patient care in the recovery room must be noted and documented (Marley and Calabrese, 2014).

2.10. Intraoperative complications:

Because of factors such as the increasing amount of inpatient operations, the length of operational hours, and the increased number of inpatient days, neurosurgical procedures are still more prone to problems than non-surgical treatments. This summary focuses on the general complications that are prevalent to all surgical interventions, where a good understanding of a potential intra - operative complications associated of skull surgery enables for more skilled nursing assessment and interference during the early post-surgical period (Rolston *et al.,* 2014).

The most serious intraoperative complications are:

2.10.1. Hemorrhage and hypovolemic shock:

The most important factors surrounding the surgery, Among these include the difficulty to establish hemostasis and circumstances that occur during surgical , high blood pressure and severe bleeding during surgery leading to intravascular coagulation, Intracerebral hemorrhage in or away from the operative field often occurs due to traction of an adjacent artery or vein. In addition, the pre-operative factors such as advanced age, high blood pressure and blood abnormalities (thrombocytopenia and coagulation abnormalities) affect the course of the surgery (Fugate, 2015).

A study of cranial aneurysm surgeries show that 547 patients who underwent intracranial aneurysm surgery were followed up over 10 years to evaluate factors likely to be associated with the use of allogeneic blood. Of those studied, 134 patients (22.5%) received an average of 2 U (range: 1-17U) of intraoperative transfusions. Those who had a ruptured intraoperative aneurysm received a mean of 3.6 ± 0.35 units, while those who did not received a mean of 1.9 ± 0.12 units, after surgery, 244 patients (44.5%) received an average of 2 units of blood with 77 patients Having received intraoperative Red Blood Cell Transfusions (RBCTs) (Voth *et al*., 2017).

A database assessment of 38,000 neurosurgery cases from 2006 to 2011 found that the total complication rate following surgical interventions is 14.3 percent; the risk of complications after cranial operations was 23.6 percent, which would have been 2.6 times the average with spinal interventions (11.2 percent). In this research, its most common consequence was bleeding that required a transfusions, which happened in 4.5 percent of participants (Ingraham *et al*., 2010).

2.10.2. Cardiopulmonary shock:

Cardiopulmonary shock-leads to a sharp drop in blood pressure due to cardiac arrhythmia or an air embolus. The risk of severe hypotension after induction of anesthesia, and air embolism, arc increased at posterior fossa exploration in a sitting position (Algahtani and Merenda, 2021).

2.10.3.Brain edema:

It usually presents prior to surgery and may be severely aggravated during surgery by mechanical retraction, venous compression, brain manipulation, and overhydration. It can be reduced preoperatively by giving

corticosteriod for several days prior craniotomy, and intraoperatively by using mannitol (Mahajan and Bhagat, 2016).

2.10.4.Seizures:

Operations carry a high risk of causing partial or generalized seizures. It is dependent on the tumor's location and nature. as well as operative complications (Englot *et al.*, 2012).

2.10.5. Infection:

Infections of the injury is more likely in lengthy surgery and in which foreign materials (e.g. shunt tubing) are implanted. Most infectious are by airborne contaminants (Taylor *et al.*, 2016).

2.11. Postoperative Nursing Assessment:

Surveillance is among the traditional tasks of nurses. This might entail keeping an eye on patients for alterations in their situation, recognizing early deteriorating patient, and safeguarding against injury or mistakes (Rogers *et al.*, 2008).

Nurses have been performing this monitoring for almost a century, utilizing a same vitals: heat, pulse, hypertension, respiration rate, and, more recently, oxygen saturation (Ahrens, 2008).

During the postoperative period, nursing assessment is directed toward careful observation and immediate intervention that assist the patient in returning to optimal function quickly, safely, and comfortable as possible.

2.12.Immediate postoperative nursing assessment:

After transferring the patient from operating theater to the recovery room, recovery is established within one hour depending on the duration of anesthesia .In this period, assessment of vital signs, level consciousness, drainage tube, and intravenous (IV) transfusion, is necessary until establishing recovery. In addition to sharing information about patient condition during surgery, type of surgery, and drugs been used. These will help the nurse to detect any evidence of immediate postoperative complications (e.g., hemorrhage, shock, respiratory impairment), (Rhondali *et al*., 2011);(Wicker, 2015)**.**

In addition to standard nursing roles and responsibilities, nurses who care for patients undergoing surgeries also need to have a deep understanding of potential problems or complications that can occur after surgery, such as surgery site infection, pain and decrease of temperature and how they can reduce risks or recognize quick signs that develop (Liddle, 2013).

2.13. Early postoperative nursing assessment:

According to Carlisle (2015), when patient is received in (NICU) following cranial surgery, the nurse collects basic assessment data that will be helpful in anticipating potential postoperative complications.

This information are :

- Integrate data into the delivery report for transfer of care .
- Vital signs.
- The type and duration of surgery performed.
- Neurological functions including state of consciousness
- patient's position.
- The occurrence of complications or problems during the operation.

- Patient security requirements.
- Neurovascular: peripheral pulses, peripheral sensations, and parties if needed.
- State of the dressing, suture lines, drains, tubing, and veins.
- Quantity and type of exchange.
- Muscle response and strength/state of motion.
- Pupillary reaction as indicated.
- Fluid treatment includes the placement of the line, the state of the vein site, the safety and volume of solution delivered, as well as the implantation of the line (included crystallography, colloid and the blood components).
- Input and output.
- Post-anaesthesia score (if using scoring system).
- You must follow specific diary after surgery**.**

During the first 72 hours, close monitoring by the nursing staff is required, and when a changes in patient's clinically status occurs, further evaluation data is necessary to determines the causes of this change so that an appropriate intervention can be initiated quickly. The frequency of monitoring after cranial surgery is determined minute by minute or hour by hour for the first hours depending on the clinical condition of the patient (Urden *et al*., 2017).

As all major surgeries, cranial surgery requires monitoring and recording of vital signs (V/S), usually during 2 hours, each 15 min, and every 30 min for the 4 hours, hourly for 4 hours, and every 4 hours for the resting time of

staying (NICU), if he/she is clinically stable, Patients at intensive care were constantly watched and cared for by highly trained personnel. Outside of the (ICU), fast response systems may now provide an immediate response by adequately trained personnel. General ward personnel, on the other hand, must really be able to notice patients who may be at danger and, when necessary, elevate treatment (Nicholson and Hillman, 2015).

The most critical clinical aim in the early postoperative (ICU) of these surgeries is airway patency. This potential would be symptomatic of (ICU) treatment throughout the first 24 - 48 hours; due to the likelihood of problems, thorough monitoring during the first little hours is important. The (ICU) is the route to go in these instances since these unit contain certified, fully trained professionals who can handle them. because hypoventilation often indicate airway obstruction leads to hypoxia that aggravate cerebral ischemia. Suctioning, repositioning, checking of arterial blood gas, and administering of oxygen, can prevent or decrease this complications (Fierstra *et al*., 2011).

Alternation in pattern may be due to compression or damage to the respiratory centers in brainstem. Cheyne-stokes respiration (respiration of increasing depth followed by a period of apnea), often are indications of moderate and severe (ICP) elevations. Breathing sound as rales may develop due to secretion closes one of the bronchi, or wheezing when there is narrowing in one of the air passes through trachea, bronchi, or bronchioles (Bannister *et al*., 2016).

Body temp is check at frequent intervals to evaluate for hyperpyrexia that may result from hypothalamic and pons damaged, thermostat center pressure, infection, drug fever, (IV) sepsis, and hospital pneumonia. Catheter-associated

bacteriuria is a rare cause of fever, in which the temperature is maintained at less than 38°C (100.4°F) (Perez-Barcena *et al*., 2014).

Pulse and blood pressure are indicators of cardiac function, but they also serve as indicators of cerebral function. An increase in (ICP) leads to a slowing of the pulse, an high in (BP) and an expanding of pulse pressure, i.e. a rapid changes in a patient's state, such as sleeplessness (for no apparent reason), disorientation, or increasing sleepiness, has neurological implications. Pressure of brain owing to bulge from hemorrhage or edema, expansion of an intracranial lesions (hematoma with tumor), or a mixture of the two can cause these symptoms. The patient gets shocked as the (ICP) rises, and then only responds to loud sounds or painful sensations. Cerebral flow is likely to be severely impaired at this time, necessitating rapid attention (Thomas *et al.*, 2015).

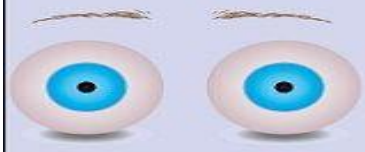
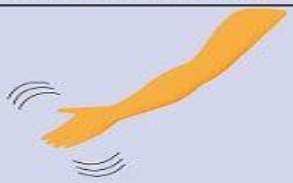
As the neurological function deteriorates further, the patient falls into a coma and exhibits abnormal motor responses in the form of desquamation (abnormal flexion of the upper extremities and extension of the lower extremities), dissipation (excessive extension of the upper and lower extremities), or flaccidity. If the coma is profound and irreversible with no known confounding factors, brainstem reflexes are absent, respiration, If the patient is impaired or absent, the patient may be evaluated for brain death (Wijdicks *et al.*, 2010).

2.13.1. Glasgow coma scale (GCS) :

Level of consciousness is the most important indicator of patient's neurological status. If assesses by using (GCS) It gives high score (13-15) for consciousness, (9-12) score for intermediate disturbance of consciousness, and

low score (3-8) for unconsciousness, Rapid action in a failing or worsening patients state requires frequent and detailed neurologic examinations. The (GCS) is routinely used in many facilities to conduct hourly neurologic examinations. The (GCS) objectivity provides for a standard assessment of a patient's neurologic condition. This scale may be used by nurses to examine three aspects of a patient's status : ocular, motor, and vocal responses (Brooks, 2015);(Rau *et al.*, 2017), this detail show in table (2-1).

Table 2-1: Postoperative Observation Sheet GCS (Steffen-Albert, 2018).

Behaviour	Response
 Eye Opening Response	4. Spontaneously 3. To speech 2. To pain 1. No response
 Verbal Response	5. Oriented to time, person and place 4. Confused 3. Inappropriate words 2. Incomprehensible sounds 1. No response
 Motor Response	6. Obeys command 5. Moves to localised pain 4. Flex to withdraw from pain 3. Abnormal flexion 2. Abnormal extension 1. No response

If a patient's GCS deteriorates, immediate nurse care is required, as well as communication of the neurosurgery team. A baseline neurologic assessment is required when acute neurosurgery patients are admitted to the (ICU). During care delivery, the nurse will be able to promptly notice any possible deterioration in the patient's neurological status thanks to this baseline screening. This assessment also provides for continuity of treatment during the

transfer from of the postoperative phase to admission to the (ICU) (Mehta *et al.*, 2019).

The GCS, pupil, but also grips/grasps must be checked every 15 minutes during the first hr., then each 30 min for such following 6 hours, and then frequently after that (Hinkle d Heck, 2015).

Because alterations in level of consciousness (LOC) predate all other alterations in vital and neurologic indicators, GCS is employed to measure LOC at regular times. The best reactions of the patients to pre-set stimuli were recorded. Each answer is given a score (the greater the number, the higher the activity), and the aggregate of these values determines the severity of a coma and predicts the likely result. The lowest number is 3 (the least responsive), and the greatest is 15 (a most responsive) .(GCS) includes eye opening, articulation, and movement responses. Eye opening reflexes are spontaneous opening that may occur when a nurse approaches a patient's bed, calls his name, asks him to open his eyes, or applies a painful stimulus. Verbal responses include directed, awkward conversation, inappropriate words, incomprehensible sounds, and a lack of response (Moore, 2016).

Ask the patient to give information about the place, time and person. Motor responses include, obedience to commands, pain positioning, withdrawal, abnormal flexion, extension, and unresponsiveness. The patient is expected to perform specific tasks based on verbal or written commands or gestures as a motor response. These commands may be, 'Lift two fingers,' squeezing and releasing my fingers'. If there is no response, the painful stimulus should be applied (pressing on the outside or back of the neck or pressing on the nail bed). Abnormal motor responses are two types of

situations in a patient Unconscious: Extension (all limbs extended, head erect, jaws closed and arm internally rounded at the shoulder and extended at the elbow), abnormal flexion have the same letters as above, except for the arms semi-flexed and both positions include leg extension, internal rotation, and plantar flexion (Middleton, 2012).

The width and equal of the pupils, as well as their responsiveness to light, are tested in addition to the client's spontaneously eye opening, which also is evaluated with the GCS (Booker, 2015).

The nurse must remember that decrease status of the consciousness, is one of the early sign of the increased (ICP) in addition to headache and restlessness, while the very late signs are bradycardia and hypertension (Ghavanini *et al.*, 2013).

2.13.2. Others neurological nursing assessment:

Examining pupil size and interaction with light is important to recognize changes, provide treatment, and prevent further brain damage. The symmetry of the pupil size is usually 1.5-6.0 mm, with an average of 3.5 mm. It can be measured in three ways the pupils (small, medium, large) draw one-to-one scale, and the pupils are millimeter scale. Pupillary constriction can be caused by excessive stimulation of the third nerve by drugs (e.g. morphine, neostigmine), or by compression of sympathetic fibers. While enlargement can be caused by drugs (atropine), or pressure on the third nerve due to cerebral edema and a growing mass lesion, Unilateral enlargement and a slow-responding pupil might be a sign of a growing hematoma, putting pressure upon that 3rd cranial nerve as a result of brain displacement. When both pupils appear fixed and enlarged, this implies an acute insult to the higher brainstem

with significant damage and is a negative prognostic indicator (Zrelak *et al.*, 2020).

Other area of neurological assessment is Motor ability for checking equality of strength by using limb movement scale, looking at right versus left and upper versus lower extremities. If patient obeys commands, ask him to move each limb, grip two examiner's fingers, push his feet against examiner's hand. If the arm grip, and leg strength are equal in both side and limbs movement are appropriate to normal muscle strength, it considers normal. If one limb shows normal power and the opposite is less it is mild weakness while severe weakness the strength of both sides is reduced. If patient not obeys command, observe movement in response to painful stimulus (pressure on the nail bed of finger and the great toe). This may shows spastic flexion (arm moves slow accompanied by stiffness, and forearm and hand held against the body), or extension (limb is straightened at the elbow and knee joint and in upper limb there is inward rotation of the hand). "No response" records when movement of limb is limp and is not response in to any stimulation (Sole and Klein, 2012).

It is helpful and necessary to monitor plantar reflex only, if the nurse has not time to a detailed examination of vibration sense, sensory equality, and deep tendon reflexes. Since this reflex produces an early signs of neurological deficit. With a sharp object (end hand of a reflex hammer), stroke the lateral aspect of the sole from the heel to the ball of the food, curving medially across the ball, note movement of the toes ; normally "flexion" of great toe (downward), while abnormally "dorsoflexion" of the great toe (upward) with fanning of the other toes indicates upper motor neuron and corticospinal tract

diseases. Absent of this reflex indicates deficit of sensory neuron and lower motor neuron (Jarvis, 2019).

Any evidence of seizure activity is also reported promptly. In the (NICU), generalized and focal seizures can usually be seen after cranial surgery. In focal (Jacksonian) seizures the lip muscles spasm, then travel along the limb and body to affect half or all of the body. Grand mal seizures (the tonic phase followed by tonicity) may last less than 1 minute or more than 30 minutes. During an attack, the patient may bite his tongue, urinate or defecate, stop breathing and become blue, then regain consciousness and fall asleep. In the case of epilepsy, consciousness does not regain between epileptic seizures and this is usually an emergency. Careful observation and recording are the best thing to do (after protecting the patient during an attack). These included; Seizure type (or any unexpected activity or muscle twitching), duration, level of consciousness, vital signs, cyanosis, and urinary or fecal incontinence The use of preventive epilepsy for the other neurosurgery illnesses has been found to be inconclusive and should be avoided (Ozuna *et al.*, 2016).

Many anesthetics inhibit seizure activity, increasing the likelihood of a seizure after a wake up. Patients' continuous requirement for anticonvulsant medication should be assessed and managed via critical care specialists after surgery. Older epilepsy, such like phenytoin, phenobarbital, with valproic acid, having significant side effects which may exacerbate neurological condition and raise the risk of adverse event. Recent research suggests that levetiracetam might be used as an option to avoid seizures (Hines and Marschall, 2008);(Rowe *et al*., 2014).

After this neurological assessment, patient's head dressing must be inspected for a tightly fitting dressing (due to edema of head, hematoma, or signs of raised ICP). Also for determining character and amount of discharge. to find out any indicator of increasing amount due to bleeding, or leak of CSF (yellowish drainage). Type and amount of drainage tube should be recorded in addition to check for kinking and secure. Any drainage of (CSF) from the nose (rhinorrhea), or ears (otorrhea) is reported (Singhal *et al.*, 2004).

The head should be kept in most craniotomy elevated 30-45 degree because rotation, flexion, or extension decrease cerebral venous return to the heart, thereby increasing ICP. After craniectomy, the head should not place on the side of operation (Pandhi and Elijovich, 2018).

Monitoring of intake and output is a crucial part of nurse evaluation. IV fluid is restricted to 1000-1500 ml/24 hours, to avoid overload that resulting in cerebral edema. A Folly catheter may be used, urine output should be recorded every hour. The nurse should be alert for increasingly amount of urine more than 100 ml/hr that signify diabetes insidious (DI) or decreasingly amount of urine less than 30 ml/hrs. with increasing specific gravity due to inappropriate antidiuretic hormone (ADH) syndrome (Bausker, 2018).

Eating should be started only if the intestines are healthy, and start nutritional treatment as soon as possible. Once the patient is hemodynamically stable, an endeavor should be made to counteract the body's strong catabolic reaction during 24-48 hours in ICU. Within next 48-72 hours, dietary adjustments will be made depending on the patient's nutrient needs (Tian *et al*., 2018).

In critical ill cases, overstimulation can result from inflammatory mediators, over-activity of sympathetic nerve system, disturbances of glucose metabolism, and early introduction of nutrition has been associated with fewer complications and improved recovery. Although the research is unclear on calorie intake, each patient should receive individualized care from nutrition experts and the multidisciplinary team. After craniotomy, patients who are able to eat should be encouraged to do so, if swallowed or if mental state prevents oral administration then the stomach should be reached to initiate enteral feeding. Packing and feeding should be individualized according to the complexity and risk of dysphagia. Nasogastric tubes (or other nasal tubes) and Continuous Positive Airway Pressure (CPAP) are not used in patients after intravenous surgery due to ethmoid/nasal turbulence and risk of intracranial air entry (McClave *et al.*, 2016).

Finally, the nurse should assess skin color (pale, cyanosis, redness, Jaundice). Also evidence of pressure sores (eg grade1 which identity by edema, heat, readiness over a bony prominences area) due to inability to move and express pain in unconscious patient, and prolonged operation (Mohamed and Mohamed, 2013)**.**

Reporting and recording of such accurate systematic assessment makes the nurse always alert to any evidence of postoperative complications, and it helps to reach to proper nursing diagnosis to plan upon for providing care.

2.14. Early postoperative complications:

There is a wide spectrum of devastating complications of cranial surgeries, those can endanger the patient in early postoperative period (Rolston *et al*.,2014) .

Therefore, the nurse should know the most important complications to do her/his job more effectively and intelligently in order to prevent or decrease these complications.

Patients in the neurosurgical setting get a higher rate of complications, which include neurological adverse effects (motor deficit, speech difficulties, seizure, worsening of consciousness), hemodynamic negative events (bradycardia, tachycardia, hypertension, and hypotension), respiratory serious incidents, post - operative vomiting, anabolic adverse reactions, internal bleeding, pyrexia, pain, and re-surgery, according to reports (Chen and Liu, 2021).

The most frequent early postoperative complications are:

2.14.1 Neurological complications :

2.14.1.a. Motor deficits:

One of the most anticipated consequences is motor impairments. Many neurologic impairments, particularly those impacting greater mental skills, go undiagnosed until they are explicitly evaluated. In the postoperative phase, substantial neurologic impairments including limb weakening, numbness, or language problems can cause significant morbidity. In the long run, most patients to regain to a large extent; nevertheless, total recovery is uncommon. Because neurologic impairments are localized to the operation location, they are typically predictable. Because adjacent neurons are involved, the

deficiencies are denser and also more pervasive in the early postoperative period, a condition called as "neural stunning," which is generally transitory. The deficiencies eventually improve and become restricted to the areas that have been directly harmed after the neuron heal from the operating stress (Nanda *et al.*, 2018).

2.14.1.b.Seizures:

Seizures after surgery can happen right after surgery or later in the healing process. Cortical irritation following management of tumours such gliomas, and meningiomas, or vascular diseases like aneurysms or pneumocephalus, could cause early postoperatively seizures in 10% - 20% of supratentorial operations (Weston *et al*., 2015).

Venkatapura *et al* (2021) reported, seizures were observed postoperatively in 6% of patients.

Various studies have reported an incidence of postoperative seizures ranging from 1 to 12% (Mashour *et al.*, 2015),(Rahman *et al.*, 2016),(Skardelly *et al*., 2017).

