Development of a Self-Directed Orientation Resource for Nurses Newly Hired to the Neurosurgical Perioperative Specialty

by © Allison Lenihan

A report submitted to the School of Graduate Studies in partial fulfillment of

the requirements for the degree of

Master of Nursing

Faculty of Nursing

Memorial University of Newfoundland

April 2023

St. John’s Newfoundland and Labrador

Abstract

Background: Perioperative nursing requires nurses to have advanced clinical judgement and critical thinking. Neurosurgery is a complex service line that differs from the other perioperative services. This necessitates perioperative nurses to acquire specialized knowledge for neurosurgical instrumentation and equipment; neurological conditions; and complex surgical procedures. Training and education are traditionally provided to nurses who are new to perioperative nursing practice through the processes of orientation and onboarding. However, there is not a specific process in place that adequately addresses the learning needs for orienting nurses to practice competently within the neurosurgical service line for the institution where this practicum project was undertaken. **Purpose:** To develop a unit specific resource that contains relevant information and addresses the unique needs of nurses newly hired to the perioperative neurosurgical specialty. **Methods:** 1) an integrative literature review, 2) an environmental scan of available resources from hospitals within Central and Atlantic Canada and reputable websites, 3) consultation interviews with key stakeholders, and 4) the development of the self-directed orientation resource manual. **Results:** The findings established the need for the development of the orientation resource. The literature review revealed that orientation and onboarding programs can be effective for improving clinical knowledge and competence. The environmental scan resulted in several reputable resources that are used to support neurosurgical perioperative nursing orientation in other institutions. Consultation interviews reinforced the demand for the orientation resource and illuminated the learning needs of perioperative neurosurgical nurses. The six modules included in the orientation resource are: 1) Overview of perioperative neurosurgical nursing, 2) Overview of neurosurgical procedures, 3) Common instruments used in neurosurgery, 4) Common equipment used in neurosurgical procedures, 5) Emergency considerations, and 6) Neurosurgical interprofessional considerations. Additionally, the use of

case studies, reflection exercises, helpful tips for practice, photos, and videos were included for adult learner engagement, as per Knowle's Adult Learning Theory. **Conclusion:** This orientation resource is to educate newly hired nurses to become confident and competent in their perioperative neurosurgical nursing practice.

Key Words: *perioperative, orientation, neurosurgical, nursing, self-directed learning.*

Acknowledgements

I would like to extend a special thank you and my sincerest appreciation for my practicum supervisor, Jennifer Collins. Your patience, guidance, knowledge, and support were instrumental in the development of this resource. The last few months have been quite challenging at times, and your kindness and encouragement have been invaluable to me. Thank you for being such a positive role model in the nursing profession.

Thank you to my nursing colleagues for contributing to the development of the resource by sharing your ideas and agreeing to participate in the consultations.

To my husband, Matthew, thank you for constant support and encouragement over the last four years. There were many times I felt like giving up, but it was your belief in me that kept me going. I truly could not have done this without your limitless love and support.

I would also like to thank my son. You have made me stronger, better, and more fulfilled than I could have ever imagined. Thank you for being the light of my life over the last two years and giving me the extra strength and motivation to complete this project.

My family and friends. Thank you all for believing in me, offering words of encouragement, and understanding when I was unable to make certain events over the past few years. I am grateful to every one of you.

Table of Contents

Introduction

Specialty nursing practice requires a supportive orientation that is tailored to accommodate individual learning needs. Specialization in nursing involves focused nursing practice in an identified specific clinical area and is defined as a delimited or concentrated area of clinical expertise with focused knowledge and competencies (University of Alberta, 2022). Perioperative nursing is a term used to describe nurses who work as surgical nurses in operating rooms to provide care to patients undergoing surgical procedures (Mayo Foundation, 2022). Comprehensive training is essential to provide nurses who are new to the perioperative specialty area with the tools needed to practice competently and confidently. Perioperative nursing requires nurses to have advanced clinical judgement, critical thinking, and clinical leadership skills (Nova Scotia Health Authority, 2022). Training and education are traditionally provided to nurses who are new to perioperative nursing practice through the processes of orientation and onboarding. The existing orientation practices provide a general overview of perioperative nursing competencies and do not distinguish the intricacies of neurosurgical perioperative nursing. An orientation resource that builds upon entry level perioperative nursing knowledge and competencies but focuses on the complexities of neurosurgical nursing is required to ensure nurses are competent and confident in their neurosurgical perioperative nursing practice.