However, seizures on the other hand, might be the first sign of serious complications such as postoperative haemorrhages, venous oedema, or infarction. To ruling potential life-threatening episodes, all postsurgical seizures must be examined with brain scans. Recurrence in individuals who have had prior seizures, metabolic acidosis, hypoxia, and anaesthesia drugs are some of the other reasons of seizures in the post - operative period. Because to cortical fibrosis or recurrence of the damage, seizures may develop in the latter post - operative period. Unless the seizure are caused by an existence hematoma or swelling, post-surgical seizures are normally treated

conservatively using antiepileptic medications. However, antiepileptic prophylaxis for cranial operations has not been proved to be beneficial in different systematic reviews and clinical studies. Minimizing retraction, avoiding excessive clotting, frequent irrigated, and maintaining adequate hemostasis are all intraoperative measures that can help reduce the risk of seizures (Wu *et al*., 2013).

2.14.1.c. Dysphasia:

Posterior temporal/inferior parietal lesions are associated with receptive speech disorders. Parietal involvement may be associated with more complex associative features than classical Wernicke's aphasia (Alentorn *et al* ., 2016).

Duffau *et al* (2009) reported that 24 patients underwent surgery for a glioma involving the dominant hemisphere (22 left, 2 right). Language deterioration was detected immediately after surgery in 12 (50%) cases.

2.14.1.d. Deterioration of consciousness:

It's a generic sign of numerous neurosurgical problems, and it can be produced by things like rebleeding brain aneurysms, decompensating cerebral swelling, postoperative haemorrhage, and seizures. There are two types of consciousness: alertness and consciousness. Stimulation, alertness, and alertness are all part of the former, whereas cognitive and emotionlly functions make up the latter. The anatomic structures that are responsible for alertness and consciousness. Wakefulness disorders are always associated with a loss of consciousness. Although understanding the pathophysiology that altered consciousness necessitates distinguishing between alertness and awareness (Burkhart and Steiner, 2020).

2.14.1.e. Cerebral edema:

It's an abnormal fluid buildup in one of three intracranial compartments. It increases within 24-96 hours postoperatively it may occur after operation of malignant and benign tumors prolonged manipulation (increase in local brain edema), malposition of head (lower than the rest of the body or kinking of neck), increased circulatory blood volume (increase blood flow to brain), and high level of carbon dioxide (produce cerebral vasospasm) (Weiss, 2011).

Patient may show increased drowsiness and external evidence of swelling (edema and/or ecchymosis of the eye and face), this is specially observed after prolonged craniotomy with frontal lobe retraction, Some anesthetic drugs can also generate cerebral edema, which can limit CSF absorption through multiple pathways (Fugate, 2015).

2.14.1.f. Increased intracranial pressure:

Acute intracranial pressure (ICP) is the threaten of life neurosurgical emergent. The optimal management strategy is selected according to causative process. It usually occurs after craniotomy, due to intracranial hemorrhage, or as a result of cerebral edema. If this is not treated quickly, the function of the vital brain stem location stops and a patient dies. Hence the importance of detecting its occurrence immediately. Increased blood pressure within comparisons characterized by headache, insomnia, vomiting, change in vital signs and degree of consciousness, pupil size, and light sensitivity, abnormal changes appear, a state of weak and paralysis in the limbs and seizures may occur (Leinonen *et al*., 2018).

2.14.1.g. CSF leak:

It is a serious complications, may see through rhinorrhea. otorrhea, or the site of the incision (yellowish discharge on dressing). It increases the chance of developing infection (meningitis). Leak of (CSF) occurs frequently after removal of acoustic neuromas (within first three postoperative days), and removed of large tumor due to surgical deficit and inability to achieve primary dural repair (Crowson *et al.*, 2016).

Kehler *et al.*, (2013) reported that 545 patients who underwent cranial surgery had a cerebrospinal fluid (CSF) leak rate of 7.7% (n = 42) at the time of hospital discharge. Dura suture augmentation was performed in 472 cases, using several different reinforcing techniques and materials (fibrin glue, wool-coated sealant, etc.).

2.14.2. Hemodynamic complications:

Hemodynamic Cardiopulmonary problems such as hypertension, hypotension, bradycardia, myocardial infarction , and hypoxemia can occur after neurologic surgery. The impact of surgical stressors on preexisting medical illnesses such as high blood pressure, artery disease, and cardiac disease may cause these physiologic abnormalities. In vulnerable patients, hypertension, irritation and pain, can cause tachycardia and raise myocardial oxygen need, leading in ischemic. Arrhythmias, hypotension, and heart failure can be precipitated by electrolyte abnormalities and fluid overload changes caused by hyperosmotic treatment. During therapy for brain vasospasm, fluid load and vasopressor delivery, including for hypertension, hypervolemic (triple H) treatment, can cause pulmonary oedema and heart problems (Yoder *et al.*, 2020).

Yousef *et al.*, (2012) examined continuous monitoring data in 326 patients neurosurgical to identify variables linked to cardiorespiratory dysfunction Heart rate under 40 beats per minute or more than 140 beats per minute; respirations below 8 beats per minute or larger than 36 beats per minute; SpO2 under 85%; with blood pressure under 80 mmHg, more then 200 mm/Hg systolic, and higher then 110 mm/Hg diastolic. Patients who stayed clinically stable compared to those that had just one phase of instability seemed to have greater comorbidities.

2.14.2.a. Bradycardia:

Bradycardia is often observed in neurosurgery patients, through the perioperative phase . It is critical to determine the root of the problem in order to provide appropriate treatment. Multiple neurogenic, cardio, or metabolic variables might cause this reaction. Cerebral herniation can happen as a result of circumstances that raise ICP, such as tumors, edema, cerebral bleeding, or severe hydrocephalus, resulting of Cushing triad of slowness heartbeat, hypertension, and breathlessness (Agrawal *et al.*, 2008).

2.14.2.b. Tachycardia:

Coronary artery spasm may occur during surgery and cause dangerous ventricular tachycardia and circulatory instability. However, recurrent episodes of postoperative coronary artery spasm in a single patient during a single procedure are very rare. Multiple postoperative episodes of ST change and ventricular tachycardia in a neurosurgical patient. These recurrent episodes were clinically diagnosed as mitral spasm, and beta-blocker administration may have occurred for intentional hypotension (Kotake *et al.*, 2009).

2.14.2.c. Hypertension:

Hypertension is a common postoperative complication, it may precipitate intracranial hemorrhage. Blood pressure is very important during neurosurgical procedures. That the brief periods of hypertension during neurosurgery or emergence from anesthesia may result in the occurrence of postoperative bleeding and cerebral edema. It is generally preferable to avoid the occurrence of hypertension by preemptive (Goma and Ali, 2009).

2.14.2.d. Hypotension:

Hypotension during neurosurgery can be caused by blood loss, damage to important tissues such as the pituitary or brainstem, or abrupt steroid withdrawal. The treatment of hypotension entails determining how much blood has been lost and replacing it with enough blood products. If a patient is taking cortisone for the management of cerebral edema, it is possible that the dose will be missed inadvertently during the lengthy procedure. Acute intravenous dose of hydrocortisone will promptly relieve hypotension, however electrolyte problems may take hours to rectify. Inotropes and vasopressors must be used to manage hypotension induced by damage to the hypothalamic or brainstem (Rao and Muthuchellappan, 2020).

2.14.3. Respiratory:

Post-operative respiratory complications in patients with intracranial lesions can lead to significant increase in the (ICU) / hospitalization, morbidity and mortality (Bharati *et al.*, 2015).

The postoperative pulmonary complications includes widely differing events in addition to respiratory failure: pneumonia, prolonged or unplanned mechanical ventilation, hypoxemia, atelectasis, bronchospasm, pleural

effusion, pneumothorax, ventilatory depression, and aspiration pneumonitis. Pneumonia results from atelectasis or aspiration of secretion, produces (productive cough, fever, increase pulse rate and decrease respiration rate, and present of wheezing) (Hooda *et al.*, 2019); (Canet & Gallart, 2014).

2.14.3.a. Acute respiratory failure:(ARF)

Patients with cranial surgery have a problem in maintaining blood flow to the brain while helping to keep the (ICP) lower enough to prevent catastrophic cerebral herniation.. When the same patient has (ARF), he or she is at a higher risk of brain hypoxic, secondary injury, and death. When standard ventilator procedures fail to help a patient with(ARF) (Robba *et al.*, 2017).

2.14.3.b. Pulmonary edema:

Fluid builds up in the lungs' air passages and parenchyma, resulting in pulmonary edema. It causes a reduction in gas exchange, which can lead to respiratory failure. NPE (neurogenic pulmonary edema) is a clinical phenomenon in which pulmonary edema develops suddenly after a major CNS trauma. A spike of catecholamines is assumed to be the cause, which causes cardiopulmonary dysfunction. Although the pathophysiological processes for NPE are unknown, it has been suggested that neurologic disorders that induce a sudden, quick, and severe increase in (ICP) are more likely to be linked to NPE (Kosuke Tsubaki and Kawaguchi, 2017).

2.14.3.c. Pneumonia:

It is the 3rd most frequent complication after surgery, and it's linked to a poor prognosis and quick mortality. Several risk factors related to postsurgical pneumonia in general and cardiothoracic operations, including older age, smoking, diabetic, pulmonary disease such as chronic obstructive

pulmonary disease (COPD), and functional status. However, little is known regarding the occurrence and consequences of postsurgical pneumonia following craniotomy, its most common neurosurgical technique (Zhang *et al.*, 2020).

2.14.3.d. Atelectasis:

Is among the most frequent perioperative respiratory problems, and can cause severe morbidity and death, including as pneumonia and abrupt respiratory failure. A patients under general anaesthetic has a 90% chance of developing atelectasis, and research have also shown that near to 15-20% of both the lung being at base collapses under calm anesthesia before to any invasive surgery (Grott and Dunlap, 2019) .

General anesthesia usually causes atelectasis. In addition to the increased risk of hypoxemia during anesthesia, atelectasis forms the pathophysiological basis of postoperative pulmonary complications (Ostberg *et al*., 2019).

2.14.4. Postoperative vomiting: (POV)

(POV) occurs in up to 70% of patients following craniotomy, causing not only pain, high blood pressure, and a higher risk of aspiration, but also cranial hypertension, fluid–electrolyte abnormalities, including acid–base instability (Apfel *et al.*, 2004).

Combination of dexamethasone and 5HT 3rd or a neurokinin (NK)/1 receptor antagonist decreases POV levels. Additional administration of metoclopramide, droperidol, or gabapentin can also be effective. These techniques help to lessen the occurrence of POV, but they don't fully remove it (Leslie and Williams, 2005); (Habib *et al.*, 2011).

Vomiting might be an indication of rising ICP and deteriorating neurologic state. With neurosurgical patients, also there is a significant rate of (POV). Certain neurosurgery operations, including as cortical resection for seizures, acoustic tumor surgery, and cranial nerves microvascular decompress, are more likely to cause (POV). During surgery, directly and indirectly activation of a chemoreceptor trigger zones or the region postrema may enhance the risk. Vagal activation may potentially be a cofactor in the higher occurrence of vomiting caused by activation of these locations. Antiemetic drugs, such as ondansetron, are given to patients during and following anesthesia (Tan *et al.*, 2012).

2.14.5. Hyperthermia:

It is a dangerous hypermetabolic process that can signal an infectious condition, sepsis, or an infectious disease. hyperthermia is a life-threatening condition caused by a genetic mutation. hyperthermia is potential problem for all postoperative patients. It increasingly is dangerous because it increases cerebral metabolic demands (Fiszer *et al.*, 2015).

Observational studies have found that the occurrence of fever in the first week after surgery is associated with increased intracranial pressure, neurologic impairment, and prolonged ICU stay (Badjatia, 2009).

2.14.6. Hypothermia:

Hypothermia after surgery , described as a temperature of less than (96.8°F), (36°C). Despite the fact that hypothermia is still not dangerous, it does create physiological stress. Hypothermia has been linked to a longer recovery period and increased surgical morbidity. Older and younger people are most susceptible to the effects of hypothermia. Female , as well as those

who have undergone general anesthesia, are all risk factors. with axonal sedation, hypothermia in the operating room, Cachexia, considerable fluid shifting, and the use of cooler irrigation modalities, as well as the duration and kind of surgical operation (Hooper, 2017).

2.14.7. Metabolic disorders:

In neurosurgery patients, abnormalities in sodium and water equilibrium are frequent. Approximately 70percent of endocrine consultations relate to similar issues. They can arise as a result of the fundamental neurological damage or as a result of the neurosurgical operation and postoperative care. According the actual condition, hyponatremia is the most commonly electrolyte imbalance observed in neurosurgical units, affecting 10–50% of cases. It occurs more frequently after even a subareachnoid hemorrhage (SAH), traumatic head injury (TBI), and hypophysectomy of pituitary tumours than does after other neurosurgical procedures. Although diabetic insipidus is prevalent in the immediate aftermath of a neurosurgical procedure, it is typically very temporary (Hannon et al., 2012).

2.14.7.a. Hyperglycemia:

In individuals who really are candidate for or have had neurosurgical operations, hyperglycemia is linked to poor results. Preoperative blood glucose control, perioperative control, treatment in the (NICU), and postoperatively control are all problems and situations that are relevant to all these patients. Clinicians must maintain optimal glycemic control in all of these situations, to avoid or limit adverse effects. Glycemic control is often handled by a neurohospitalist collaboration with neurosurgery staff both before and after surgery, and of the neurocritical healthcare professional in the NICU (Daniel *et al.*, 2017).

2.14.7.b. Hypoglycemia:

Hypoglycemia, like hyperglycemia, has been linked to problems in neurosurgery patients, including an increased risk of death. This is owing to glucose's critical involvement in brain metabolism (Bilotta and Rosa, 2010);(Hwang and Weiss, 2014).

In addition, Because glucose metabolism inside the brain is regulated by glucose translocation, blood sugar levels may well not accurately represent blood glucose within brain cells, that may be lesser than predicted based on glucose levels (Godoy *et al.*, 2012).

2.14.7.c. Diabetic insipidus: (DI**)**

It is prevalent in the acute period of neurosurgical exposures such as pituitary surgeries, (SAH), and (TBI). (DI) is the syndrome marked by polyuria, thirsty, and extreme thirst. Patient with DI lose an excessive amount of free water in their urine, resulting in a rise in solute concentrations throughout the body causing hemodynamic instability due to hypovolemia. There are two forms of DI: nephrotic and central (or neurological). Nephrogenic DI due to the inability of the renal to appropriate response adequately to physiological concentrations of ADH in the blood , which is caused by a malfunction of aquaporin 2, an intrinsic receptors that increases kidney collecting tubular permeable to water. Central DI, the more prevalent subtype in neurosurgical patients، results of the inadequate ADH production from posterior pituitary. Under the effect of ADH, up to 12percent of the glomerular filtrate is regularly reabsorbed. ADH deficiency causes a significant loss of free water (up to 20 L/24 h) in the urine, resulting in polyuria with abnormally low urine osmolality. The most prevalent kind of ADH insufficiency is incomplete, with an amount of hypotonic urine of 5–10 L/24 h.

DI is generally temporary, but it can also be lifelong (Hannon et al., 2012);(Capatina *et al.*, 2015).

2.14.7.d. Dysnatremia:

It is the most common and most widely discussed complication of surgery. All patients who have undergone cranial surgery and the complex postoperative stage , and who require intensive care for more than 24 hours, dysnatremia. Weakness around surgery of hypothalamic and pituitary gland function in cranial surgery patients determines average of hyponatremia. In approximately to 75-90 percent of patients, postsurgical hypernatremia (Na>145 mmol/L) develops (Berker *et al.*, 2012);(Abla *et al.*, 2011); (Wait *et al.*, 2010). .

The most common cause of hypernatremia is diabetes insipidus (DI), which causes fluid overload loss and hypovolemia, is. As a result, according to the free aqueous definition, individuals with DI require considerable and prompt administration of desmopressin acetic and salt fluid replacement. Hypovolemia, on the other hand, causes artery hypotension and intraperitoneal hypoperfusion in the earliest postoperative stage. Up to 35% of individuals develop hyponatremia following surgery (Na 135 mmol/L) (Freeman *et al.*, 2003);(Palmer, 2003); (Sata *et al.*, 2006).

It might be mild (Na = 134 - 125 mmol / l) or serious (Na 125 mmol / l); acute (within 72 hours of surgery) or late (within and over 72 hours of surgery). Acute hyponatremia can result in unconsciousness, convulsions, and a poor prognosis. Correction For delayed hyponatremia, sodium levels should be controlled to 6-8 mmol/L a day since a fast rise in salt might trigger a

dangerous and sometimes deadly consequence called particulates or extracorporeal myelolysis (Brown, 2000).

Hyponatremia is still the most common electrolyte disorder in patients admitted. It is more common in people who have had a neurosurgical procedure or intervention. Hyponatremia affects (15–20) percent of patients brought to hospitals with head injury and more than half of those treated for the subarachnoid hemorrhage . Decreased plasma sodium ratios are also often detected in patients hospitalized to neurosurgical departments with brain tumors and internal bleeding, and hyponatremia occurs in (10 to 20%) of individuals following pituitary surgery. Acute hyponatremia is more commonly related with neurosurgical illnesses than chronically hyponatremia (Hannon and Thompson, 2019).

Hyponatremia is a frequent complication after pituitary surgery, with a frequency ranging from 3 to 25% and lasting just a few days. It occurs on the sixth day after surgery on the average (Jahangiri *et al.*, 2013).

2.15. Previous Studies:

First study:

A study conducted by Hanko *et al.*, (2021) the incidence and risk factors for early postoperative complications in patients after craniectomy: 5 years' experience. It was aimed to describe their occurrence and possible associated risk factors. Methods: This study included (118) patients who underwent cranial surgery in Germany. Craniectomy was performed as primary surgical intervention in 95 cases and re-intervention for postoperative complications of previous cranial surgery in (23) cases. The researchers concluded that the craniectomy is associated with many early postoperative complications of

varying severity. However, most cases of complications can be managed conservatively. Risk factors associated with postoperative complications must be taken into account during the indication process in each individual patient.

Second study:

A study conducted by Siqueira and Diccini, (2017)Postoperative complications in elective and non-elective neurosurgery. It was aimed to evaluate the incidence of postoperative complications and mortality among patients submitted to elective or non-elective neurosurgery. Methods: This study included (202) patients was calculated in a period of (10) months in January 18, 2017 One hundred and twenty seven patients were included in elective surgery group and 75 patients in non-elective surgery group in a university hospital in São Paulo, Brazil. The conclusions revealed that the elective procedures in neurosurgery are related to higher frequencies of systemic complications while non-elective surgeries had significantly higher rates of neurological complications and mortality.

Third study:

A study conducted by Lonjaret *et al.,* (2017) Postoperative complications after craniotomy for brain tumour surgery. It was aimed to evaluate the incidence and timing of neurologic and non-neurologic postoperative complications after brain tumour surgery, to determine factors associated with neurologic events and to evaluate the timing and causes of (ICU) readmission The conclusions was Postoperative complications, especially (PONV), are frequent after brain tumour surgery. Moreover, (16%) of patients presented a neurological complication, probably justifying the (ICU) postoperative stay for early detection. The absence of preoperative motor deficit and intraoperative bleeding seems to predict postoperative neurologic complications. Finally,

patients may present complications after (ICU) discharge, especially patients with fossa posterior surgery, suggesting that (ICU) hospitalization may be longer in this type of surgery.

Fourth study:

A study conducted by Hanak *et al*., (2014) Postoperative Intensive Care Unit Requirements After Elective Craniotomy. It was aimed to determine the frequency with which patients who have undergone elective craniotomies require intensive care unit (ICU)elevel interventions or experience significant complications during the postoperative period to identify a subset of patients for whom an alternative to ICU-level care may be appropriate The Conclusions of this study was: Diabetes and older age predict the need for ICU-level intervention after elective craniotomy. Properly selected patients may not require postcraniotomy ICU monitoring. Further study of resource utilization is necessary to validate these preliminary findings, particularly in different hospital types.

Finally, from this extensive reviewing, it is observed that postoperative complications are possible and very serious after cranial surgery. These complications may related to the residual effects of the primary lesion or to complication associate with surgery. This will help in supporting the findings of the present study.

Chapter Three

Methodology

Chapter Three

3. Methodology:

This chapter covers the study of a designing, administrative arrangement, the setting, sample selection, instrument creation, instrument validity, pilot study, instrument reliability, data collection techniques, rating and scoring of the scale and statistical analysis.

3.1. Study Design:

A descriptive design of the study started from 18th January 2022 to the 23 June, 2022. The study was conducted to assess the complications, This may arise in patients following cranial surgeries and know the relation to between demographical characteristics, clinical data ,GCS and postoperative complications during the first 72 hours.

3.2.Administrative Arrangements:

Special permission to conduct the research was obtained through the official channels(Appendix C) as follow:

- Approval from the Research Ethical Committee at the College of Nursing, University of Babylon.
- Official permissions were obtained from the Al-Rusafa Health Baghdad Directorate and Medical City in order to access the Hospitals formally.
- The permission was presented to hospitals, which includes:
- Neurosurgical Teaching Hospital .
- AL- Shaheed Ghazi AL- Hariri Surgical Specialties Hospital.

3.3. Setting of the study:

Study conducted at NICU, Neurosurgical Department. at a Neurosurgical Hospital in Baghdad and AL- Shaheed Ghazi AL- hariri Surgical Specialties Hospital, Medical City, Baghdad, Iraq.

3.3.1. Neurosurgical Teaching Hospital:

Neurosurgery Teaching Hospital is the mother hospital for neurosurgery in Iraq. It is the first hospital in the country since it was established in 1970 and specializes in brain and spinal cord surgery, and it is one of the teaching hospitals. The hospital is located in Baghdad on Port Said Street near Al Tayaran Square in Al Bab Al Sharqi, and it is adjacent to the Ministry of Interior. The bed capacity is 145 beds and is prepared for 135 beds. It contains three main corridors: the wards for mothers and children, and the male's ward, and the intensive care unit prepared for 18 beds. It contains a consulting clinic, radiology, neurophysiology and physiotherapy, as well as About that it is a training center for postgraduate students. The hospital also contains 4 operating theaters, and the hospital receives patients from all over the country.

3.3.2. AL- Shaheed Ghazi AL- Hariri Surgical Specialties Hospital:

It is one of the Medical City Hospitals in Baghdad, which was established in 1961, which is located on the eastern shore of the Tigris in the Bab Al-Moadham area in central Baghdad. The hospital includes inpatient wards, respiratory wards, specialized intensive care wards, and consulting clinics. It also has physiotherapy rooms, and the hospital has specialized surgical departments, its own neurosurgery department and an neurointensive care unit(NICU) located on the 16th floor with a capacity of 12 beds. The hospital includes the following medical and scientific departments. Department of

Urology, Ear, Nasal, Throat, and Neck and Head Surgical Department, Department of Orthopedics, Joints and Traumatology, Department of Thoracic and Vascular Surgery, Department of Ophthalmology, Department of Orthognathic Surgery, Department of Oral and Maxillofacial Surgery, Respiratory Care, RCU, Department of Dental Implants, Department Congenital lip and palate surgery, Chinese medicine department, laboratories department, radiology and imaging department, joint diseases and physiotherapy unit. The hospital also includes (23) operating rooms distributed over the aforementioned specialty. The number of beds equipped for the hospital (528) beds. Neurosurgery (86) beds.

3.4.Study Sample:

Using purposive (non-probability) method of (115) patients, their age over (18) years, and underwent cranial surgeries. Follow-up period included day shifts of the first three postoperative days. The study sample was distributed throughout the Neurosurgery Hospital (68 patients) and AL-Shaheed Ghazi AL- hariri Surgical Specialties Hospital (47 patients). The study sample was selected according to the following:

3.4.1. Inclusion Criteria:

- Patients who are adult (18 years older).
- Patients who are undergoing cranial surgeries under general anesthesia in intensive care unit.
- Both gender male and female.

3.4.2.Exclusion Criteria:

- Deceased patients during the postoperative period
- patients who are transferred to another hospital
- Patients infected with Coronavirus (Covid 19)
- Patients who are selected to pilot study.

3.5.Study Instruments:

A three part data collection questionnaire format was constructed, (Appendix B). which consist of:

Part I: Demographical data:-

It consisted of (4) items which included the (gender, age, education level and occupation).

Part II: clinical data :-

It comprised of (7) items which included the patient's medical history, chronic diseases, medicines used for chronic diseases, previous surgeries, type of surgery, operation site ,duration of surgery.

Part III:

This part consists of (22) items and is divided into (2) sections to assess the patient's state of consciousness using CGS scale and postoperative complications within 72 hours. They include**:**

A-Postoperative Observation Sheet GCS:

GCS is a standardized measurement of the patient's neurological status. This scale assesses 3 components of a patient's condition through visual, motor, and verbal response. It gives a high score (13-15) for consciousness, (9-12)

score for moderate disturbance of consciousness, and a low score (3-8) for unconsciousness (Rau et al., 2017).

B-The complications during the first 72 hours:

This section included the neurological complications which included (motor deficit , dysphasia, seizure, deterioration of consciousness and increased intracranial pressure). Moreover, assessment of hemodynamic complications adverse effects or negative reactions were included: (bradycardia (<45/bpm), tachycardia (<100/bpm), arterial hypertension(>110mmHg) and arterial hypotension (<60mmHg)) . The pulmonary complications included (acute respiratory failure, pulmonary edema, pneumonia and atelectasis).Postoperative vomiting which included(early postoperative vomiting (< 4h)and late postoperative vomiting (≥ 4h)). Integument system complications included (hyperthermia and hypothermia). Metabolic disorders included (hyperglycemia, hypoglycemia, diabetes insipidus and dysnatremia).

3.6.Validity of the Questionnaire:

The best way to be sure about the validity of an instrument is to estimate the extent of each items of the instrument objectively by relative experts in the study.

The validity of the instrument was determined by having it evaluated by (12) experts, (Appendix A), who have more than 15 years' experience in their job. Some items were excluded such as marital status, nausea, routine laboratory tests and radiological investigations and some items such as chronic diseases, medicines used for chronic diseases and duration of surgery were added after personally discussion with each expert. 85% of experts agreed with the final draft and the Instrument considered valid after taking all comments into consideration.

3.7.Pilot Study:

A ten-patient pilot study was done over eighteen years old of age underwent cranial surgery in Neurosurgical Department at Neurosurgical Hospital for the period of 22 February 2022 to 7 March 2022.

3.7.A.The purpose of pilot study is to:

- Stability and credibility of the study tools.
- Clarity and its efficiency and standard time required to collect data for each patient can be estimated during the observation.
- Difficulties and limitations which occur during data collection.
- Examine consistency and reliability of the questionnaire.

3.7.B. Reliability of the Questionnaire:-

The 10 patients were collected at neurosurgical hospital in Baghdad by two investigator (researcher and well trained person).

Together the researcher and one students (Master of Science in Nursing), College of Nursing, University of Babylon, were used the instrument for each patient in the same time and place with using of same equipment, then recording was done independently.

The scale had an acceptable level of internal consistency (Wood and Haber, 2014), as determined by a Cronbach's alpha and shown below:

All-33 items have a Cronbach‘s alpha value of = (0.83).

Table 3-1: Reliability of the instrument

No items	Cronbach's Alpha	Assessment
33	0.83	Pass

3.8.Data Collection Methods:

Data collected during the period from March 13, 2022 to May 15, 2022 for each admission of (115) patients with intracranial lesion or head trauma to the department of neurosurgery, Hospital for Neurosurgery and AL- Shaheed Ghazi AL- Hariri Surgical Specialties Hospital, Medical City, as follows:

1-Preoperative data (demographic history and clinical data) collected in the ward. In the first interview, he asked the patient for permission to take the information from him, after explaining to each patient the study's aims. The study's aim was to assess postoperative complications in patients undergoing cranial surgery.

2-Postoperatively as patient arrived to the (NICU), the depending on a questionnaire list used to record the assessment level of consciousness, GCS checked every 15 mins, for the first 2 hours, every 30 mins. for 4 hours, and then like the others, hourly Tor 4 hours, and every 4 hours when the patient was stable during the rest time of follow-up.

From the day of the operation to three days (72 hours) after surgery, we evaluate complications related to cranial surgery such as neurological complications that include (motor deficits, dysphasia, seizures, deterioration of consciousness and increased intracranial pressure). Furthermore, the assessment of hemodynamic complications was: bradycardia (<45/bpm), tachycardia (<100/bpm), arterial hypertension (>110 mmHg) and arterial hypotension (< 60 mm Hg)). Pulmonary complications (acute respiratory failure, pulmonary edema, pneumonia and atelectasis). Postoperative vomiting which includes (early postoperative vomiting (less than 4 hours) and late postoperative vomiting (4 hours)). Complications of the casing system included

(hyperthermia and hypothermia). It included metabolic disturbances (hyperglycemia, hypoglycemia, diabetes insipidus and dynatremia). Results of laboratory tests also were recorded .

Finally, following such systematic and accurate assessment, postoperative complications which not exit preoperatively were spotted quickly.

3.9. Rating and scoring of the scale :

Used rated and scored for two items as used one (1) for " Present " and used two (2) for "Absent " to knowledge the signs and symptoms postoperative complications, the numeric values for the positive items were scaled as one (1) for " Present " while the negative items were scaled as two (2) for "Absent " .

3.10.Methods of Statistics Data Analysis:

In order to statistically analyze the data collected from the study Sample to get to the results, the researcher used the *SPSS ver-20* and Microsoft Excel (2010) program to analyze this data and deal with it statistically, to find the relationships between the variables, and obtain the final results of the research based on a set of statistical tests.

3.10.1.Descriptive approach:

Descriptive statistics includes a collection of mathematical methods and statistical methods adopted to describe the main features of a data quantitatively using tables and charts. Descriptive statistics always aim to present and describe the data which is required to be processed, organized, summarized and categorized, as well as presenting them in a simple and clear manner that makes it easier for the recipient to recognize and understand its content. The analysis performed through use:

3.10.1.a. Statistical tables(Frequency and percentage)which are:

$$\% = \frac{\boldsymbol{Frequency}}{\boldsymbol{Sample\ Size}}\ x100$$

3.10.1.b. Mean of scores *M*±.

The average score can be calculated by using the following:

$$M.S = \frac{\sum \text{ri} = 1\text{Fi x Si}}{\sum \text{ri} = \ 1\text{Fi}}\ x100$$

The overall responses Complication according to total mean of score which follow:

M= 21-28 refers to Unsatisfied.

M=28.1-35 refers to Satisfied to Certain Limit.

M=35.1-42 refers to Satisfied.

3.10.1.c. Standard Deviation test ±*SD*.

$$SD = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(Xi - \bar{\chi})^2}$$

3.10.1.d. It uses a correlational coefficient Cronbach alpha used in estimating the internal consistency of the study tool, which can be calculated by using the following:

$$\alpha = \frac{K}{K-1}\left[1 - \frac{\sum_{i=1}^{K}\sigma_{ii}}{\sum_{i=1}^{K}\sum_{j=1}^{K}\sigma_{ij}}\right]$$

3.10.2.Inferential approach:

3.10.2.a. One Way ANOVA:

For equality of Means, is use (ANOVA test when the mean's parameter is different).

Source of variance	Sum of square	d.f	Mean square	F
Between Groups	$SS_B = \sum \frac{(\sum xP1)^2}{n} - \frac{(\sum xP)^2}{n}$	$df_B = K-1$	$\frac{MS\beta}{MS\beta}$	$\frac{MSB}{MSW}$
Within Groups	$SS_w = \sum \frac{(\sum xP1)^2}{N} - \frac{(\sum xP)^2}{N}$	$df_w = N-k$	$\frac{SSw}{DFw}$	
Total	$SS_T = \sum \frac{(\sum xP1)^2}{N} - \frac{(\sum xP)^2}{N}$	$df_t = N-1$		

3.10.2.b. Sample Independent t-test:

The t Test examines the mean of two independent groups to see if the related population means differ significantly statistically.

$$t = \frac{\mu_A - \mu_B}{\sqrt{\left[\frac{\left(\Sigma A^2 - \frac{(\Sigma A)^2}{n_A}\right) + \left(\Sigma B^2 - \frac{(\Sigma B)^2}{n_B}\right)}{n_A + n_B - 2}\right] \cdot \left[\frac{1}{n_A} + \frac{1}{n_B}\right]}}$$

$(\Sigma A)^2$: Sum of data set A, squared (Step 2).
$(\Sigma B)^2$: Sum of data set B, squared (Step 2).
μ_A: Mean of data set A (Step 3)
μ_B: Mean of data set B (Step 3)
ΣA^2: Sum of the squares of data set A (Step 4)
ΣB^2: Sum of the squares of data set B (Step 4)
n^A: Number of items in data set A
n^B: Number of items in data set B

3.10.2.c. Simple Liner Regression

The following are shortcuts for measuring important in comparison to the level:

(1) **NS**: *Non significantly at probability-value>0.05*.

(2) **S**: *Significantly at probability-value <0.05*.

Chapter Four

Results

Chapter Four

4.Results of the Study

Under the objectives of current study findings, the descriptive and inferential statistic approach organized in tables and figures that includes the followings:

4.1. Demographic data of the subjects were involved in this study

In Table (4-1), the participants demographic information including age, gender, the education level and occupation were studied, the results showed that, the mean differences of age was (45±17.35), the age range from (40-49) years old were recorded the highest percentage in rate (20.9%) more than other age groups. Regarding gender, the male were recorded more than half of study samples in rate (66.1%) as compared with those who are female (33.9%). Respected to the education level, primary school graduated were recorded in rate (33.9%) more than other type of education levels. In terms of occupation, the results finding that, the mostly distributed between free business and retired (22.6%) for each them.

Table (4-1): Descriptive statistic of socio-demographic variables

SDVs	Classification	Freq.	%
Age/years (M ±SD= 45±17.35)	>20 years old	7	6.1
	20-29 years old	23	20.0
	30-39 years old	18	15.7
	40-49 years old	24	20.9
	50-59 years old	14	12.2
	60-69 years old	11	9.6
	70 and older	18	15.7

Gender	Male	76	66.1
	Female	39	33.9
Education level	Illiterate	1	0.9
	Read & Write	3	2.6
	Primary school	39	33.9
	Intermediate school	21	18.3
	Secondary school	15	13.0
	College	36	31.3
Occupation	Governmental employ	27	23.5
	Private employ	11	9.6
	Free business	26	22.6
	Unemployment	25	21.7
	Retired	26	22.6

The results in Table (4-1-1) demonstrated that, there are significant differences in complications of cranial surgery with regards patients age (P=0.001). It was observed that, the introduced ages (70 and older) was significantly associated higher complications (lower average) unlike those who are aged <40 years (higher average) as shown in (Figure 4-1-1).

Table (4-1-1): Statistical differences in Complications with Patients age (n=115)

	Classification	Mean ±SD	*p-value*
Complication *Vs.* age	>20 years old	1.48±0.09410	0.001
	20-29 years old	1.53±0.08204	
	30-39 years old	1.48±0.11054	
	40-49 years old	1.51±0.08654	
	50-59 years old	1.40±0.15145	
	60-69 years old	1.31±0.17217	
	70 and older	1.24±0.21200	

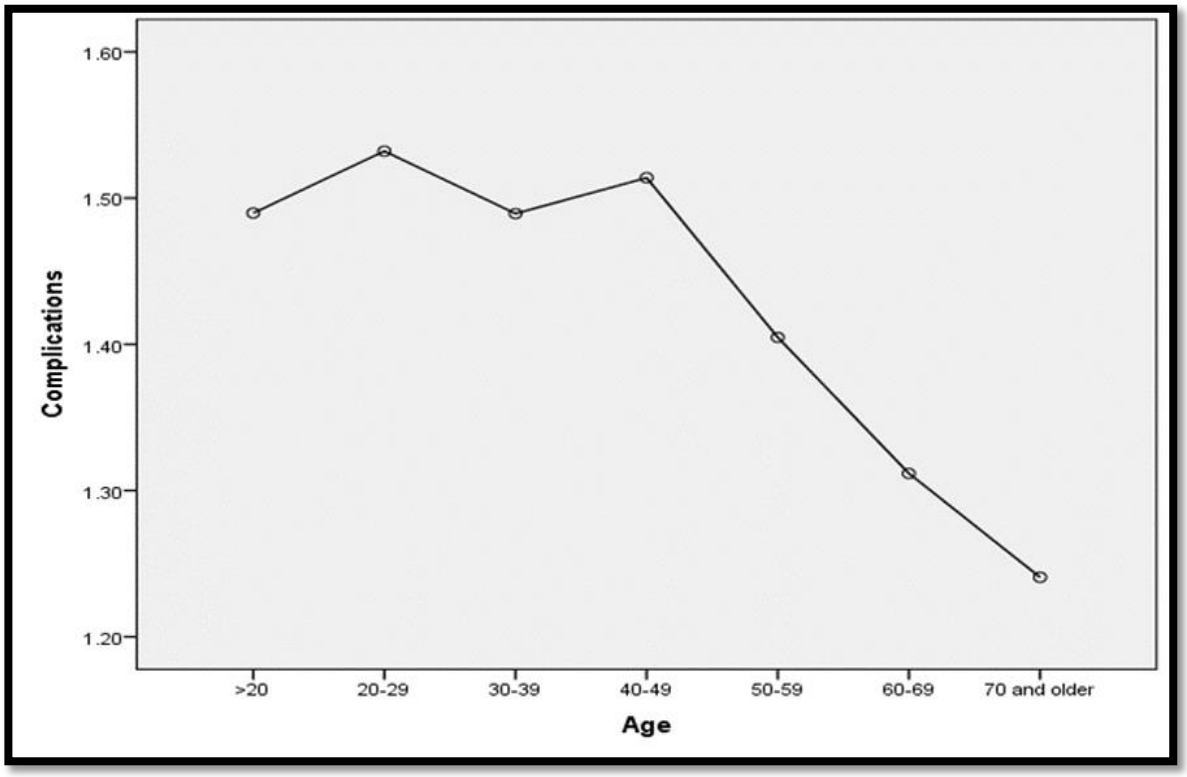


Figure (4-1-1): Distribution of complications according to age group

In Table (4-1-2), the results showed that, there are no-significant differences between complications of cranial surgery and gender, those who include male with mean (1.43±0.17682) and female with mean (1.44±0.15340) at (t=0.067; p=0.946).

Table (4-1-2): Statistical differences in complications with Patients Gender (n=115)

	Gender	Mean ±SD	t-value	d.f	p-value
Complications	Male	1.43±0.17682	0.067	113	0.946
	Female	1.44±0.15340			

SD: Standard deviation, t: t-test d.f: Degree of freedom, p: Probability value.

In Table (4-1-3), the results demonstrated that, there are significant differences between complications of cranial surgery and patients occupation (P=0.001). It was showed that, the retired was significantly associated with higher complication [lower average (1.24 ± 0.17139)] unlike those who were governmental employment [higher average (1.52±0.10356) as shown in Figure (4-1-3).

Table (4-1-3): Statistical differences between complications and patients occupation (n=115)

	Classification	Mean ±SD	p-value
Complication / Occupation	Governmental employ	1.52±0.10356	0.001
	Private employ	1.44±0.12615	
	Free business	1.50±0.11169	
	Unemployment	1.47±0.12992	
	Retired	1.24±0.17139	

Figure (4-1-3): Distribution of complications according to occupation

4.2. Clinical data of the subjects were involved in this study

In Table (4-2) the clinical data include patient's history, chronic diseases, medictation use, previous surgery, type of surgery, site of Surgery, duration of surgery and GCS were studied, the results showed that, patients history were recorded the highest percentage rate (58.3%), regarding to chronic diseases and associated medication, the results showed that, most of patients expressed no chronic diseases, as related to medication, it was recorded (63.5%) for each them respectively, in addition, (58.3%) had a pervious surgery. Regarding to concerning surgery, craniectomy was mostly conducted for parietal and temporal site, it was recorded more than 6 hours as a duration of surgery. A (49.6%) rate of the cranial surgery patients were mild recorded on GCS.

Table (4-2): Clinical data of the subjects were involved in this study

Clinical Data	Classification	Freq.	%
Patients History	Present	67	58.3
	Absent	48	41.7
Chronic diseases	No Chronic diseases	73	63.5
	Hypertension	16	13.9
	Respiratory diseases	9	7.8
	Seizure	3	2.6
	Cardiac diseases	7	6.1
	Diabetes	7	6.1
Medication use	No Medication use	73	63.5
	Amlodpine	6	5.2
	Nifedipine	3	2.6
	Lisinopril	2	1.7
	Captopril	5	4.3
	Flylicasone &salmeterol	2	1.7
	Fluticasone &Vilanterol	2	1.7
	Budesonide & Formoterol	5	4.3
	Valproic acid	1	0.9
	Carbamazepine	1	0.9
	Levetiracetam	1	0.9
	Metoprolol	2	1.7
	Carvedilol	1	0.9
	Digoxin	1	0.9
	Nitroglycerin	2	1.7
	Propranolol	1	0.9

	Glimepiride	3	2.6
	Insulin	3	2.6
	Glybride	1	0.9
Previous Surgery	Present	67	58.3
	Absent	48	41.7
Type of Surgery	Shunt	23	20.0
	Craniotomy	37	32.2
	Craniectomy	55	47.8
Site of Surgery	Frontal	21	18.3
	Parietal	27	23.5
	Posterior fossa	14	12.2
	Temporal	27	23.5
	Occipital	26	22.6
Duration of Surgery	<2 Hours	13	11.3
	2-4 Hours	38	33.0
	5-6 Hours	30	26.1
	>6 Hours	34	29.6
GCS	Mild (13-15)	57	49.6
	Moderate (9-12)	38	33.0
	Sever (3-8)	20	17.4

There are significant differences between complications of cranial surgery with patients history, those who were present history with mean (1.35±0.170), and those who were absent with mean (1.54±0.084) at (t=6.975; P=0.000). These results were shown in Table (4-2-1).

Table (4-2-1): Mean differences between complications with patients history (n=115)

	History	Mean ±SD	t-value	d.f	*p-value*
complications	Present	1.35±0.170	6.975	113	0.000
	Absent	1.54±0.084			

SD: Standard deviation, t: t-test, d.f: Degree of freedom, p: Probability value.

However, there are significant differences between complications of cranial surgery with chronic diseases (p=0.003). It was showed that, the patients with Seizure were significantly associated with higher complication (lower average) with mean (1.28±0.047), unlike those who are no history of chronic diseases (higher average) with mean (1.50±0.134) as shown in Table (4-2-2).

Table (4-2-2): Mean differences between complications with chronic diseases (n=115)

	Classification	**Mean ±SD**	**p-value**
Complication / chronic Diseases	No Chronic Diseases	1.50±0.134	0.003
	Hypertension	1.44±0.137	
	Respiratory diseases	1.50±0.126	
	Seizure	1.28±0.047	
	Cardiac diseases	1.61±0.155	
	Diabetes	1.60±0.164	

In addition, there are no significant differences between complications of cranial surgery with medications uses (p=0.932) as shown in Table (4-2-3).