A shortage of appropriately trained perioperative nurses has a significant impact for perioperative patients, nurses, and the healthcare organization. Perioperative nurses use their knowledge to prioritize activities to protect the patient. Patient safety in the neurosurgical perioperative setting is dependent upon qualified and credentialed nursing care. Perioperative patients often have dynamic and complex care needs and require nursing care from competent and knowledgeable professionals (Lenihan, 2021).

Neurosurgery is a complex service line that is different from the other services in terms of surgical instruments, patient acuity, and complex surgical procedures. The neurosurgery operating room environment is dominated by high patient acuity and heavy workloads (Clarke et al., 2021). Working as a perioperative neurosurgical nurse requires a diverse set of skills and competencies. Hiring nurses without any or only limited perioperative nursing experience can have negative impacts on nurses working in the neurosurgical specialty. The impacts of ineffective neurosurgical nursing orientation can lead to increased emotional exhaustion, poor job satisfaction, and burnout for the remaining nurses working in neurosurgery (Baumann et al., 2019; Reuter & King, 2021). Nurses who are newly hired to specialty areas such as neurosurgery can experience transition shock and feel overwhelmed because of the large amount of new knowledge and skills to acquire. Transition shock is a concept used to describe the immediate, acute, and dramatic stage during the process of professional role adaptation for novice nurses (Duchscher, 2009). A new perioperative nurse may need time to adjust to the rigors of the daily perioperative routines, learning new technology, and the acquisition of surgical knowledge and skills (Clarke et al., 2021; Mollohan & Morales, 2016). Ineffective orientation and training of new nurses may contribute to nursing turnover rates and an increase in staff nurse vacancies. Therefore, nurses new to perioperative nursing, or new to the neurosurgical perioperative service, should receive orientation that is specific to their learning needs and the unique needs of the neurosurgical perioperative service.

The setting for this practicum project is a neurosurgical perioperative unit at a large Level 1 Trauma Center hospital in an Atlantic Canadian province. The unit provides perioperative care to a diverse neurosurgical patient population, over the age of sixteen. This report provides a summary of the objectives and methods for the practicum project, in which a learning resource

was developed to support the orientation and onboarding of nurses newly hired to the neurosurgical perioperative specialty.

Objectives

The goal of this practicum project is to develop an educational resource that will support the orientation and onboarding process for newly hired neurosurgical perioperative nurses.

The key practicum project objectives are to:

1. Assess and identify the learning needs of nurses newly hired to the neurosurgical perioperative service;
2. Develop a resource manual that aides in the orientation of nurses working in the neurosurgical perioperative service; and
3. Demonstrate advanced nursing practice competencies through leadership, collaboration, and following research practices including conducting a literature review, environmental scan, and consultations.

Overview of Methods

Several methods were utilized to formulate a foundation for the development of an orientation resource. An integrative literature review, environmental scan, and consultation scan were conducted to identify learning needs, resource content, and preferred delivery methods. Findings from the literature review confirmed that perioperative nursing requires a supportive orientation that is tailored to accommodate unique and individual learning needs that are specific to neurosurgical perioperative nursing. There was a noted knowledge gap for perioperative neurosurgical nurses. The literature review focused on the synthesis of best practices for orientating and onboarding neurosurgical or perioperative nursing staff.

An environmental scan was also conducted by contacting healthcare agencies with comparable neurosurgical programs across Atlantic and Central Canada. Through this

environmental scan, it was determined that there was no existing resource available to adequately support the learning needs of neurosurgical perioperative nurses that could be adapted or adopted for use in this clinical area. Consultation interviews were then conducted with key stakeholders which confirmed there were several key learning needs and knowledge gaps that are not addressed by the current orientation practices. Through the interviews, the key stakeholders voiced their opinions on the content and delivery of the orientation resource.

Findings from the literature review, environmental scan, and consultation interviews confirmed the need for a resource to support the orientation and onboarding of newly hired neurosurgical perioperative nurses. These methods provided valuable information about what content should be included within the resource and effective strategies for dissemination of the resource. The data collected through these methods was utilized to develop the orientation resource and meet the objectives of the practicum project.

Summary of the Literature Review

A search of the Cumulative Index to Nursing and Allied Health Literature (CINAHL) and PubMed databases were completed in pursuit of articles related to the topic of perioperative nursing orientation. Searches contained various combinations of key terms including “nursing”, “nurse”, “orientation”, “onboarding”, “training”, “perioperative”, “neurosurgical”, “operating room”, “perioperative nursing”, “surgical”, “neurosurgical”, “residents”, and “surgeons”. The reference lists of selected articles were also searched for additional articles related to the topic of perioperative nursing orientation. While perioperative nursing was the focus of this literature review, medium and high-quality studies regarding orientation were also considered for inclusion in areas where there was limited information available. This was decided as other specialty practice areas have comparable learning needs such as the requirements for further education, a

defined specialty scope, and standards of professional practice. A total of 31 articles were selected to inform the review with quantitative and qualitative studies appraised using the Public Health Agency of Canada Toolkit for Critical Appraisal (Public Health Agency of Canada, 2014) and the Joanna Briggs Institute Checklist for Qualitative Research (Joanna Briggs Institute, n.d.), respectively. A full copy of the literature review can be found in Appendix I of this report.

Significance of the Problem

Of the 31 articles considered for inclusion in this literature review, 11 supporting studies were used to determine the significance of the problem. It was determined that effective perioperative training for nurses is a significant issue with a negative impact on patient safety, nursing knowledge, and the healthcare system. Nursing turnover rates are as high as 15% in some Canadian healthcare organizations (Zaheer et al., 2019). Compounding this issue further is the statistic that as many as 50% of new nurses will change positions or leave nursing within the first three years of clinical practice in a specialty setting because of feeling overwhelmed with the amount of knowledge and skills necessary for practice (Baumann et al., 2019), increased emotional exhaustion (Beitz et al., 2019; Sasso et al., 2019), and poor job satisfaction (Sasso et al., 2019).

Perioperative patients often have dynamic and complex care needs and require nursing care from competent and knowledgeable professionals. Nurses hired to the neurosurgical perioperative service often do not have any previous perioperative nursing experience. Neurosurgical perioperative nurses are required to be knowledgeable about neurosurgical pathophysiology and have assessment skills that require education that may be beyond basic perioperative curricula (Clarke et al., 2021; Fearon, 2018). Shortages of trained perioperative nurses can jeopardize patient safety and the quality of care provided as perioperative nurses use

their knowledge to prioritize activities to protect the patient. A lack of perioperative experience and improper perioperative training need to be addressed to effectively manage patient safety concerns.

Nurses who are new to the perioperative environment face many unique challenges as they transition into this specialty role. A new perioperative nurse may need additional time and support to adjust to the rigors of the daily perioperative routines, learning new technology, and the acquisition of surgical knowledge and skills (Clarke et al., 2021; Mollohan & Morales, 2016). These issues contribute to feelings of both physical and emotional exhaustion because of the amount of new information, new skills to learn, demands of clinical practice, or adjusting to practicing in a different patient care environment.

Interventions

Nine studies were included in the literature review to explore orientation and training related interventions for healthcare staff working in perioperative or other nursing specialty areas. Results of the integrative literature review indicated that several interventions are used to support the orientation and training of healthcare staff. Educational strategies including high fidelity simulation-based learning (Bommer et al., 2018; Clarke et al., 2021; Fernandez et al., 2020), comprehensive learning plans (Kurnat-Thoma et al., 2017; Ndung'u et al., 2022), and onboarding or orientation programs (Hope et al., 2021; Lalithabai et al., 2021; Madhuvu et al., 2018) are among the most predominant interventions noted for orientating and onboarding nursing staff to the perioperative setting.

Simulation-based Learning

The literature review found that orientation and onboarding that includes high-fidelity

simulation-based learning often results in a more positive orientation experience and can increase the individual's confidence in clinical practice. According to Clarke et al. (2021), high-fidelity simulation-based training can effectively improve nurses' perioperative skills compared to other orientation methods. Simulation-based training for perioperative nursing typically focuses on using a computer or tablet software program to become familiar with the surgical instruments and equipment (Clarke et al., 2021). Learning the surgical instruments and specialty equipment used in neurosurgery is a critical component of the orientation process.

Comprehensive Learning Plans and Programs

Comprehensive learning plans (Kurnat-Thoma et al., 2017; Ndung'u et al., 2022), and orientation or onboarding programs (Lalithabai et al., 2021; Madhuvu et al., 2017) were all reported to have a positive impact on nursing knowledge and clinical competence when incorporated into the orientation process (Kurnat-Thoma et al., 2017; Ndung'u et al., 2022). Comprehensive learning plans were tailored to accommodate individual learning needs and were developed through collaboration with the orientee and preceptor. Orientation and onboarding programs typically included educational sessions, clinical skills workshops, and a self-directed learning component. The plans and programs were designed as resources to support the orientation and onboarding process for nursing staff newly hired to specialty areas such as neurosurgical perioperative nursing.