Table (4-2-3): Mean differences between complications with medication use (n=115)

	Classification	Mean ±SD	p-value
Complication / Medication use	No medication use	1.5082±0.134	0.932
	Amlodpine	1.4762±0.223	
	Nifedipine	1.4444±0.054	
	Lisinopril	1.4286±0.067	
	Captopril	1.4286±0.067	
	Flylicasone+salmeterol	1.3810±0.134	
	Fluticason+Vilanterol	1.5952±0.168	
	Budesonide + Formoterol	1.5143±0.091	
	Valproic acid	1.2381±0.067	
	Carbamazepine	1.2857±0.061	
	Levetiracetam	1.3333±0.062	
	Metoprolol	1.5476±0.168	
	Carvedilol	1.3810±0.067	
	Digoxin	1.7143±0.067	
	Nitroglycerin	1.7381±0.101	
	Propranolol	1.6667±0.001	
	Glimepiride	1.5714±0.171	
	Insulin	1.5556±0.119	
	Glybride	1.8571±0.003	

In addition, there are significant differences between complications of cranial surgery with previous surgeries as present with mean (1.39±0.191) or absent with mean (1.49±0.102) at (t=3.509; P=0.001) as shown in Table (4-2-4).

Table (4-2-4): Mean differences between complications with pervious surgeries (n=115)

	Surgeries	Mean ±SD	t-value	d.f	p-value
Complications	Present	1.39±0.191	3.509	113	0.001
	Absent	1.49±0.102			

SD: Standard deviation, t: t-test, d.f: Degree of freedom, p: Probability value.

In Table (4-2-5), there are significant differences between complications of cranial surgery with type of surgery (P=0.000). As being the Craniotomy and Craniectomy is significantly associated with higher complications [low average with mean (1.42±0.075)].

Table (4-2-5): Mean differences between complications with type of surgery (n=115)

	Classification	Mean ±SD	*p-value*
Complication / Type of surgery	Shunt	1.59±0.143	0.000
	Craniotomy	1.42±0.075	
	Craniectomy	1.44±0.114	

In Table (4-2-6), there are significant differences between complications of cranial surgery with site of surgery (p=0.000). That was, the cranial surgery at temporal and occipital were significant complications [lower average with mean (1.33±0.084)].

Table (4-2-6): Mean differences between complications with site of surgery (n=115)

	Classification	**Mean ±SD**	**p-value**
Complication / Site of surgery	Frontal	1.61±0.129	0.000
	Parietal	1.46±0.030	
	Posterior Fossa	1.52±0.086	
	Temporal	1.37±0.057	
	Occipital	1.33±0.084	

However, there are significant differences between complications of cranial surgery with duration of surgery (p=0.001). That was, the cranial surgery at >6 Hours were significant complications [lower average with mean (1.48±0.251)] as shown in Table (4-2-7).

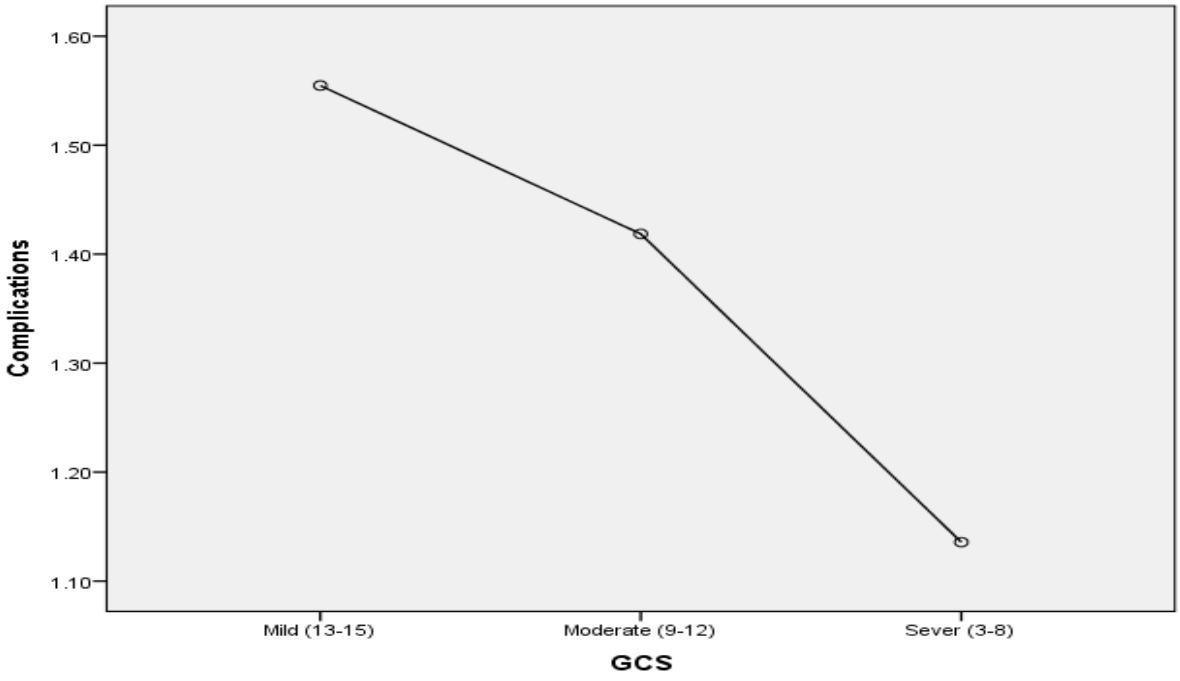
Table (4-2-7): Mean differences between complications with duration of surgery (n=115)

	Classification	Mean ±SD	*p-value*
Complication / Duration of surgery	<2 Hours	1.84±0.040	0.001
	2-4 Hours	1.77±0.120	
	5-6 Hours	1.77±0.134	
	>6 Hours	1.48±0.251	

There are significant differences between complications of cranial surgery with GCS (*p=0.000*). The cranial surgery of sever GCS were significant complications [lower average with mean (1.13±0.079)] as shown in Table (4-2-8), and distribution of complications according to level of conscious (GCS) were shown in Figure (4-2-8).

Table (4-2-8): Mean differences between complications with level of conscious (GCS) (*n=115*)

	Classification	Mean ±SD	*p-value*
Complication / GCS	Mild (13-15)	1.55±0.082	0.000
	Moderate (9-12)	1.41±0.056	
	Sever (3-8)	1.13±0.079	



Figure(4-2-8): Distribution of complications according to level of conscious (GCS)

4.3. Postoperative complications for cranial surgeries patients

4.3.1. Postoperative Complications related to neurological system

In Table (4-3-1), the results recorded that, the cranial surgery patients showed a moderate complications related to neurological system as indicated by moderate mean of scores (M.s=1.34-1.66) at all studied complications except, the dysphasia and seizure are highly neurological complications as showed by low mean of scores (M.s ≤1.33).

Table (4-3-1): Postoperative Complications related to neurological system

Neurological Complication	Responses	Freq.	%	M.s ± SD	Ass.
Motor deficit	Present	73	63.5	1.36±0.364	Moderate
	Absent	42	36.5		
	Total	115	100		
Dysphasia	Present	85	73.9	1.26±0.441	High
	Absent	30	26.1		
	Total	115	100		
Seizure	Present	81	70.4	1.29±0.458	High
	Absent	34	29.6		
	Total	115	100		
Deterioration of consciousness	Present	69	60.0	1.40±0.492	Moderate
	Absent	46	40.0		
	Total	115	100		
Increased intracranial pressure	Present	69	60.0	1.40±0.492	Moderate
	Absent	46	40.0		
	Total	115	100		

"(M.s) Mean of Scores, (SD) Standard deviation, Level of Assessment (High=1-1.33, Moderate=1.34-1.66, Low=1.67-2)"

4.3.2. Postoperative complications related to hemodynamic

In Table (4-3-2), the results recorded that, the cranial surgery patients showed a high complications related to tachycardia (>100/bpm) with mean difference (1.29±0.458), and arterial hypertension (>110 mmHg) with mean difference (1.27±0.450) as indicated by low mean of scores (M.s≤1.33).

Table (4-3-2): Postoperative complications related to hemodynamic

Hemodynamic Complication	Responses	Freq.	%	M.s ± SD	Ass.
Bradycardia (<45/bpm)	Present	72	62.6	1.37±0.485	Moderate
	Absent	43	37.4		
	Total	115	100		
Tachycardia (>100/bpm)	Present	81	70.4	1.29±0.458	High
	Absent	34	29.6		
	Total	115	100		
Arterial hypertension (>110mmHg)	Present	83	72.2	1.27±0.450	High
	Absent	32	27.8		
	Total	115	100		
Arterial hypotension (<60 mmHg)	Present	67	58.3	1.41±0.495	Moderate
	Absent	48	41.7		
	Total	115	100		

"(M.s) Mean of Scores, (SD) Standard deviation, Level of Assessment (High=1-1.33, Moderate=1.34-1.66, Low=1.67-2)"

4.3.3. Postoperative complications related to respiratory System

In Table (4-3-3), the results were illustrated that, the cranial surgery patients showed a low complications related to acute respiratory system

complication as indicated by high mean of scores at all studied complications (M.s≥ 1.67).

Table (4-3-3): Postoperative complications related to Respiratory System

Respiratory Complication	Responses	Freq.	%	M.s ± SD	Ass.
Acute respiratory failure	Present	17	14.8	1.85±0.356	Low
	Absent	98	85.2		
	Total	115	100		
Pulmonary edema	Present	15	13.0	1.87±0.338	Low
	Absent	100	87.0		
	Total	115	100		
Pneumonia	Present	28	24.3	1.75±0.431	Low
	Absent	87	75.7		
	Total	115	100		
Atelectasis	Present	40	34.8	1.77±0.420	Low
	Absent	75	65.2		
	Total	115	100		

"(M.s) Mean of Scores, (SD) Standard deviation, Level of Assessment (High=1-1.33, Moderate=1.34-1.66, Low=1.67-2)"

4.3.4. Postoperative complications related to postoperative vomiting

In Table (4-3-4), In terms of statistical mean and standard deviation, the results recorded that, the cranial surgery patients showed a moderate complications in terms of early postoperative vomiting (< 4h) as indicated by high mean of scores (1.35±0.481) (M.s ≥1.67) and low complication in terms of late postoperative vomiting (≥ 4h) as indicated by moderate mean of scores (1.69±0.465) (M.s 1.34-1.66).

Table (4-3-4): Postoperative complications related to Postoperative Vomiting

Vomiting Complication	Responses	Freq.	%	M.s ± SD	Ass.
Early postoperative vomiting (< 4h)	Present	74	64.3	1.35±0.481	Moderate
	Absent	41	35.7		
	Total	115	100		
Late postoperative vomiting (≥ 4h)	Present	36	31.3	1.69±0.465	Low
	Absent	79	68.7		
	Total	115	100		

"(M.s) Mean of scores, (SD) Standard deviation, Level of assessment (High=1-1.33, Moderate=1.34-1.66, Low=1.67-2)"

4.3.5. Postoperative complications related to body temperature

The cranial surgery patients were showed a low complications in terms of complication associated body temperature as indicated by high mean of scores (M.s≥1.67). These results were shown in Table (4-3-5).

Table (4-3-5): Postoperative complications related to body temperature

Body temp. complication	Responses	Freq.	%	M.s ± SD	Ass.
Hyperthermia	Present	32	27.8	1.72±0.450	Low
	Absent	83	72.2		
	Total	115	100		
Hypothermia	Present	26	22.6	1.77±0.420	Low
	Absent	89	77.4		
	Total	115	100		

"(M.s) Mean of Scores, (SD) Standard deviation, Level of Assessment (High=1-1.33, Moderate=1.34-1.66, Low=1.67-2)"

4.3.6. Postoperative complications related to metabolic disorder

In Table (4-3-6), the cranial surgery patients were showed a moderate complications related to metabolic disorder as indicated by moderate mean of scores (M.s 1.34-1.66), a high complication in terms of Hyperglycaemia (M.s ≤1.33) and low complications in terms of Diabetes insipidus as indicated by high mean of scores (M.s ≥1.67).

Table (4-3-6): Postoperative complications related to Metabolic Disorder

Metabolic Complication	Responses	Freq.	%	M.s ± SD	Ass.
Hyperglycemia	Present	83	72.2	1.27±0.450	High
	Absent	32	27.8		
	Total	115	100		
Hypoglycemia	Present	69	60.0	1.40±0.492	Moderate
	Absent	46	40.0		
	Total	115	100		
Diabetes insipidus	Present	21	18.3	1.81±0.388	Low
	Absent	94	81.7		
	Total	115	100		
Dysnatremia	Present	71	61.7	1.38±0.488	Moderate
	Absent	44	38.3		
	Total	115	100		

"(M.s) Mean of scores, (SD) Standard deviation, Level of assessment (High=1-1.33, Moderate=1.34-1.66, Low=1.67-2)"

4.4. Overall Postoperative complication for cranial surgery patients

In Table (4-4), the results indicate that (71.3%) of the studied sample after cranial surgery had a moderate complications as described by moderate average (31.63±3.03), in Figure (4-4) show the overall complications, the

neurological and hemodynamic complication were most common after cranial surgery (M=1.34), followed by metabolic complications (M=1.46), followed by complication associated vomiting (M=1.52), followed by complication related to body temperature (M=1.74) and complications associated respiratory system (M=1.78) for each them respectively.

Table (4-4): Overall postoperative complication for cranial surgery patients

Complication	Freq.	%	M ± SD
High (M=21-28)	18	15.7	31.63 ± 3.03
Moderate (M=28.1-35)	82	71.3	
Low (M=35.1-42)	15	13.0	
Total	115	100	

M: Mean for total score, SD=Standard Deviation for total score

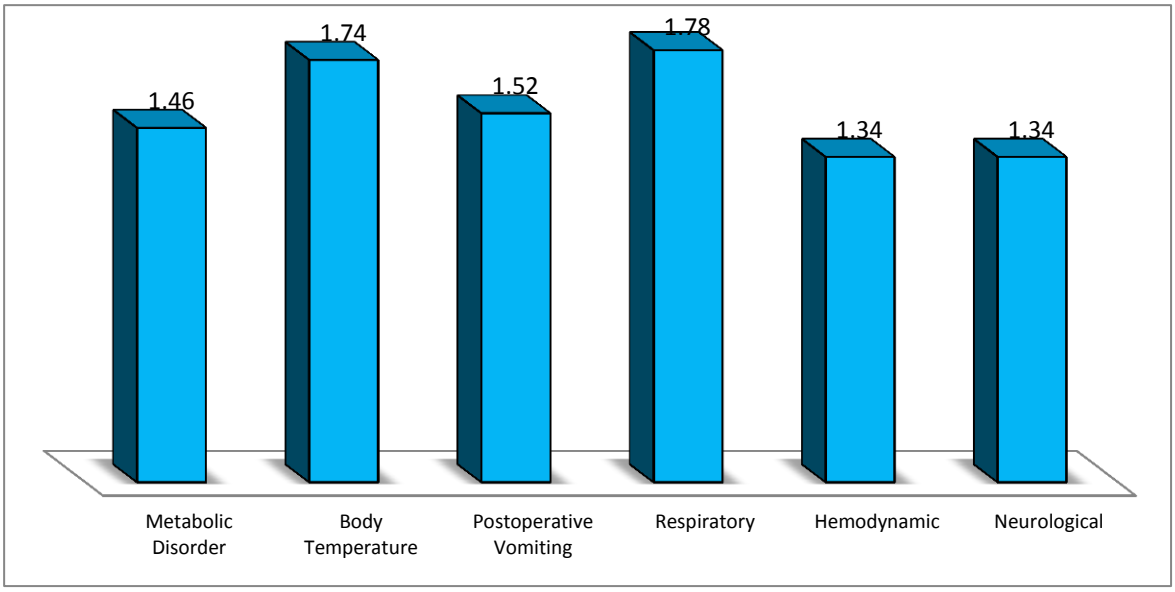


Figure (4-4): Overall postoperative complication for cranial surgery patients

Chapter Five

Discussion

Chapter Five

Discussion of the results

Intracranial surgeries are among the most crucial procedures done just on human body. The whole therapy approach has physical, mental, and emotional effects on the patient. To provide excellent care and achieve the best possible result after cranial surgery, nurses must be aware about the kind of surgical procedure planned, its length, and any problems (Elmowla *et al.,* 2015).

Through this present chapter, the results of the study were carefully discussed with supporting evidence provided because they are available in the literature and in relation to the objectives of the study.

5.1. Distribution of study groups by socio-demographic characteristics

Table (4-1) revealed the percentages of the demographical data of the sample including age, gender, education level and occupation, the results showed that, the mean difference (45 ±17.35) at range from (40-49) years old were recorded the highest percentage (20.9%) with significant difference (P 0.001) (Table 4-1-1). These results agreed with results obtained by Mohamad & El-khayat, (2015) who found that patients with cranial surgeries were highest in mean (41.25±5.83) in the age range between 30-45 years old with significant differences. Bin-Madhi, (2012) found that an age with an average age around (47) yrs. showed significant differences in patients with cranial surgeries.

The patient age dependency has associated with the risk causing problems after surgery (Schipmann *et al.,* 2019). Giese *et al.,* (2021) who

found that 54.4 percent of children and adolescents had cranial surgeries owing to bony flap osteonecrosis, which was related with early age and persistent shunt insertion, but these results were disagreement with results in this study. However, other author reported that there was an increased complication rate after cranial surgeries in patients with an age > 60 years (Lang et al., 2018).

Regarding gender, the results showed that more than half of the study sample were male (66.1%) as compared with those who were female (33.9%) with no significant differences between them (Table 4-1-2). These results were consistent with the results obtained by Venkatapura *et al.,* (2021), which found that the number of males is more than that of females (62.4%/37.6), respectively.

Another study by Irshad *et al.,* (2018) found that, the study sample of male patients with complication after cranial surgeries were (63.3 %) more than female (36.7%). while a study by Ekşi *et al.,* (2019) were disagree with the present study, it was reported that, a total of 140 females (77.8%) and 40 males (22.2%) with postoperative complications after cranial surgery. Another study by Abel *et al.,* (2012) demonstrated the results of determining minor postoperative complications related to cranial surgeries, and it was revealed that 131 males (26%) and 374 females (74%) induced this complication but, it disagreed with the results in the present study. The causes of increased males in a study by Salehpour *et al.,* (2019) revealed that brain tumours are more common in men than women of all ages. In addition, this present study emphasizes that more males are involved in commercial vehicles, motorcycles, and technical works in our environment (Researcher).

According to the level of education, the results showed that primary education was recorded higher rate (33.9%) than others. Because they are of different degrees and they are not united by one specialty (Researcher).

Primary education was the higher proportion in the study of (Moursy and Ead, 2014) due to the geographical area and cultural factors.

Related to occupation, the findings as mostly distributed between free business and retired (22.6%) for each of them with significant differences (Table 4-1-3). These results came along with results obtained by Gao et al., (2010) who found that (26.7%) of patients were craftsmen who have cranial surgeries .

A study by Afifi et al., (2010) found the highest percentage was (62%) of patients with the free jobs have cranial operations, whereas Nnadi, (2010) stated that, most male in rate (59.7%) and (32.8%) female patients were retired who have cranial surgery .

In our country (Iraq), Ahmadi et al., (2013) found that patients have chronic diseases with retired age which may be affected by the improvement of the cranial surgeries.

5.2. Descriptive statistic of clinical data

The finding demonstrated in table (4-2) that, the clinical data of the participants (present history) recorded the highest percentage (58.3%) with statistically significant differences (Table 4-2-1). The results were consistent with those of Sivanaser et al., (2010) who found that patients with a history of various chronic diseases such as respiratory disease, cardiovascular disease, diabetes, renal impairment and liver disease were at high risk of complications after cranial surgery (63.3%). The subject with regard to chronic diseases recorded the highest percentage of the study sample who did not have chronic

diseases by (63.5%), with statistically significant differences in (Table 4-2-2). This also appears in the work of Lin *et al.*, (2019) that there was a rate of increased complications after cranial surgery in patients who had a history of chronic disease, including pneumonia (odds ratio = 90.3; 95% confidence interval: 60.3-135), and were at increased risk of death after 30 days of surgery.

Medical history is important for finding the relationship between past illness and current problems so the surgical care team must pay more attention to this specific population (researcher).

With regard to drug consumption for chronic diseases, the current study revealed that (63.5%) of the sample were patients who were not associated with any medication used with no statistically significant differences between the study criteria (Table 4-2-3). This finding is consistent with (Hockey *et al.*, 2009) who stated that all current medications and ongoing allergies should be reviewed. Continuing before surgery for most ongoing medications is usually simple, but ongoing treatment of neurological disorders depends on the recommendations of a neurosurgeon or neurologist.

Consultation with specialists such as hematologist, cardiologist and surgeon is useful for understanding the pharmacodynamic effects of most chronic medications used to avoid undesirable outcomes in the perioperative and postoperative period (Researcher).