Adult Learning Theory and Novice to Expert Theory

The methods utilized for the practicum project were influenced by Knowles' (1978) Adult Learning Theory and Benner's Novice to Expert Theory. These theories also guided the development of an educational resource to support the orientation of newly hired neurosurgical perioperative nurses. Knowles' theory indicates that adults are motivated to learn by drawing on

personal experiences, problem solving, and a sense of responsibility (Knowles, 1978; Renger et al., 2020). Benner's Novice to Expert theory identifies that nurses progress through stages of clinical competence, building on the principles in each previous step (Larew et al., 2006; Murray et al., 2019). Therefore, case studies were incorporated into the orientation resource to allow learners the opportunity to build on personal experiences, clinical competency, and practice problem solving and decision-making skills.

Knowles also identifies that adult learners may have a preferred personal learning style but are also motivated and self-directed learners (Knowles 1978, Renger et al., 2020). Learning needs and delivery methods were discussed during the consultation interviews to identify important concepts to include in the resource.

Summary of the Environmental Scan

An environmental scan was conducted to identify any existing resources, educational materials, and practices that are utilized to support neurosurgical perioperative nursing orientation and onboarding at hospitals across Canada. Five managers or nurse educators from hospitals in large city centers across Atlantic and Central Canada were emailed to request copies of any resources or educational material used to support the process of orientating newly hired neurosurgical perioperative nurses. Four organizations replied to the initial injury and agreed to share their orientation resources for the purposes of this practicum project. Although these shared resources provided some insight into the topic of neurosurgical perioperative orientation, the resources were not specific enough to utilize in this setting. Common processes found in the information received involved educational resources and checklists that are focused on neurosurgical perioperative nursing competencies. A complete copy of the environmental scan report can be found in Appendix II.

From each of these sources, the common theme among all three orientation resources is that the checklists or educational handbook focused on neurosurgical nursing practice. The orientation checklists used by other neurosurgical perioperative areas provide a comprehensive overview of the orientation process and are useful tools to organize the new hire's learning experience. The checklists outline the specific competencies required to practice as a neurosurgical perioperative nurse and are focused on neurosurgical orientation.

The nurse educators and managers have found that these tools have been effective for measuring the newly hired nurses progress during the process of orientation and onboarding. Comparatively, they reported that these educational resources are valuable as they can provide a concrete foundation for acquiring the skills and knowledge base required for neurosurgical perioperative nursing. Through this environmental scan, it was determined that there was no existing resource available to adequately support the learning needs of neurosurgical perioperative nurses that could be adapted or adopted for use in this clinical area. Therefore, the results of this environmental scan support the need for the development of a new resource that is comprehensive and relevant for nurses newly hired to the perioperative neurosurgical service.

Summary of Consultations

Consultations were completed by interviewing members of the neurosurgical perioperative team to identify their thoughts, opinions, and ideas of what should be included in an educational resource for neurosurgical perioperative nursing orientation. Four novice neurosurgical perioperative nurses, four experienced neurosurgical perioperative nurses, two perioperative clinical supervisors, the perioperative clinical nurse educator, and the perioperative health service manager participated in the interview process. By agreeing to an interview, participants provided verbal agreement to participate in the consultations. This sample provided

the opportunity to capture consultation data from a variety of perspectives. The semi-structured interviews were conducted one on one, by phone call with each participant and consisted of open-ended questions to gain insight as to the information to be used for the development of an orientation resource. Interview notes were taken during the interview process, and phone calls were recorded. A complete copy of the consultation report can be found in Appendix III.

The interviews provided an opportunity for participants to share their experiences and perspectives of the orientation practices and processes using their own words. Participants were encouraged to provide complete answers to all questions but were also reminded that they were not required to answer all questions and could end the interview at any time. Through content analysis methods, three major themes were identified and explored. These themes were issues related to orientation, resource content, and resource delivery methods.

Orientation-related Issues

The theme of issues related to current orientation and onboarding practices identified the concepts of lack of neurosurgical specific education, confidence and feeling unprepared, organizational challenges as the most common issues that arise during the process of orientating newly hired neurosurgical perioperative nurses. The interview consultations with novice and experienced nurse highlight the inconsistencies in the existing orientation processes for nurses newly hired to the neurosurgical perioperative service. Many of the novice and experienced nurses (n=5) felt that the existing orientation checklist was insufficient for preparing novice nurses for practice. These findings were consistent with the interviews with the perioperative supervisors, clinical nurse educator, and manager.