Regarding previous surgery, (58.3%) of the patients had previous surgery with significant difference (Table 4-2-4). These results were agreement obtained by Vidotto et al., (2011)who found that, the majority of patients in study groups in rate (60.7%) have previous surgery. In same line ،Zhang *et al.,* (2018) who found that the (48.2%) of patients have had abdominal surgery before. Patients with a previous history were more likely to have underlying disease and presented with more laboratory values. Pneumonia was the most

common pathogen. Previous surgery appears to increase the incidence of complications related to current surgery. Another study, Hu and Lieberman,(2019) shows that patients who have undergone two or even more prior procedures have a higher incidence of complications and a poorer functional level (p-value 0.05). Patients with three or even more prior procedures had a substantially greater incidence of reoperation and at risk for complication after surgery.

Previous operations are very important in terms of location and size, especially if the patient had a previous skull or vascular operation and respiratory, because it has a negative impact on the patient's condition, which leads to an increase in complications after cranial surgeries(researcher) .

Regarding to type of surgery ,craniectomy , it was a mostly conducted in rate (47.8%), In table (4-2-5)there were significant differences between complications of cranial surgery with type of surgery (p-value 0.000). As being the Craniotomy and Craniectomy is significantly associated with higher complications [low average with mean (1.42±0.075)].

These results agree with results obtained by Chidambaram et al., (2015) for (50) patients under wanted cranial surgeries (shunt , craniotomy , craniectomy) in rate (11.85%, 23.69% ,12.40%) respectively, who scored craniotomy in the highest percentage with the occurrence of many complications (p-value 0.04).

In Table (4-2-6), there were significant differences between complications of cranial surgery with site of surgery (p-value 0.000). That was, the cranial surgery at temporal and occipital were significant complications [lower average with mean (1.33±0.084)].

Survival was much higher for individuals with illness confined to the forehead, parietal, either posterior fossa, but there was no change in terms of brain hemisphere. In addition, the poor prognosis of diseases inside the temporal or occipital lobes was associated to tumour size and midline extension. (p-value 0.0003), (Yuile *et al.*, 2006).

However, there were significant differences between complications of cranial surgery with duration of surgery (p-value 0.001). That was, the cranial surgery at >6 Hours were significant complications [lower average with mean (1.48±0.251)] as shown in Table (4-2-7).This result supported by (Chidambaram et al., 2015) who recorded the higher rate of cranial procedures ($p<0.001$) among the infected patients. Another study recorded by Golebiowski et al., (2015) 18.6 percent of all patients experienced extracranial problems, among 14.3, 17.7, 22.1, as well as 37.4 percent following surgeries lasting just under 2, 2–4, 4–6, and 6 hours, respectively (p-value 0.02). In multivariate analysis, hourly surgery length with neurological impairments was related of extra cranial problems [odds ratio 1.47 (1.02–2.11)]. There was even a significant connection between an increased risk of wound infection and a longer length of operation (p-value 0.001).

There were significant differences between complications of cranial surgery with GCS (p-value 0.000). The cranial surgery of sever GCS were significant complications [lower average with mean (1.48±0.21)] as shown in Table ((4-2-8), and distribution of complications according to level of conscious (GCS) were shown in Figure (4-2-8).

With previous study carried out by Rahmanian *et al.,* (2017) related to surgical outcomes of patient with very tiny intracranium aneurysms:

Experiences from the a Centralised Location on Southern Iran significance between GCS and post-operative complication p.value <0.001.

5.3. Postoperative complications for cranial surgeries patients

5.3.1. Complications related to neurological system

In Table (4-3-1), the results recorded that, the cranial surgery patients showed a moderate complications related to neurological system as indicated by moderate mean of scores (M.s=1.33-1.66) at all studied complications except, the dysphasia and seizure were highly neurological complications as showed by low mean of scores (M.s ≤1.33). This coincide with Ersoy *et al* ., (2020) related to In 34/679 instances (5.1%), EPS seizures have been seen, with Seventeen patients (2.5%) experiencing multiple seizures. At least once generalized seizure occurred in 14 individuals (2.1%). And over half the patients suffered seizures during the first 3 days after the surgery, and 29/34 (or 85.3%) during the first week.

Supported by study carried out by Lonjaret *et al* ., (2017) The most common forms of tumors were dangerous glioma (31 percent) with meningioma (28 percent). 49 (29 percent) preoperative patients experienced seizures, whereas 42 (25 percent) had motor deficits. 55 percent of the patients, or 92, did not have problems. 51% of the patients had one problem, 10% had two problems, and 4% had more than two problems PONV has been the most common post-surgical complication, occurring in 42 (25 percent) of patients, especially during the early post-operative period, preceding neurological and cardiac problems. Twenty-six individuals (16%) experienced at least once neurologic consequence, including 12 (7%) with a new motor

impairment, 10 (6%) with a decline in consciousness, 6 (4%) with dysphasia, as well as 2 (1%) with seizures.

Various factors, such as genetic anomalies, congenital malformations, infections, and difficulties associated with one's diet, lifestyle, or even the environment may all contribute to neurological illnesses and Injuries to the brain, vertebral column, or nerves . Some for these complications involve sudden with undesirable events due to poor management (researcher).

5.3.2. Complications related to hemodynamic

In Table (4-3-2), the results recorded that, the cranial surgery patients showed a high complications related to tachycardia (>100/bpm) with mean difference (1.29±0.458), and arterial hypertension (>110 mmHg) with mean difference (1.27±0.450) as indicated by low mean of scores (M.s≤1.33).

While Flexman et al., (2010) related to after-effects of a craniotomy: severe and persistent discomfort recorded hypertension was the most often encountered cardiovascular problem, prior to bradycardia with hypotension. (7) percent of patients reported acute discomfort. The intensity of post-craniotomy pain is typically underestimated, although it may be effectively treated using a variety of treatment modalities.

Hypertension to be a common complication of neurosurgical procedures, it may precipitate intracranial hemorrhage. It may be related to fluid overload, vasoconstriction medications, hyperthermia, anesthesia, pain, hyper apnea, and pre-existing of hypertension (researcher).

5.3.3. Complications related to respiratory system

The results of table (4-3-3) illustrated that the cranial surgery patients showed little complications related to acute respiratory system complications as indicated by high mean scores (1.85±0.356) at all studied complications (M.s≥ 1.67).

In a previous study carryout by Chari et al. (2006) found respiratory problems in just 0.99 percent of individuals in a prior research of 100 patients. Patients who had both intracranial and spinal surgery were included in the research. Patients who needed immediate admission to an (ICU) were not included in the trial and were only monitored for the first four hours after the procedure.

After a cranial surgeries, a person's lungs are at risk. The respiratory system dynamics of brain-damaged individuals absent pulmonary disease are altered, principally by an increase in respiratory system aptitudes and capacities and airway impedance and hypoxemia, respectively. (researcher).

5.3.4. Complications related to postoperative vomiting

Related to the results in a table (4-3-4), the terms of statistical mean and standard deviation, recorded that, the cranial surgery patients showed moderate complications in terms of early postoperative vomiting (<4h) as indicated by high mean of scores (1.35±0.481) (M.s ≥1.67) and low complication in terms of late postoperative vomiting (≥ 4h) as indicated by moderate mean of scores (1.69±0.465) (M.s 1.34–1.66).

In the study of Lonjaret *et al*., (2017), their results point out that 31.1% of a patients had at most one symptom of an issue (25 percent) of them suffered from postoperative nausea and vomiting.

After general anesthetic, PONV is a prevalent issue. This was the case in 20-30 percentage of patients with Morgan *et al*.,(2006).(PONV) is common in 20% to 30% of surgical patients, however there is a large variation in incidence across studies from the (range 80 to 90 percent .) (Brunicardi, *et al.*, 2010).

The factors associated with the risk of vomiting after cranial operations come due to an imbalance in the central nervous system, which leads to changes in the digestive system, and for various reasons, including fluids resulting from anaesthesia, and others related to tension of the nerve responsible for balance (researcher).

5.3.5. Complications related to body temperature

The cranial surgery patients showed few complications in relation to body temperature as indicated by high mean scores (M.s≥1.67). These results were shown in Table (4-3-5).

The previous study revealed concerning the fever postoperative, Most patients (21%) had a persistent fever (temperatures above 38c), while the lowest (7%) had a fever, (Helal and Muhbesb,2017).

Another study carried out Schortgen *et al.,* (2012) who observe that external coolness is a safe method of fever management that also reduces the need for vasoconstriction and the risk of early death. Yet, An early and active approach to lowering the patient's body temperature is required. Antipyretic drugs administered intravenously or eternally, temperature regulation, and the use of cooling towels or pads.

Usually, patients develop a greater fever after a surgical procedure. It's not unusual for patients to have post-operative fever. So a patient's risk of developing a fever depends on the kind and length of the procedure, age of the

patient, wound site, postoperative infection, as well as due to germs related to the environment of the operating rooms (researcher).

5.3.6. Complications related to metabolic disorder

The present study demonstrates in the results of table (4-3-6), that the cranial surgery patients were showed moderate complications related to metabolic disorder as indicated by moderate mean of scores (M.s 1.34-1.66), a high complication in terms of Hyperglycaemia (M.s ≤1.33) and low complications in terms of Diabetes insipidus as indicated by high mean of scores (M.s ≥1.67).

Lonjaret *et al.,* (2017) reported in their study that the postoperative complications in elective and non-elective neurosurgery recorded hyperglycemia and it was found in 10(6%) of their participants.

When the spotlight is on the surgery and anesthesia there is a hormones are released in response to stress. Insulin sensitivity is reduced by these hormones, which may lead to high blood sugar levels. (researcher).

5.4. Postoperative complication for cranial surgery patients

According to results in a table (4-4), (71.3%) of the studied sample after cranial surgery had moderate complications as described by a moderate (31.63±3.03) in average.

Figures (4-4) show the overall complications, the neurological and hemodynamic complications were most common after cranial surgery (M=1.34), followed by metabolic complications (M=1.46), followed by complications associated with vomiting (M=1.52), followed by a complication related to body temperature (M=1.74) and complications associated respiratory system (M=1.78) for each them respectively.

A previous study by Siqueira and Diccini, (2017) shows this study found a wide range of neurologic and systemic problems.

There was a higher incidence of vomiting and nausea in the early stages of recovery for patients who received elective surgery compared to those who underwent non-elective surgery. Non-elective surgery patients, on the other hand, had increased rates of IH, vascular, light-unresponses pupil needing a revision surgery, use of vasodilation drugs, hypotension, increased heart rate and sinus irregular heartbeats, cardiac arrest, gastroesophageal reflux, electrolyte changes, hypoglycemia, pyrexia and pneumonia inside the post - operative period . Patients who received emergency operation had a greater death rate.

Finally, the nurse should be aware of these risk factors during assessment in the early postoperative period. Since it's possible to develop most of these complications within the first 24 hours, they can be prevented and/or reduce by prompt interaction subsequently on the second or third day.

Chapter six

Conclusions and Recommendations

Chapter six

Conclusions and Recommendations

6.1.Conclusions:

In view of the findings and their discussion, this quantitative review used an assessment approach with questionnaire objects and concludes that:

6.1.1. There are significant differences between postoperative complications according to demographic data except for gender, and according to clinical data except for the medication use for chronic diseases.

6.1.2. There are significant differences between postoperative complications according to the level of consciousness (GCS).

6.1.3. A moderate postoperative complication related to the neurological system according to the motor deficit, deterioration of consciousness, and increased intracranial pressure, whereas there were highly neurological complications according to dysphasia and seizure.

6.1.4. Tachycardia and arterial hypertension, has recorded high postoperative complication, on the other hand, a moderate complication related to bradycardia and arterial hypotension.

In addition, acute respiratory system complications recorded low postoperative complications .

6.1.5. Vomiting is one of the moderate complications in the early postoperative period, but the temperature as one of the late complications was low.

6.2. Recommendations:

According to the above mentioned conclusions, the study recommends the following:

6.2.1. A careful assessment and special care is to be taken for the patient who underwent the carinal surgeries.

6.2.2. Conducting specialized courses for medical and health professionals on postoperative problems following neurosurgery, so that they can recognize and avoid postoperative difficulties.

6.2.3. Establishing awareness leaflets and instructional movies in the wards, pushing and motivating patients to learn more about postoperative complications following neurosurgery.

6.2.4. Further studies should be conducted to help improve nurses' abilities during providing care after cranial surgery.

6.2.5. Activating the hospital's policies related to the care of nervous system operations due to its high risk, strengthening the resuscitation equipment to alleviate severe complications, and selecting a staff with the highest years of experience in this field to manage it.

References

- **المصادر العربية**
- القرآن الكريم : سورة الجمعة آية: ٢
- Abiwinanda, N., Hanif, M., Hesaputra, S. T., Handayani, A., & Mengko, T. R. (2019). Brain tumor classification using convolutional neural network. In *World congress on medical physics and biomedical engineering 2018* (pp. 183-189). Springer, Singapore.
- Alcázar Sánchez-Elvira, L., Bacian Martínez, S., del Toro Gil, L., & Gómez Tello, V. (2020). Postoperative management in the Intensive Care Unit of head and neck surgery patients. *Medicina Intensiva (English Edition)*,*44*(1),46–53. https://doi.org/10.1016/j.medine.2019.05.009.
- Alentorn, A., Hoang-Xuan, K., & Mikkelsen, T. (2016). Presenting signs and symptoms in brain tumors. *Handbook of clinical neurology*, *134*, 19-26.
- AL-Hashimi, M. M., & Alkhateeb, A. N. (2020). Spatial Analysis of Brain and other Cns Cancers Incidence in Iraq During 2000-2015. *Malaysian Journal of Public Health Medicine*, *20*(3), 27–34. https://doi.org/10.37268/MJPHM/VOL.20/NO.3/ART.549.
- Allesee, L., & Gallagher, C. M. (2011). Pregnancy and protection: The ethics of limiting a pregnant woman's participation in clinical trials. *Journal of clinical research & bioethics*, *2*(108).
- Alvarez-Nebreda, M. L., Bentov, N., Urman, R. D., Setia, S., Huang, J. C. S., Pfeifer, K., ... & Javedan, H. (2018). Recommendations for preoperative management of frailty from the Society for Perioperative Assessment and Quality Improvement (SPAQI). *Journal of clinical anesthesia*, *47*, 33-42.

- Abla, A. A., Wait, S. D., Forbes, J. A., Pati, S., Johnsonbaugh, R. E., Kerrigan, J. F., & Ng, Y.-T. (2011). Syndrome of alternating hypernatremia and hyponatremia after hypothalamic hamartoma surgery. *Neurosurgical Focus, 30*(2), E6.
- Abel, N. J., Klaassen, Z., Mansour, E. H., Marano, M. A., Petrone, S. J., Houng, A. P., & Chamberlain, R. S. (2012). Clinical outcome analysis of male and female genital burn injuries: A 15-year experience at a Level-1 Burn Center. *International journal of urology*, *19*(4), 351-358.
- Agrawal, A., Timothy, J., Cincu, R., Agarwal, T., & Waghmare, L. B. (2008). Bradycardia in neurosurgery. *Clinical Neurology and Neurosurgery, 110*(4), 321–327.
- Ahrens, T. (2008). The most important vital signs are not being measured. *Australian Critical Care, 21*(1), 3–5.
- Algahtani, R., & Merenda, A. (2021). Multimorbidity and Critical Care Neurosurgery: Minimizing Major Perioperative Cardiopulmonary Complications. *Neurocritical Care, 34*(3),1047–1061. https://doi.org/10.1007/s12028-020-01072-5.
- Apfel, C. C., Korttila, K., Abdalla, M., Kerger, H., Turan, A., Vedder, I., Zernak, C., Danner, K., Jokela, R., & Pocock, S. J. (2004). A factorial trial of six interventions for the prevention of postoperative nausea and vomiting. *New England Journal of Medicine, 350*(24), 2441–2451.
- Afifi, A. M., Gordon, C. R., Pryor, L. S., Sweeney, W., Papay, F. A., & Zins, J. E. (2010). Calcium phosphate cements in skull reconstruction: a meta-analysis. *Plastic and reconstructive surgery*, *126*(4), 1300-1309.

- Ahmadi, K., Shahidi, S., Nejati, V., Karami, G., & Masoomi, M. (2013). Effects of Chronic Illness on the Quality of Life in Psychiatric out patients of the Iraq–Iran War. *Iranian journal of psychiatry*, *8*(1), 7.
- Badjatia, N. (2009). Hyperthermia and fever control in brain injury. (7 Suppl), S250-7.
- Bin-Madhi, M. K. (2012). Brain tumors excision guided by neuronavigation: Practical application and results. *Doctor thesis, Neurosurgery, Faculty of medicine, Assiut University*, 89.
- Brunicardi F C., Andersen K D., Billiar T R., Dunn D., Hunter J G., Jeffrey, matthems B., Pollock R E. *Schwartz's of principles of surgery, 9th edition*; 2010, p. 1749.
- Bannister, M., Trotter, P., Jawad, A., & Veitch, D. Y. (2016). Airway and head and neck high dependency unit: a single-centre experience. *The Journal of Laryngology & Otology*, *130*(8), 777–780.
- Bausker, S. N. (2018). The recording of fluid balance/intake-output. *Asian Journal of Nursing Education and Research*, *8*(4), 553–554.
- Berker, M., Hazer, D. B., Yücel, T., Gürlek, A., Cila, A., Aldur, M., & Önerci, M. (2012). Complications of endoscopic surgery of the pituitary adenomas: analysis of 570 patients and review of the literature. *Pituitary*, *15*(3), 288–300.
- Bharati, S. J., Pandia, M. P., Rath, G. P., Bithal, P. K., & Dash, H. H. (2015). Respiratory complications in the early post-operative period following elective craniotomies. *Journal of Neuroanaesthesiology and Critical Care*, *2*(02), 114–120.
- Bilotta, F., & Rosa, G. (2010). Glucose management in the neurosurgical patient: are we yet any closer? *Current Opinion in Anesthesiology*, *23*(5),

539–543.

- Borden, N. M., Stefan, C., & Forseen, S. E. (2015). *Imaging Anatomy of the Human Brain: a Comprehensive Atlas Including Adjacent Structures*. Springer Publishing Company.
- Booker, K. J. (2015). Philosophy and treatment in US critical care units. *Critical Care Nursing: Monitoring and Treatment for Advanced Nursing Practice*, 1–12.
- Brooks, C. (2015). Critical care nursing in acute postoperative neurosurgical patients. *Critical Care Nursing Clinics of North America*, *27*(1), 33–45. https://doi.org/10.1016/j.cnc.2014.10.002
- Brown, W. D. (2000). Osmotic demyelination disorders: central pontine and extrapontine myelinolysis. *Current Opinion in Neurology*, *13*(6), 691–697.
- Bui, J. Q. H., Mendis, R. L., Van Gelder, J. M., Sheridan, M. M. P., Wright, K. M., & Jaeger, M. (2011). Is postoperative intensive care unit admission a prerequisite for elective craniotomy? *Clinical article. Journal of Neurosurgery*, *115*(6), 1236–1241. https://doi.org/10.3171/2011.8.JNS11105.
- Burkhart, C. S., and Steiner, L. A. (2020). Altered Mental Status in Neurosurgical Critical Care. In *Essentials of Neurosurgical Anesthesia & Critical Care* (pp. 545-550). Springer, Cham.
- Brommeland, T., Rydning, P. N., Pripp, A. H., & Helseth, E. (2015). Cranioplasty complications and risk factors associated with bone flap resorption. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, *23*(1), 1–7. https://doi.org/10.1186/s13049-015-0155-6.

- Buchman, A. L. (Ed.). (2015). *Nutritional Care of the Patient with Gastrointestinal Disease*. CRC Press.
- Roostaei, T., Nazeri, A., Sahraian, M. A., & Minagar, A. (2014). The human cerebellum: a review of physiologic neuroanatomy. *Neurologic clinics*, *32*(4), 859-869.
- Chauhan, G., Singh, V., Phadke, R., Yadav, S., & Aggarwal, V. (2019). Multiple Cerebral and Systemic Aneurysms in a Case of Left Atrial Myxoma – Are They Related? Journal of Neuroimaging in Psychiatry and Neurology, 04(01), 8–11. https://doi.org/10.17756/jnpn.2019-028
- Chen, M., and Liu, J. (2021). Anesthesia Comlications After Neurosurgical Procedure in Post-Anesthesia Care Unit Running Title : Complications in Post-Anesthesia Care Unit. 1–14.
- Canet, J., and Gallart, L. (2014). Postoperative respiratory failure: pathogenesis, prediction, and prevention. *Current Opinion in Critical Care*, *20*(1), 56–62.
- Chidambaram, S., Nair, M. N., Krishnan, S. S., Cai, L., Gu, W., & Vasudevan, M. C. (2015). Postoperative central nervous system infection after neurosurgery in a modernized, resource-limited tertiary neurosurgical center in South Asia. *World Neurosurgery*, *84*(6), 1668–1673. https://doi.org/10.1016/j.wneu.2015.07.006.
- Capatina, C., Paluzzi, A., Mitchell, R., & Karavitaki, N. (2015). Diabetes insipidus after traumatic brain injury. *Journal of Clinical Medicine*, *4*(7), 1448–1462.
- Carlisle, H. (2015). Promoting the use of capnography in acute care settings: an evidence-based practice project. *Journal of PeriAnesthesia Nursing*, *30*(3), 201–208.

- Crowson, M. G., Cunningham III, C. D., Moses, H., Zomorodi, A. R., & Kaylie, D. M. (2016). Preoperative lumbar drain use during acoustic neuroma surgery and effect on CSF leak incidence. *Annals of Otology, Rhinology & Laryngology, 125*(1), 63–68.
- Daniel, R., Villuri, S., & Furlong, K. (2017). Management of hyperglycemia in the neurosurgery patient. *Hospital Practice, 45*(4), 150–157.
- Dimick, J. B., Chen, S. L., Taheri, P. A., Henderson, W. G., Khuri, S. F., & Campbell Jr, D. A. (2004). Hospital costs associated with surgical complications: a report from the private-sector National Surgical Quality Improvement Program. *Journal of the American College of Surgeons*, *199*(4), 531–537.
- Duffau, H. (2009). A personal consecutive series of surgically treated 51 cases of insular WHO Grade II glioma: advances and limitations. *Journal of neurosurgery*, *110*(4), 696-708.
- Elmowla, R. A. A. A., El-Lateef, Z. A., & El-khayat, R. (2015). Impact of Nursing Educational Program on Reducing or Preventing Postoperative Complications for Patients after Intracranial Surgery. *Journal of Education and Practice*, *6*(9), 60-70.
- Englot, D. J., Young, W. L., Han, S. J., McCulloch, C. E., Chang, E. F., & Lawton, M. T. (2012). Seizure predictors and control after microsurgical resection of supratentorial arteriovenous malformations in 440 patients. *Neurosurgery, 71*(3), 572–580.
- Ersoy, T. F., Ridwan, S., Grote, A., Coras, R., & Simon, M. (2020). Early postoperative seizures (EPS) in patients undergoing brain tumour surgery. *Scientific Reports*, *10*(1), 1-10.

- Ekşi, M. Ş., Canbolat, Ç., Akbaş, A., Özmen, B. B., Akpınar, E., Usseli, M. İ. & Pamir, M. N. (2019). Elderly patients with intracranial meningioma: surgical considerations in 228 patients with a comprehensive analysis of the literature. *World neurosurgery*, *132*, e350-e365.
- Eckman M., Jasmine, T. J. X., Wai-Chi, S. C., and Hegney, D. G. Medical-Surgical Nursing Made Incredibly Easy 3rd edition, *china*, *Lippincott Williams & Wilkins com*., 2012; p. 62.
- Fierstra, J., Machina, M., Battisti-Charbonney, A., Duffin, J., Fisher, J. A., & Minkovich, L. (2011). End-inspiratory rebreathing reduces the end-tidal to arterial PCO2 gradient in mechanically ventilated pigs. *Intensive Care Medicine*, *37*(9), 1543–1550.
- Fiszer, D., Shaw, M.-A., Fisher, N. A., Carr, I. M., Gupta, P. K., Watkins, E. J., Roiz de Sa, D., Kim, J. H., & Hopkins, P. M. (2015). Next-generation sequencing of RYR1 and CACNA1S in malignant hyperthermia and exertional heat illness. *Anesthesiology*, *122*(5), 1033–1046.
- Fitzmaurice, C., Dicker, D., Pain, A., Hamavid, H., Moradi-Lakeh, M., MacIntyre, M. F., Allen, C., Hansen, G., Woodbrook, R., & Wolfe, C. (2015). The global burden of cancer 2013. *JAMA Oncology*, *1*(4), 505–527.
- Flexman, A. M., Ng, J. L., & Gelb, A. W. (2010). Acute and chronic pain following craniotomy. *Current Opinion in Anesthesiology*, *23*(5), 551–557.
- Freeman, J. L., Zacharin, M., Rosenfeld, J. V, & Harvey, A. S. (2003). The endocrinology of hypothalamic hamartoma surgery for intractable

epilepsy. *Epileptic Disorders*, *5*(4), 239–247.

- Fugate, J. E. (2015). Complications of neurosurgery. CONTINUUM: *Lifelong Learning in Neurology*, *21*(5), 1425–1444.
- Fuji, K. T., Abbott, A. A., & Norris, J. F. (2013). Exploring care transitions from patient, caregiver, and health-care provider perspectives. *Clinical Nursing Research*, *22*(3), 258–274.
- Ghavanini, A. A., Scott, C. A., Chan, D. K., & Tang-Wai, D. F. (2013). Management of patients with spontaneous intracranial hypotension causing altered level of consciousness: report of two cases and review of literature. *Cephalalgia*, *33*(1), 43–51.
- Golebiowski, A., Drewes, C., Gulati, S., Jakola, A. S., & Solheim, O. (2015). Is duration of surgery a risk factor for extracranial complications and surgical site infections after intracranial tumor operations? *Acta Neurochirurgica*, *157*(2), 235–240. https://doi.org/10.1007/s00701-014-2286-3.
- Gao, L. L., Rogers, G. F., Clune, J. E., Proctor, M. R., Meara, J. G., Mulliken, J. B., & Greene, A. K. (2010). Autologous cranial particulate bone grafting reduces the frequency of osseous defects after cranial expansion. *Journal of Craniofacial Surgery*, *21*(2), 318-322.
- Godoy, D. A., Di Napoli, M., Biestro, A., & Lenhardt, R. (2012). Perioperative glucose control in neurosurgical patients. *Anesthesiology Research and Practice*, 2012.
- Giese, H., Meyer, J., Unterberg, A., & Beynon, C. (2021). Long-term complications and implant survival rates after cranioplastic surgery: a single-center study of 392 patients. *Neurosurgical review*, *44*(3), 1755-1763.

- Goma, H. M., & Ali, M. Z. (2009). Control of emergence hypertension after craniotomy for brain tumor surgery. *Neurosciences Journal*, *14*(2), 167–171.
- Gadler, T., Gardiner, A., & Martinez, N. (2014). Caring for the postoperative patient with complications presenting to the emergency department. *Advanced Emergency Nursing Journal, 36*(2), 134–144.
- Hockey, B., Leslie, K., & Williams, D. (2009). Dexamethasone for intracranial neurosurgery and anaesthesia. *Journal of clinical neuroscience*, *16*(11), 1389-1393.
- Hanko, M., Soršák, J., Snopko, P., Opšenák, R., Zeleňák, K., & Kolarovszki, B. (2021). Incidence and risk factors of early postoperative complications in patients after decompressive craniectomy: a 5-year experience. *European Journal of Trauma and Emergency Surgery*, *47*(5), 1635–1647. https://doi.org/10.1007/s00068-020-01367-4.
- Hanak, B. W., Walcott, B. P., Nahed, B. V, Muzikansky, A., Mian, M. K., Kimberly, W. T., & Curry, W. T. (2014). Postoperative intensive care unit requirements after elective craniotomy. *World Neurosurgery*, *81*(1), 165–172.
- Habib, A. S., Keifer, J. C., Borel, C. O., White, W. D., & Gan, T. J. (2011). A comparison of the combination of aprepitant and dexamethasone versus the combination of ondansetron and dexamethasone for the prevention of postoperative nausea and vomiting in patients undergoing craniotomy. *Anesthesia & Analgesia*, *112*(4), 813–818.
- Hannon, M. J., Finucane, F. M., Sherlock, M., Agha, A., & Thompson, C. J. (2012). Disorders of water homeostasis in neurosurgical patients.

The Journal of Clinical Endocrinology, 97(5), 1423–1433.

- Hannon, M. J., & Thompson, C. J. (2019). Hyponatremia in neurosurgical patients. *Disorders of Fluid and Electrolyte Metabolism*, 52, 143–160.
- Hooper, V., Wagner, D., Bankieris, K., & Johnson, A. (2016). The relationship of postoperative delirium and unplanned perioperative hypothermia in surgical patients. Journal of PeriAnesthesia Nursing, 36(1), 41-46.
- Helal, A. R., & Muhbesb, F. J. (2017). Assessment of postoperative complications for patients undergoing orthopedics surgery at Al-Hilla teaching hospital. *Iraq Medical Journal*, *1*(1), 20-23.
- Harper, E. (2011). The development of intensive care nursing as a specialty at Wellington Hospital intensive care unit, Wellington, New Zealand, 1964-1989.
- Hines, R. L., & Marschall, K. (2008). Stoelting's anesthesia and co-existing Disease. *Elsevier Health Sciences*.
- Hinkle, J. L., & Heck, C. (2015). Monitoring for neurologic dysfunction. *Critical Care Nursing: Monitoring and Treatment for Advanced Nursing Practice*, 87–103.
- Hooda, B., Chouhan, R. S., Rath, G. P., Lamsal, R., & Bithal, P. K. (2019). Incidence and predictors of postoperative pulmonary complications in patients undergoing craniotomy and excision of posterior fossa tumor. *Journal of Anaesthesiology, Clinical Pharmacology*, *35*(2), 254.
- Hussain, A. M. A., & Lafta, R. K. (2021). Cancer Trends in Iraq 2000–2016. *Oman Medical Journal*, *36*(1), e219.

- Hu, X., & Lieberman, I. H. (2019). Revision adult spinal deformity surgery: Does the number of previous operations have a negative impact on outcome? *European Spine Journal*, *28*(1), 155–160. https://doi.org/10.1007/s00586-018-5747-1.
- Hwang, J. L., & Weiss, R. E. (2014). Steroid-induced diabetes: a clinical and molecular approach to understanding and treatment. *Diabetes/Metabolism Research and Reviews*, *30*(2), 96–102.
- Ingraham, A. M., Richards, K. E., Hall, B. L., & Ko, C. Y. (2010). Quality improvement in surgery: the American College of Surgeons national surgical quality improvement program approach. *Advances in Surgery*, *44*(1), 251–267.
- Irshad, M., Manzoor, C. A., & Aamir, M. (2018). The frequency of infection in early versus late surgery of compound depressed skull fractures in adults. *International Surgery Journal*, *5*(2), 538-543.
- Iglesias, J. E., Van Leemput, K., Bhatt, P., Casillas, C., Dutt, S., Schuff, N., Truran-Sacrey, D., Boxer, A., Fischl, B., & Initiative, A. D. N. (2015). *Bayesian segmentation of brainstem*.
- Jarvis, C. (2019). *Physical Examination and Health Assessment E-Book*. Elsevier Health Sciences.
- Jahangiri, A., Wagner, J., Tran, M. T., Miller, L. M., Tom, M. W., Kunwar, S., Blevins, L., & Aghi, M. K. (2013). Factors predicting postoperative hyponatremia and efficacy of hyponatremia management strategies after more than 1000 pituitary operations. *Journal of Neurosurgery*, *119*(6), 1478–1483.
- Kehler,G., Orlovska-Waast, S., Köhler-Forsberg, O., Brix, S. W. (2013). Post-traumatic cerebrospinal fluid rhinorrhea associated with

craniofacial fibrous dysplasia: Case report and literature review.

- Kruchko, C., Ostrom, Q. T., Gittleman, H., & Barnholtz-Sloan, J. S. (2018). The CBTRUS story: Providing accurate population-based statistics on brain and other central nervous system tumors for everyone. *Neuro-Oncology,20*(3),295–298. https://doi.org/10.1093/neuonc/noy006.
- Kosuke Tsubaki, S. I., & Kawaguchi, M. (2017). A diagnostic dilemma in an alert patient with pulmonary oedema following craniotomy: A case report. *Colombian Journal of Anestesiology*, 45, 71–75.
- Kotake, Y., Matsumoto, M., Yorozu, T., & Takeda, J. (2009). Recurrent ST-segment elevation on ECG and ventricular tachycardia during neurosurgical anesthesia. *Journal of Anesthesia, 23*(1), 115–118.
- Laprovitera, N., Riefolo, M., Ambrosini, E., Klec, C., Pichler, M., & Ferracin, M. (2021). Cancer of unknown primary: challenges and progress in clinical management. *Cancers, 13*(3), 451.
- Lang, J. D., Grell, L., Hagge, M., Onugoren, M. D., Gollwitzer, S., Graf, W. & Hamer, H. M. (2018). Long-term outcome after epilepsy surgery in older adults. *Seizure*, *57*, 56-62.
- Leinonen, V., Vanninen, R., & Rauramaa, T. (2018). Raised intracranial pressure and brain edema. *Handbook of Clinical Neurology*, 145, 25–37.
- Leslie, K., & Williams, D. L. (2005). Postoperative pain, nausea and vomiting in neurosurgical patients. *Current Opinion in Anesthesiology*, *18*(5), 461–465.
- Liddle, C. (2013). How to reduce the risk of deterioration after surgery. *Nursing Times, 109*(23), 16–17.
- LoBiondo-Wood, G., & Haber, J. (2014). Reliability and validity. Nursing research. Methods and critical appraisal for evidence based

practice, 289-309.

- Louis, D. N., Perry, A., Reifenberger, G., Von Deimling, A., Figarella-Branger, D., Cavenee, W. K., Ohgaki, H., Wiestler, O. D., Kleihues, P., and Ellison, D. W. (2016). The 2016 World Health Organization classification of tumors of the central nervous system: a summary. *Acta Neuropathologica*, *131*(6), 803–820.
- Lin, C. S., Chen, C. Y., Yeh, C. C., Chung, C. L., Chen, T. L., & Liao, C. C. (2019). Defining risk of general surgery in patients with chronic obstructive pulmonary diseases. *QJM: An International Journal of Medicine*, *112*(2), 107-113.
- Lonjaret, L., Guyonnet, M., Berard, E., Vironneau, M., Peres, F., Sacrista, S., Ferrier, A., Ramonda, V., Vuillaume, C., & Roux, F.-E. (2017). Postoperative complications after craniotomy for brain tumor surgery. *Anaesthesia Critical Care & Pain Medicine*, *36*(4), 213–218.
- Markandaya, J., Thomas, K. P., Jahromi, B., Koenig, M., Lockwood, A. H., Nyquist, P. A., ... & Ziai, W. C. (2012). The role of neurocritical care: a brief report on the survey results of neurosciences and critical care specialists. *Neurocritical care*, *16*(1), 72-81.
- Mahajan, S., & Bhagat, H. (2016). Cerebral oedema: Pathophysiological mechanisms and experimental therapies. *Journal of Neuroanaesthesiology and Critical Care*, *03*(04), S22–S28. https://doi.org/10.4103/2348-0548.174731
- Marshall, J. C., Bosco, L., Adhikari, N. K., Connolly, B., Diaz, J. V., Dorman, T., Fowler, R. A., Meyfroidt, G., Nakagawa, S., Pelosi, P., Vincent, J. L., Vollman, K., & Zimmerman, J. (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*, 37, 270–276. https://doi.org/10.1016/j.jcrc.2016.07.015

- Mashour, G. A., Woodrum, D. T., & Avidan, M. S. (2015). Neurological complications of surgery and anaesthesia. *British Journal of Anaesthesia, 114*(2), 194–203.
- Marley RA, Calabrese T, Thompson KJ. Preoperative evaluation and preparation of the patient In: Nagelhout JJ, Plaus KL, eds. Nurse Anesthesia 5ed. St. Louis, MO: *Saunders Elsevier*; 2014:335-381.
- Moursy, A. M. E. S., & Ead, A. Y. S. (2014). Self-care practices of chemotherapy patients. *Life Science Journal*, *11*(4), 212-22.
- McClave, S. A., Taylor, B. E., Martindale, R. G., Warren, M. M., Johnson, D. R., Braunschweig, C., McCarthy, M. S., Davanos, E., Rice, T. W., & Cresci, G. A. (2016). Guidelines for the provision and assessment of nutrition support therapy in the adult critically ill patient: Society of Critical Care Medicine (SCCM) and American Society for Parenteral and Enteral Nutrition (ASPEN). JPEN. *Journal of Parenteral and Enteral Nutrition, 40*(2), 159–211.
- Morgan, G. Edward, Mikhail, Maged S., Murray, Michael J. (2006). *Clinical anesthesiology* (fourth ed.). New York: McGraw-Hill Companies, Inc.
- Mohamad, Z. A. E. L., & El-khayat, R. A. E. A. (2015). Impact of Nursing Educational Program on Health Promotion for Patients after Intracranial Surgery. *Assiut Scientific Nursing Journal, 3*(5), 18-33.
- Mehta, R. (2019). Trainee GP, Chinthapalli K. *Consultant, N. Glasgow coma scale explained. BMJ*, *365*, l1296.
- Middleton, P. M. (2012). Practical use of the Glasgow Coma Scale; a

comprehensive narrative review of GCS methodology. *Australasian Emergency Nursing Journal*, *15*(3), 170–183.

- Mohamed, I. R., & Mohamed, E. E.-E. (2013). Nursing Practices for patients at risk to the pressure sores in Minia University Hospital. *Journal of American Science, 9*(4), 471–478.
- Moore, T. (2016). Monitoring and interpreting. Clinical Skills for Nursing Practice, 233–285.
- Myburgh, J., Abillama, F., Chiumello, D., Dobb, G., Jacobe, S., Kleinpell, R., Koh, Y., Martin, C., Michalsen, A., & Pelosi, P. (2016). End-of-life care in the intensive care unit: Report from the Task Force of World Federation of Societies of Intensive and Critical Care Medicine. *Journal of Critical Care*, 34, 125–130.
- Mekhlef, A. K., Hameed, I. H., & Khudhair, M. E. (2017). Prevalence of Physical Injuries on the Head, neck and Entire body in, Hilla, Iraq. *Research Journal of Pharmacy and Technology, 10*(10), 3276–3282.
- Miller, K. D., Ostrom, Q. T., Kruchko, C., Patil, N., Tihan, T., Cioffi, G., Fuchs, H. E., Waite, K. A., Jemal, A., and Siegel, R. L. (2021). Brain and other central nervous system tumor statistics, 2021. CA: A Cancer Journal for Clinicians, 71(5), 381–406.
- Mekitarian Filho, E., Brunow De Carvalho, W., Cavalheiro, S., Horigoshi, N. K., and Freddi, N. A. (2012). Perioperative factors associated with prolonged intensive care unit and hospital length of stay after pediatric neurosurgery. *Pediatric Neurosurgery, 47*(6), 423–429. https://doi.org/10.1159/000339312.
- Mary, L.,and Adrian , B. (2017). Common postoperative complications. *In Journal of the Indian Medical Association* (Vol. 97, Issue 5).

https://doi.org/10.1017/9781108297783.008.

- Moyle, S. (2017). Postoperative complications clinical guidelines for nurses. *In Ausmed*. https://www.ausmed.com/cpd/articles/postoperative-complications.
- Noordzij, P. G., Poldermans, D., Schouten, O., Bax, J. J., Schreiner, F. A. G., & Boersma, E. (2010). Postoperative mortality in the Netherlands: A population-based analysis of surgery-specific risk in sdults. *Anesthesiology,112*(5),1105–1115. https://doi.org/10.1097/ALN.0b013e3181d5f95c.
- Nicholson, M., & Hillman, K. (2015). Vital Signs : From Monitoring to Prevention of Deterioration in General Wards. 533–545. https://doi.org/10.1007/978-3-319-13761-2
- NIGIM, F., CRITCHLOW, J. F., & KASPER, E. M. (2015). Role of ventriculoperitoneal shunting in patients with neoplasms of the central nervous system: An analysis of 59 cases. *Molecular and Clinical Oncology*, *3*(6), 1381–1386. https://doi.org/10.3892/mco.2015.627
- Norman C. J and Keegan C. *#90761Postoperative complications*, NetCE.com. September 21, 2015; p.3. Available at: *http://www.netce.com/coursecontent.php?courseid=1148works=true#bibl.workscited.NetCE•Sacramento,California*.
- Nanda, A.L., Kim, H. J., Kwon, T. Y., Jeon, Y. S., Kang, S. G., Rhee, Y. G., & Rhee, S. M. (2018). Neurologic deficit after reverse total shoulder arthroplasty: correlation with distalization. Journal of Shoulder and Elbow Surgery, 29(6), 1096-1103.
- NNADI, M. O. N. (2010). OUTCOME OF SURGICAL INTERVENTION ON TRAUMATIC BRAIN INJURY PATIENTS IN LAGOS UNIVERSITY TEACHING HOSPITAL. *Faculty of SURGERY*.

- Ormond, D. R., & Hadjipanayis, C. G. (2014). The history of neurosurgery and its relation to the development and refinement of the frontotemporal craniotomy. *Neurosurgical Focus*, *36*(4), 1–11. https://doi.org/10.3171/2014.2.FOCUS13548
- Östberg, E., Thorisson, A., Enlund, M., Zetterström, H., Hedenstierna, G., & Edmark, L. (2019). Positive end-expiratory pressure and postoperative atelectasis: A randomized controlled trial. *Anesthesiology*, *131*(4), 809–817.
- Ozuna, J., Stecker, M., Walter, S. M., Maytum, J., & Krause, A. (2016). Care of Adults and Children With Seizures and Epilepsy: AANN Clinical Practice Guideline Series. *Chicago, IL: American Association of Neuroscience Nurses.*
- Palmer, B. F. (2003). Hyponatremia in patients with central nervous system disease: SIADH versus CSW. *Trends in Endocrinology & Metabolism*, *14*(4), 182–187.
- Pandhi, A., & Elijovich, L. (2018). Postoperative positioning in the neurointensive care unit. In *Perioperative Considerations and Positioning for Neurosurgical Procedures* (pp. 241-249). Springer, Cham.
- Perez-Barcena, J., Llompart-Pou, J. A., & O'Phelan, K. H. (2014). Intracranial pressure monitoring and management of intracranial hypertension. *Critical Care Clinics, 30*(4), 735–750.
- Phan, K., Moore, J. M., Griessenauer, C., Dmytriw, A. A., Scherman, D. B., Sheik-Ali, S., Adeeb, N., Ogilvy, C. S., Thomas, A., & Rosenfeld, J. V. (2017). Craniotomy versus decompressive craniectomy for acute subdural hematoma: systematic review and meta-analysis. *World*

Neurosurgery, 101, 677–685.

- Philips, A., Henshaw, D. L., Lamburn, G., & O'Carroll, M. J. (2018). Brain tumours: Rise in glioblastoma multiforme incidence in England 1995-2015 Suggests an Adverse Environmental or Lifestyle Factor. *Journal of Environmental and Public Health*, 2018. https://doi.org/10.1155/2018/7910754.
- Popugaev, K. A., & Lubnin, A. Y. (2015). Postoperative care in neurooncology. In Neurointensive Care (pp. 95–123). Springer.
- Rudolphi, D. M. (2019). Postoperative Care. *Lewis's Medical-Surgical Nursing E-Book: Assessment and Management of Clinical Problems, Single Volume*, 328.
- Rahman, M., Abbatematteo, J., De Leo, E. K., Kubilis, P. S., Vaziri, S., Bova, F., Sayour, E., Mitchell, D., & Quinones-Hinojosa, A. (2016). The effects of new or worsened postoperative neurological deficits on survival of patients with glioblastoma . *Journal of Neurosurgery, 127*(1), 123–131.
- Rao, G. S., & Muthuchellappan, R. (2020). Neurologic Emergencies After Neurosurgery. In *Essentials of Neurosurgical Anesthesia & Critical Care* (pp. 501-506). Springer, Cham.
- Rau, C.-S., Wu, S.-C., Chen, Y.-C., Chien, P.-C., Hsieh, H.-Y., Kuo, P.-J., & Hsieh, C.-H. (2017). Effect of age on Glasgow Coma Scale in patients with moderate and severe traumatic brain injury: an approach with propensity score-matched population. *International Journal of Environmental Research and Public Health, 14*(11), 1378.
- Reisner-Sénélar, L. (2011). The birth of intensive care medicine: Björn Ibsen's records. *Intensive care medicine, 37*(7), 1084-1086.

- Rhondali, O., Genty, C., Halle, C., Gardellin, M., Ollinet, C., Oddoux, M., Carcey, J., Francony, G., Fauvage, B., & Gay, E. (2011). Do patients still require admission to an intensive care unit after elective craniotomy for brain surgery? *Journal of Neurosurgical Anesthesiology, 23*(2), 118–123.
- Robba, C., Ortu, A., Bilotta, F., Lombardo, A., Sekhon, M. S., Gallo, F., & Matta, B. F. (2017). Extracorporeal membrane oxygenation for adult respiratory distress syndrome in trauma patients: A case series and systematic literature review. *Journal of Trauma and Acute Care Surgery, 82*(1), 165–173.
- Rogers, A. E., Dean, G. E., Hwang, W. T., & Scott, L. D. (2008). Role of registered nurses in error prevention, discovery and correction. *BMJ Quality & Safety, 17*(2), 117–121.
- Rowe, A. S., Goodwin, H., Brophy, G. M., Bushwitz, J., Castle, A., Deen, D., Johnson, D., Lesch, C., Liang, N., & Potter, E. (2014). Seizure prophylaxis in neurocritical care: a review of evidence-based support. Pharmacotherapy: *The Journal of Human Pharmacology and Drug Therapy, 34*(4), 396–409.
- Rodriguez, L. (2015). Pathophysiology of pain: Implications for perioperative nursing. *AORN Journal, 101*(3), 338–344.
- Rahmanian, A., Ghaffarpasand, F., & Derakhshan, N. (2017). Surgical Outcome of Patients with Very Small Intracranial Aneurysms: A Single-Center Experience from Southern Iran. *World Neurosurgery*, 98, 470–478. https://doi.org/10.1016/j.wneu.2016.11.086.
- Rolston, J. D., Han, S. J., Lau, C. Y., Berger, M. S., & Parsa, A. T. (2014). Frequency and predictors of complications in neurological

surgery: national trends from 2006 to 2011. *Journal of neurosurgery*, *120*(3), 736-745.

- Siqueira, E. M. P., & Diccini, S. (2017). Postoperative complications in elective and non-elective neurosurgery. *ACTA Paulista de Enfermagem*, *30*(1), 101–108. https://doi.org/10.1590/1982-0194201700015.
- Sata, A., Hizuka, N., Kawamata, T., Hori, T., & Takano, K. (2006). Hyponatremia after transsphenoidal surgery for hypothalamo-pituitary tumors. *Neuroendocrinology*, *83*(2), 117–122.
- Sivanaser, Vanitha; Manninen, Pirjo (2010). Preoperative Assessment of Adult Patients for Intracranial Surgery. *Anesthesiology Research and Practice*, (2010), 1–11. doi:10.1155/2010/241307.
- Salehpour, F., Mirzaei, F., Meshkini, A., Parsay, S., Salehi, S., & Asl, M. M. B. (2019). Trends in primary brain tumors: A 5-year retrospective histologically confirmed study in Tabriz, Iran, 2011–2016. *Asian Journal of Neurosurgery*, *14*(2), 427.
- Schortgen, F., Clabault, K., Katsahian, S., Devaquet, J., Mercat, A., Deye, N., ... & Brochard, L. (2012). Fever control using external cooling in septic shock: a randomized controlled trial. *American journal of respiratory and critical care medicine*, *185*(10), 1088-1095.
- Schipmann, S., Brix, T., Varghese, J., Warneke, N., Schwake, M., Brokinkel, B., Ewelt, C., Dugas, M., & Stummer, W. (2019). Adverse events in brain tumor surgery: incidence, type, and impact on current quality metrics. *Acta Neurochirurgica*, *161*(2), 287–306. https://doi.org/10.1007/s00701-018-03790-4.
- Steffen-Albert, K., A. (2018). Management of patients with neurologic trauma. In J. H. Hinkle, & K. H. Cheever (Eds.), *Brunner & Suddarth's*

textbook of medical- surgical nursing (14th ed., pp.5345). Wolters Kluwer.

- Singhal, A., Bray, P. W., & Bernstein, M. (2004). Scalp ulceration from a circumferential head dressing after craniotomy: Case report of an uncommon complication due to human error. *Canadian Journal of Plastic Surgery*, *12*(4), 210–212.
- Singla, N., Singh, S. P., Gupta, S. K., Karthigeyan, M., & Radotra, B. D. (2014). Histopathology of subcutaneously preserved autologous bone flap after decompressive craniectomy: a prospective study. *Acta Neurochirurgica*, *156*(7), 1369–1373.
- Skardelly, M., Rother, C., Noell, S., Behling, F., Wuttke, T. V, Schittenhelm, J., Bisdas, S., Meisner, C., Rona, S., & Tabatabai, G. (2017). Risk factors of preoperative and early postoperative seizures in patients with meningioma: a retrospective single-center cohort study. *World Neurosurgery*, 97, 538–546.
- Sole, K., & Klein, D. G. (2012). Moseley. *Introduction to critical care nursing. Sixth Edition. Dalam: Stewart-Amidei C, Klein DG, editor. Nervous system alteration. Missouri: Elsevier Saunders*, 345-99.
- Saladino, A., Lamperti, M., Mangraviti, A., Legnani, F. G., Prada, F. U., Casali, C., Caputi, L., Borrelli, P., & DiMeco, F. (2017). The semisitting position: Analysis of the risks and surgical outcomes in a contemporary series of 425 adult patients undergoing cranial surgery. *Journal of Neurosurgery*,*127*(4),867–876. https://doi.org/10.3171/2016.8.JNS16719.
- Sehba, F. A., Hou, J., Pluta, R. M., & Zhang, J. H. (2012). The importance of early brain injury after subarachnoid hemorrhage.

Progress in Neurobiology, 97(1), 14–37.

- Tan, C., Ries, C. R., Mayson, K., Gharapetian, A., & Griesdale, D. E. G. (2012). Indication for surgery and the risk of postoperative nausea and vomiting after craniotomy: a case-control study. *Journal of Neurosurgical Anesthesiology*, *24*(4), 325–330.
- Taylor, B. E. S., Youngerman, B. E., Goldstein, H., Kabat, D. H., Appelboom, G., Gold, W. E., & Connolly Jr, E. S. (2016). Causes and timing of unplanned early readmission after neurosurgery. *Neurosurgery*, *79*(3), 356–369.
- Thomas, G. P. L., Johnson, D., Byren, J. C., Judge, A. D., Jayamohan, J., Magdum, S. A., Richards, P. G., & Wall, S. A. (2015). The incidence of raised intracranial pressure in nonsyndromic sagittal craniosynostosis following primary surgery. *Journal of Neurosurgery: Pediatrics*, *15*(4), 350–360.
- Tian, F., Heighes, P. T., Allingstrup, M. J., & Doig, G. S. (2018). Early enteral nutrition provided within 24 hours of ICU admission: a meta-analysis of randomized controlled trials. *Critical Care Medicine, 46*(7), 1049–1056.
- Urden, L. D., Stacy, K. M., & Lough, M. E. (2017). *Critical care nursing-e-book: diagnosis and management. Elsevier Health Sciences*.
- Vachon, F. (2011). Histoire de la réanimation médicale française: 1954–1975. *Réanimation*, *20*(1), 72–78.
- Venkatapura, R. J., Dubey, S. K., Panda, N., Chakrabarti, D., Venkataramaiah, S., Rath, G. P., Kaloria, N., Sharma, D., & Ganne, U. R. S. (2021). Postoperative Neurological Complications after a Cranial Surgery: A Multicentre Prospective Observational Study. *Journal of*

Neuroanaesthesiology and Critical Care, 8(1), 34–39. https://doi.org/10.1055/s-0040-1715355.

- Vidotto, M. C., Sogame, L. C., Gazzotti, M. R., Prandini, M., & Jardim, J. R. (2011). Implications of extubation failure and prolonged mechanical ventilation in the postoperative period following elective intracranial surgery. *Brazilian Journal of Medical and Biological Research, 44*, 1291-1298.
- Voth, B. L., Barnette, N. E., & Yang, I. (2017). Blood Transfusion Indications in Neurosurgical Patients : A Systematic Review. *Clinical Neurology and Neurosurgery*. https://doi.org/10.1016/j.clineuro.2017.02.006
- Williams, L. S., and Hopper, P. D. (2015). *Understanding medical surgical nursing*. FA Davis.
- Wait, S. D., Garrett, M. P., Little, A. S., Killory, B. D., & White, W. L. (2010). Endocrinopathy, vision, headache, and recurrence after transsphenoidal surgery for Rathke cleft cysts. *Neurosurgery, 67*(3), 837–843.
- Weil, M. H., & Tang, W. (2011). From intensive care to critical care medicine: a historical perspective. *American Journal of Respiratory and Critical Care Medicine, 183*(11), 1451–1453.
- Wells, E. M., & Packer, R. J. (2015). Pediatric brain tumors. *CONTINUUM Lifelong Learning in Neurology, 21*(2), 373–396. https://doi.org/10.1212/01.CON.0000464176.96311.d1
- Weston, J., Greenhalgh, J., & Marson, A. G. (2015). Antiepileptic drugs as prophylaxis for post-craniotomy seizures. *Cochrane Database of Systematic Reviews*, 3.

- Wijdicks, E. F. M.; Varelas, P. N.; Gronseth, G. S.; Greer, D. M. (2010). *Evidence-based guideline update: Determining brain death in adults: Report of the Quality Standards Subcommittee of the American Academy of Neurology*. *Neurology, 74(23), 1911–1918*. doi:10.1212/WNL.0b013e3181e242a8
- Wicker, P. (2015). *Perioperative practice at a glance*. John Wiley & Sons.
- Wu, A. S., Trinh, V. T., Suki, D., Graham, S., Forman, A., Weinberg, J. S., McCutcheon, I. E., Prabhu, S. S., Heimberger, A. B., & Sawaya, R. (2013). A prospective randomized trial of perioperative seizure prophylaxis in patients with intraparenchymal brain tumors. *Journal of Neurosurgery, 118*(4), 873–883.
- Weiss N, P KD. Avoidance of complications in neurosurgery. In: Winn H, ed. Youmans Neurological Surgery. Philadelpha, PA: Elsevier; 2011:408–423.
- World Health Organization. *Definition of key concepts from the WHO patient safety curriculum guide*, 2011; p.3. Available free from: http://www-who.int/about /icensing/ en/ index, html.
- Yoder, J., Athiraman, U., & Tempelhoff, R. (2020). Hemodynamic complications after neurosurgery. *In Essentials of Neurosurgical Anesthesia & Critical Care* (pp. 507–513). Springer.
- Yousef AS, Agazzi S, van Loveren HR. Transcranial surgery for pituitary adenomas. Neurosurgery. 2012;57(suppl 1):168–175, discussion 168–175.
- Yuile, P., Dent, O., Cook, R., Biggs, M., & Little, N. (2006). Survival of glioblastoma patients related to presenting symptoms, brain site and

treatment variables. *Journal of clinical neuroscience*, *13*(7), 747-751.

- Zhang, D., Zhuo, H., Yang, G., Huang, H., Li, C., Wang, X., Zhao, S., Moliterno, J., & Zhang, Y. (2020). Postoperative pneumonia after craniotomy: incidence, risk factors and prediction with a nomogram. *Journal of Hospital Infection*, *105*(2), 167–175.
- Zrelak, P. A., Eigsti, J., Fetzick, A., Gebhardt, A., Moran, C., Moyer, M., & Yahya, G. (2020). Evidence-based review: nursing care of adults with severe traumatic brain injury. *Am Assoc Neurosci Nurses*, 42, 1–42.
- Zhang, Jia; Du, Zhaoqing; Bi, Jianbin; Wu, Zheng; Lv, Yi; Zhang, Xufeng; Wu, Rongqian (2018). *The impact of previous abdominal surgery on clinical characteristics and prognosis of pyogenic liver abscess.Medicine,97(39), e12290*– doi:10.1097/MD.0000000000012290.

Appendices

Appendix A

Panel of Experts

ت	اسم الخبير	اللقـــــب العلمي	الاختصاص	مكان العمل	سنوات الخبرة
١	د. راجحة عبد الحسن حمزة	**أستاذ**	**تمريض صحة البالغين**	**كلية التمريض جامعة الكوفة**	٣٧سنة
٢	د. صباح عباس احمد	**أستاذ**	**تمريض صحة البالغين**	**كلية التمريض جامعة بغداد**	٣٤سنة
٣	د. سحر ادهم علي	**أستاذ**	**تمريض صحة البالغين**	**كلية التمريض جامعة بابل**	٢٧سنة
٤	د. خالدة محمد خضر	**استاذ**	**تمريض صحة البالغين**	**كلية التمريض جامعة بغداد**	٢٠سنة
٥	د. فاطمة مكي محمود	**أستاذ مساعد**	**تمريض صحة البالغين**	**كلية التمريض جامعة كربلاء**	٢٧سنة
٦	د. تحسين رجب محمد	**أستاذ مساعد**	**تمريض صحة البالغين**	**كلية التمريض جامعة بغداد**	٢٢سنة
٧	د. حسام عباس داود	**أستاذ مساعد**	**تمريض صحة البالغين**	**كلية التمريض جامعة بابل**	٢٠سنة
٨	د. حسن عبدالله عذبي	**أستاذ مساعد**	**تمريض صحة البالغين**	**كلية التمريض جامعة كربلاء**	١٩سنة
٩	د. ابراهيم علوان كاظم	**أستاذ مساعد**	**تمريض صحة البالغين**	**كلية التمريض جامعة الكوفة**	١٦سنة
١٠	د محمد عبد الكريم مصطفى	**أستاذ مساعد**	**تمريض صحة البالغين**	**كلية التمريض جامعة الكوفة**	١٣سنة
١١	د. جهاد جواد كاظم	**أستاذ مساعد**	**تمريض صحة البالغين**	**كلية التمريض جامعة الكوفة**	١٣سنة
١٢	**د .صادق عبدالحسين**	**أستاذ مساعد**	**تمريض صحة البالغين**	**كلية التمريض جامعة بغداد**	١١سنة

Appendix B1

Questionnaire

To assess Postoperative Complications for Patients in Intensive Care Units following Cranial Surgeries.

Part I: Demographical data

1- Age : ☐ Years

2- Gender: Male ☐

Female ☐

3- Educational level:

Illiterate ☐

Read and write ☐

Primary ☐

Intermediate ☐

Secondary ☐

Institute ☐

College ☐

4- Occupation:

Government employee ☐

Private employee ☐

Free business ☐

Unemployment ☐

Retired ☐

Appendix B1

Part II: Clinical data

1-Patient's medical history:

Present ☐ Absent ☐

2- chronic diseases:

3- Medicines used for chronic diseases:

4- Previous surgeries:

Present ☐ Absent ☐

5-Type of surgery:

Shunt ☐

Craniotomy ☐

Craniectomy ☐

6-Operation site:

Frontal ☐

Parietal ☐

Posterior fossa ☐

Temporal ☐

Occipital ☐

7- Duration of surgery : < 2 ☐ Hours

2- 4 ☐ Hours

4 - 6 ☐ Hours

> 6 ☐ Hours

Appendix B1

Part III:

A-Postoperative Observation Sheet GCS

Signs		Score	Patient Score
Eyes open	Spontaneously	4	
	To speech	3	
	To pain	2	
	No response	1	
Best verbal response	Oriented	5	
	Confused	4	
	Inappropriate words	3	
	Incomprehensible sound	2	
	No response	1	
Best motor response	Obeys	6	
	Localize pain	5	
	Withdraws	4	
	Abnormal flexion	3	
	Extension	2	
	No response	1	
Total Score		3-15	

Appendix B1

B-The complications during the first 72 hours:

Complications		Present	Absent
Neurologic	1-Motor deficit		
	2-Dysphasia		
	Seizure 3-		
	4-Deterioration of consciousness		
	5-Increased intracranial pressure		
Hemodynamic	1-Bradycardia (<45/bpm)		
	2-Tachycardia (>100/bpm)		
	3-Arterial hypertension(>110mmHg)		
	4-Arterial hypotension (<60mmHg)		
Respiratory	Acute respiratory failure 1-		
	2-Pulmonary oedema		
	3-Pneumonia		
	4-Atelectasis		
postoperative vomiting	1-Early postoperative vomiting (< 4h)		
	2-Late postoperative vomiting (≥ 4h)		
Hyperthermia			
Hypothermia			
Metabolic disorders	1-Hyperglycemia		
	2-Hypoglycemia		
	3-Diabetes insipidus		
	4-Dysnatremia		

Appendix B2

((استبانة))

الجزء الأول : المعلومات الديموغرافية

١ - **العمر :** ☐ سنة

٢ - **الجنس:** ذكر ☐ أنثى ☐

٣- **المستوى التعليمي:**
- امي ☐
- يقرأ و يكتب ☐
- ابتدائية ☐
- متوسطة ☐
- اعدادية ☐
- معهد ☐
- كلية ☐

٤- **المهنة :**
- موظف حكومي ☐
- موظف خاص ☐
- مهنه حرة ☐
- عاطل عن العمل ☐
- متقاعد ☐

الجزء الثاني: البيانات السريرية

١- التاريخ الطبي للمريض:

موجود ☐ غير موجود ☐

٢- أمراض مزمنة:

٣- الادوية المستعملة للأمراض المزمنة :

٤- العمليات الجراحية السابقة :

موجودة ☐ غير موجودة ☐

٥- نوع الجراحة:

التحويلة ☐

فتح القحف ☐

فتح منفذ في القحف ☐

٦- موقع العملية:

الصدغي الجبهي ☐

عظم القذالي الجداري ☐

الحفرة الخلفية ☐

العظم الصدغي ☐

عظم القذالي ☐

٧- مدة العملية :

< ٢ ☐ ساعة

٢-٤ ☐ ساعة

٤-٦ ☐ ساعة

>٦ ☐ ساعة

الجزء الثالث:

أ- ورقة مراقبة ما بعد الجراحة (مقياس جلاسكو للغيبوبة)

العلامات		الدرجة	التقييم
استجابة فتح العين	يفتح عينيه تلقائياً.	4	
	بعد التحدث إليه أو الطلب منه بصوت عال.	3	
	بعد اجراء المحفزات المؤلمة.	2	
	لا يفتح عينيه في أي وقت و لا يوجد أي عامل يتدخل في ذلك	1	
الاستجابة اللفظية	يخبر عن الاسم و المكان و التاريخ بطريقة صحيحة	5	
	مضطرب و لكنه قادر على التواصل بطريقة متسقة	4	
	كلمات منفصلة واضحة	3	
	فقط آهات و أنين	2	
	لا توجد استجابة صوتية و لا يوجد أي عامل يتدخل في ذلك	1	
الاستجابة الحركية	يستجيب للأمر	6	
	يحدد موقع الالم	5	
	ينسحب بعد الاحساس بالألم	4	
	يثني الذراع عند مفصل الكوع بطريقة غير طبيعية	3	
	يبسط الذراع عند مفصل الكوع	2	
	لا توجد حركة في الأذرع و الرجلين و لا يوجد أي عامل يتدخل في ذلك	1	
مجموع النقاط		3-15	

Appendix B2

ب - **المضاعفات خلال ال ٧٢ ساعة الأولى:**

المضاعفات		توجد	لا توجد
العصبية	١-عجز حركي		
	٢-خلل الكلام		
	٣-نوبة تشنج		
	٤-تدهور الوعي		
	٥- زيادة الضغط داخل الجمجمة		
الدورة الدموية	١- بطء ضربات القلب (<٤٥ / نبضة في الدقيقة)		
	٢- تسارع ضربات القلب (>١٠٠ / نبضة في الدقيقة)		
	٣- ارتفاع ضغط الدم الشرياني (> ١١٠ ملم زئبق)		
	٤-انخفاض ضغط الدم الشرياني (<٦٠ ملم زئبق)		
التنفسية	١- الفشل التنفسي الحاد		
	٢- الوذمة الرئوية		
	٣- الالتهاب الرئوي		
	٤- انخماص الرئة		
القيء بعد الجراحة	١-القيء المبكر بعد الجراحة(<٤ساعة)		
	٢-القيء المتأخر بعد الجراحة (≥٤ساعة)		
ارتفاع حرارة الجسم			
انخفاض حرارة الجسم			
اضطرابات الأيض	١-ارتفاع نسبة السكر في الدم		
	٢- انخفاض نسبة السكر في الدم		
	٢-مرض السكري الكاذب		
	٣-اضطراب نسبة الصوديوم		

Appendix C

University of Babylon
College of Nursing
Research Ethics Committee

جـامـعة بـابـل
كـلية التمريـض
لجنة اخلاقيات البحث العلمي

Issue No:

Date: / /2021

Approval Letter

To,

Nasser Hussain Kadhim

The Research Ethics committee at the **University of Babylon, College of Nursing** has reviewed and discussed your application to conduct the research study entitled" **Postoperative Complications for Patients in Intensive Care Units following Cranial Surgeries."**

The Following documents have been reviewed and approved:

1. Research protocol
2. Research instrument/s
3. Participant informed consent

Committee Decision.

The committee approves the study to be conducted in the presented form. The Research Ethics committee expects to be informed about any changes occurring during the study, any revision in the protocol and participant informed consent.

Prof. Dr. Salma K. Jehad
Chair Committee
College of Nursing
Research Ethical Committee
18 / 01 /2022

Appendix C

Ministry of Higher Education and Scientific Research

جمهورية العراق

وزارة التعليم العالي والبحث العلمي

University of Babylon

College of Nursing

جامعة بابل

كلية التمريض

لجنة الدراسات العليا

UNIVERSITY OF BABYLON

Ref. No. :

Date: /

العدد : ٧٧٩

التاريخ : ٢٠٢٢/٢/١٠

وزارة الصحة

دائرة مدينة الطب

الــواردة

العدد ٥٢٨٠

التاريخ ٢٠٢ /٢/١٦

الى / دائرة صحة مدينة الطب

م/ تسهيل مهمة

تحية طيبة :

يطيب لنا حسن التواصل معكم ويرجى تفضلكم بتسهيل مهمة طالب الماجستير (ناصر حسين كاظم) لغرض جمع عينة دراسة الماجستير والخاصة بالبحث الموسوم :

مضاعفات بعد الجراحة للمرضى في وحدات العناية المركزة بعد الجراحات القحفية.

Postoperative Complication for Patients in Intensive Care Units following Cranial Surgeries.

مع الاحترام ...

المرافقات //

- بروتوكول.
- استبانة.

ا.م.د. نهاد محمد قاسم الدوري

معاون العميد للشؤون العلمية والدراسات العليا

2022 /2 /١٠

مركز التدريب والتنمية البشرية

Training and Development Center

صورة عنه الى //

- مكتب السيد العميد للتفضل بالاطلاع مع الاحترام .
- لجنة الدراسات العليا
- الصادرة .

E-mail:nursing@uobabylon.edu.iq

STARS

وطني 07711632208

المكتب 009647711632208

www.uobabylon.edu.iq

Appendix C

Republic Of IRAQ
Ministry Of Health
MEDICAL city

جمهورية العراق
وزارة الصحة / البيئة
دائرة مدينة الطب التعليمية
مركز التدريب والتنمية البشرية

العدد :
التاريخ : ٢٠ / ٢ / ٢٠٢٢

جيشنا وحشدنا سور الوطن

٨٠٥٧

الى / جامعة بابل / كلية التمريض / لجنة الدراسات العليا
م / تسهيل مهمة

تحية طيبة ....

اشارة الى كتابكم المرقم ٧٧٩ في ٢٠٢٢/٢/١٠ نود اعلامكم بانه لا مانع لدى دائرتنا (م. الشهيد غازي الحريري للجراحات التخصصية) من تسهيل مهمة طالب الماجستير **(ناصر حسين كاظم)** لغرض انجاز متطلبات بحثه بعنوان (مضاعفات بعد الجراحة للمرضى في وحدات العناية المركزة بعد الجراحات القحفية).

للتفضل بالاطلاع .. مع الاحترام .

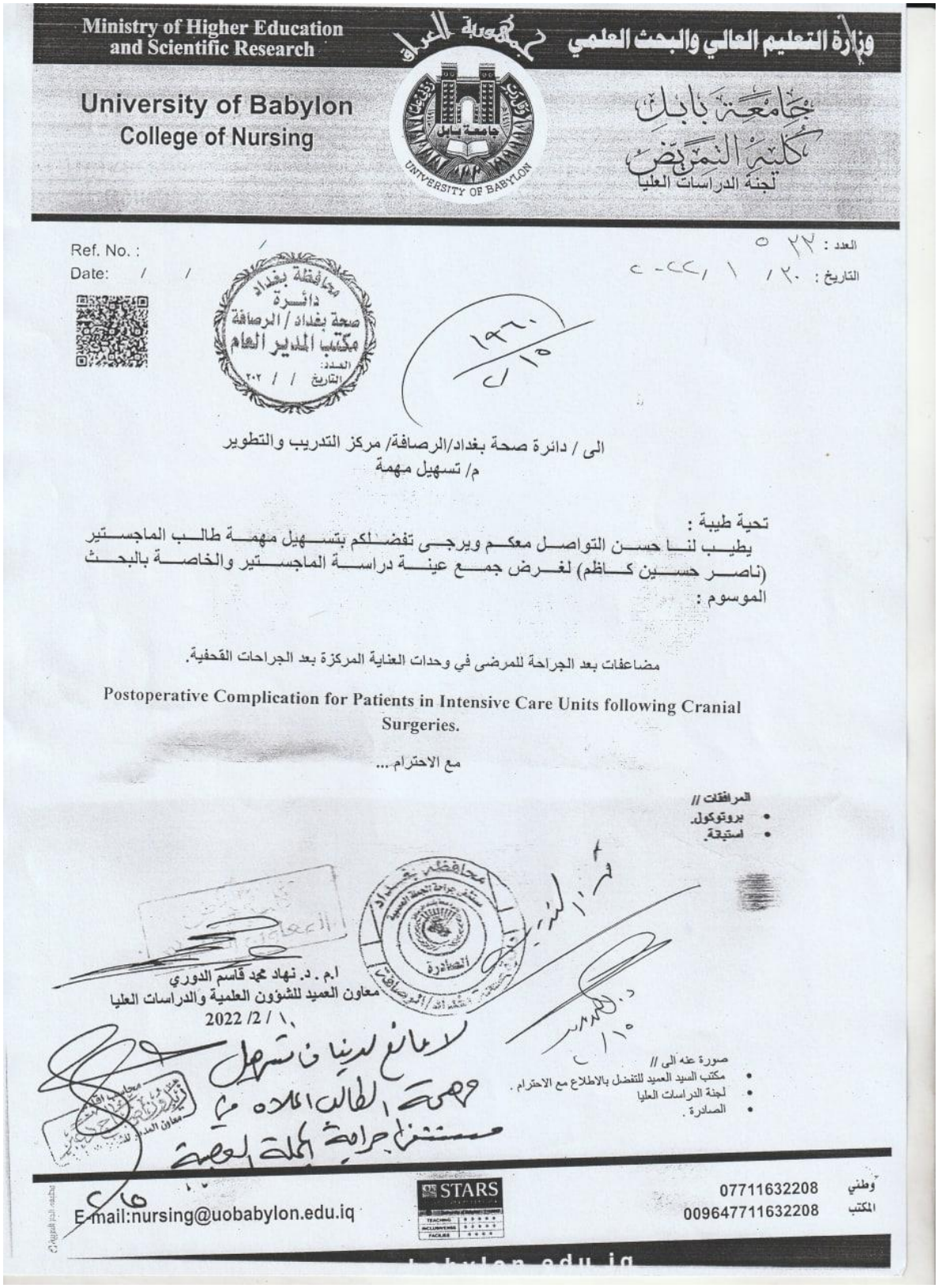
الدكتور
حسن محمد عباس التميمي
المدير العام
٢٠٢٢/٢/٢٧

عمر عدنان عبد اللطيف
مدير شعبة الموارد البشرية

نسخة منه الى/
- قسم التدريب والتنمية البشرية.....مع الاوليات .
- م. الجراحات التخصصية لاتخاذ مايلزم ...مع التقدير.

سارة ٢/١٦

Appendix C



Ministry of Higher Education and Scientific Research

وزارة التعليم العالي والبحث العلمي

University of Babylon
College of Nursing

جامعة بابل
كلية التمريض
لجنة الدراسات العليا

Ref. No. :
Date: / /

العدد : ٢٢٥
التاريخ : ٢٠ / ١ / ٢٠٢٢

محافظة بغداد
دائرة صحة بغداد / الرصافة
مكتب المدير العام
العدد:
التاريخ / / ٢٠٢

١٩٦٠
١٥

الى / دائرة صحة بغداد/الرصافة/ مركز التدريب والتطوير
م/ تسهيل مهمة

تحية طيبة :
يطيب لنا حسن التواصل معكم ويرجى تفضلكم بتسهيل مهمة طالب الماجستير (ناصر حسين كاظم) لغرض جمع عينة دراسة الماجستير والخاصة بالبحث الموسوم :

مضاعفات بعد الجراحة للمرضى في وحدات العناية المركزة بعد الجراحات القحفية.

Postoperative Complication for Patients in Intensive Care Units following Cranial Surgeries.

مع الاحترام...

المرفقات //
- بروتوكول.
- استبانة.

ا.م . د. نهاد محمد قاسم الدوري
معاون العميد للشؤون العلمية والدراسات العليا
2022 /2/ ١٠

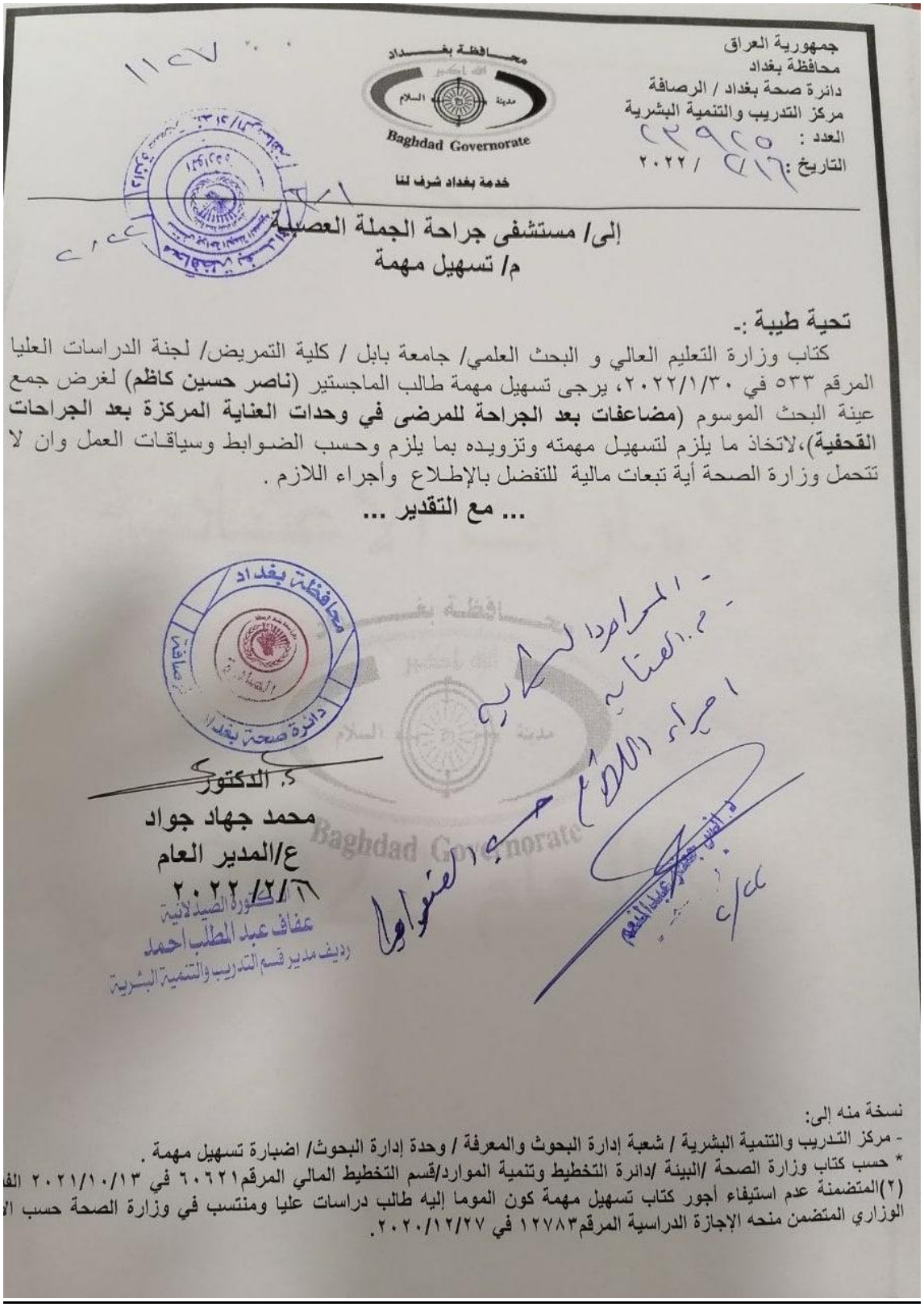
صورة عنه الى //
- مكتب السيد العميد للتفضل بالاطلاع مع الاحترام .
- لجنة الدراسات العليا
- الصادرة .

E-mail:nursing@uobabylon.edu.iq

STARS

وطني 07711632208
المكتب 009647711632208

Appendix C



جمهورية العراق
محافظة بغداد
دائرة صحة بغداد / الرصافة
مركز التدريب والتنمية البشرية
العدد : ٢٢٩٢٥
التاريخ : ٢٠٢٢/ ٢/ ١٦

محافظة بغداد
Baghdad Governorate
خدمة بغداد شرف لنا

إلى/ مستشفى جراحة الجملة العصبية
م/ تسهيل مهمة

تحية طيبة :-

كتاب وزارة التعليم العالي و البحث العلمي/ جامعة بابل / كلية التمريض/ لجنة الدراسات العليا المرقم ٥٣٣ في ٢٠٢٢/١/٣٠، يرجى تسهيل مهمة طالب الماجستير (**ناصر حسين كاظم**) لغرض جمع عينة البحث الموسوم (**مضاعفات بعد الجراحة للمرضى في وحدات العناية المركزة بعد الجراحات القحفية**)،لاتخاذ ما يلزم لتسهيل مهمته وتزويده بما يلزم وحسب الضوابط وسياقات العمل وان لا تتحمل وزارة الصحة أية تبعات مالية للتفضل بالإطلاع وأجراء اللازم .

... مع التقدير ...

محافظة بغداد
دائرة صحة بغداد

الدكتور
محمد جهاد جواد
ع/المدير العام
٢٠٢٢/٢/١٦

مديرية الصيدلانية
عفاف عبد المطلب احمد
رديف مدير قسم التدريب والتنمية البشرية

نسخة منه إلى:
- مركز التدريب والتنمية البشرية / شعبة إدارة البحوث والمعرفة / وحدة إدارة البحوث/ اضبارة تسهيل مهمة .
* حسب كتاب وزارة الصحة /البيئة /دائرة التخطيط وتنمية الموارد/قسم التخطيط المالي المرقم٦٠٦٢١ في ٢٠٢١/١٠/١٣ الف
(٢)المتضمنة عدم استيفاء أجور كتاب تسهيل مهمة كون الموما إليه طالب دراسات عليا ومنتسب في وزارة الصحة حسب الا
الوزاري المتضمن منحه الإجازة الدراسية المرقم١٢٧٨٣ في ٢٠٢٠/١٢/٢٧.

وزارة التعليم العالي والبحث العلمي
Ministry of Higher Education and Scientific Research
جامعة بابل
University of Babylon
كلية التربية للعلوم الانسانية
College of Education for Human Sciences

العدد: ٦٤٩٤
التاريخ: ٢٠٢٢/٦/٢٩

Ref. No :
Date:

المعاون العلمي

جامعة بابل / كلية التمريض
الواردة
٢٠٢٢/٦/٢٩

الى/جامعة بابل / كلية التمريض

مكتب السيد معاون العميد للشؤون العلمية المحترم

م/أعادة رسالة

تحية طيبة:

اشارة الى كتابكم المرقم (٢٢٥٩) في ٢٠٢٢/٦/٢٨، نعيد إليكم رسالة طالب الدراسات العليا / الماجستير (**ناصر حسين كاظم**) بعد تقويمها لغوياً من قبل (**أ.م.د. حسين حميد معيوف**) **من قسم اللغة الانكليزية في كليتنا**، وقد ثبت الملاحظات على متن الرسالة يرجى من الباحث الالتزام بها .

*** مع الاحترام ***

أ.د. اسامة كاظم عمران
معاون العميد للشؤون العلمية
والدراسات العليا

نسخة منه الى //
- الدراسات العليا .
- الصادرة

/ السارة /
البريد الالكتروني bad_edu_humsci@yahoo.com
امنية 07801010633
www.uobabylon .edu.iq

الخلاصة

يعاني المرضى من تأخر التعافي والخروج من المستشفى ، فضلاً عن احتمال حدوث عواقب تهدد حياتهم أو تغير حياتهم. تتأثر نتائج جراحة المخ والأعصاب سلبًا بمضاعفات ما بعد الجراحة. يمكن تقليل مخاطر حدوث مضاعفات ما بعد الجراحة من خلال الفحص والتقييم المناسبين. كان الغرض من هذه الدراسة هو تقييم مضاعفات ما بعد الجراحة للمرضى في وحدات العناية المركزة بعد جراحة القحف والتحقيق في الاختلافات في مضاعفات ما بعد الجراحة مع الخصائص الاجتماعية والديموغرافية والسريرية. بدأ التصميم الوصفي للدراسة في الفترة من ١٨ يناير ٢٠٢٢ إلى ٢٣ يونيو ٢٠٢٢. باستخدام طريقة هادفة (غير احتمالية) لـ (١١٥) مريضًا ، وأعمارهم فوق (١٨) عامًا ، وخضعوا لعمليات جراحية في الجمجمة. يتم توزيع هذه العينة في جميع أنحاء مستشفى جراحة الأعصاب التعليمي ومستشفى الشهيد غازي الحريري التخصصي الجراحي فيما يتعلق بمديرية صحة الرصافة بغداد والمدينة الطبية. الاستبانة مكونة من (٣٣) فقرة. أجريت الدراسة لتقييم المضاعفات التي يعاني منها المرضى بعد العمليات الجراحية في الجمجمة وفهم العلاقة بين الخصائص الديموغرافية والبيانات السريرية ومقياس غيبوبة غلاسكو ومضاعفات ما بعد الجراحة. تم اختبار الأداة للتأكد من صحتها وموثوقيتها. أظهرت النتائج أن معظم مرضى العينة هم من الذكور ، وتتراوح أعمارهم بين (٤٠-٤٩) سنة ، ووجدت فروق ذات دلالة إحصائية بين مضاعفات ما بعد الجراحة حسب البيانات الديموغرافية باستثناء الجنس ، وحسب البيانات السريرية باستثناء استخدام الأدوية للأمراض المزمنة. كانت هناك فروق ذات دلالة إحصائية بين مضاعفات ما بعد الجراحة حسب مستوى الوعي (مقياس غلاسكو للغيبوبة) ، حيث يعتبر عسر النطق والنوبة من المضاعفات العصبية المرتفعة للغاية كما يتضح من انخفاض متوسط الدرجات. وتسارع في ضربات القلب ، وارتفاع ضغط الدم الشرياني كما يتضح من انخفاض متوسط الدرجات ، والمضاعفات الإجمالية تشير إلى اكثر من نصف عينة الدراسة بعد جراحة القحف يعانون من مضاعفات متوسطة. بالإضافة إلى ذلك ، توجد فروق ذات دلالة إحصائية بين نوع الجراحة ومدتها فيما يتعلق بهذه المضاعفات. وفقًا للدراسة الحالية ، يوصي الباحث بإجراء دورات متخصصة للمهنيين الطبيين والصحيين حول مضاعفات جراحة الأعصاب بعد الجراحة حتى يتمكنوا من ملاحظتها والوقاية منها. عمل كتيبات توعوية ومقاطع فيديو تثقيفية في الأجنحة لتثقيف المرضى حول مشاكل جراحة الأعصاب.

جمهورية العراق
وزارة التعليم العالي والبحث العلمي
جامعة بابل
كلية التمريض

مضاعفات بعد الجراحة للمرضى في وحدات العناية المركزة بعد الجراحات القحفية

رسالة مقدمة من قبل

ناصر حسين كاظم

الى

مجلس كلية التمريض/ جامعة بابل

جزء من متطلبات نيل درجة ماجستير في علوم التمريض

بإشراف

أ. د. شذى سعدي محمد

ايلول ٢٠٢٢ ميلادي صفر ١٤٤٤ هجري