Many of the novice nurses (n=3) also expressed that they lacked confidence in their neurosurgical perioperative nursing skills upon completion of their orientation. The clinical nurse

educator discussed how nurses often feel that they are not ready to begin practicing independently as a neurosurgical perioperative nurse. Staffing issues were of the greatest concern and were noted by each of the nurses (n=8) as impacting the orientation process. Many of the novice nurses (n=3) noted that consistency of preceptors was a challenge during their orientation. The consensus from the consultations is that there is currently no comprehensive learning resource for perioperative neurosurgery that effectively meets the learning needs of newly hired nurses.

Resource Content

Results of the consultations indicated several areas of focus for the development of an educational resource to support the orientation and onboarding of newly hired neurosurgical perioperative nurses. Throughout each interview the recurring ideas that were mentioned by participants included: anatomy and pathophysiology, neurosurgical procedures, neurosurgical instruments, specialty neurosurgical equipment, and surgeon preferences. Several of the participants noted that they found the amount of new knowledge and skills required were overwhelming. Participants also reported that upon completion of orientation there seemed to be a lack of clinical competence and confidence in neurosurgical knowledge and perioperative nursing skills. These ideas will be used as content for the development of an educational resource manual to support the onboarding process for nurses in the neurosurgical line of the perioperative services.

Resource Delivery Method

The consultation results indicated that the preferred method of delivery for an orientation resource would be in the form of a printed paper resource manual and electronic version with a self-directed learning component. As a result of the findings from the consultations, the

orientation resource manual will be developed and offered in both digital and printed copies to accommodate all delivery method factors identified by the consultations. Other suggested delivery methods included: an electronic copy of the resource manual and educational learning sessions. Concerns around limited accessibility of computers, and scheduling were noted as the key limitations associated with these methods. The novice and experienced nurses indicated that they found self-directed learning modules to be an effective method for meeting their learning needs.

Summary of the Resource

Findings from the literature review, environmental scan, and consultation interviews were utilized to influence the development of a self-directed orientation resource. The resource is titled *Perioperative Neurosurgical Orientation Resource Manual: A Self-Directed Learning Resource for Nurses New to the Neurosurgical Perioperative Nursing Specialty.* A complete copy of the resource can be found in Appendix IV. The resource contains evidence-informed information about perioperative neurosurgical nursing practices, competencies, roles, and responsibilities. The self-directed approach was decided based on the preferences noted during the consultation interviews. The delivery method was consistent with findings from the environmental scan, demonstrating that self-directed orientation resources were effective at other organizations across the country. Educational strategies included predisposing (i.e., the provision of evidence informed perioperative neurosurgical nursing information), enabling (i.e., providing the learning resource to newly hired neurosurgical perioperative nurses), and reinforcing concepts (i.e., feedback from tests and case studies) factors to enhance the learning experience.

Knowles' Adult Learning Theory and Benner's Novice to Expert Theories guided the development of this self-directed orientation resource. These theories focus on gaining

knowledge and meaning through experience and building on clinical competencies. Adult learners draw on personal experiences and are self-motivated in their learning. This is consistent with the findings from the literature review and consultation interviews, indicating the need for a self-directed approach to orientation. The application of these theories also encouraged the development of a resource that provided newly hired staff members with the ability to focus their learning to suite their identified learning needs.

The orientation resource content was divided into six learning modules based, with each module building upon the foundational concepts of the previous modules. Each module contains learning objectives and images to reinforce the concepts explored within the module. Throughout the learning modules, there are reflection activities including case studies, helpful tips for practice, and videos obtained from public domains to supplement the learning. There is also a pretest and post-test that can be found at the beginning and end of the resource, respectively. The tests are designed for the reader to be able to evaluate their learning. Each module has been designed to provide structure and guidance to the process of orientating and onboarding newly hired perioperative neurosurgical nurses, but it may also provide valuable knowledge to experienced nurses already working within perioperative neurosurgery.

Module One: Overview of Perioperative Neurosurgical Nursing

The first module builds upon general perioperative nursing competencies and provides an overview of the nursing roles, competencies, and skills required for neurosurgical perioperative nursing practice. Perioperative neurosurgical nurses must have the necessary skills and competences required to provide care to patients with dynamic health needs. An overview of nursing roles including scrub and circulating nurse responsibilities will be presented to encourage awareness and accountability of perioperative nursing roles, duties, and actions.

Neurosurgical nursing requires focus and dedication, nursing knowledge, and the ability to work as a team. There is a case study at the end of this learning module that allows the reader to evaluate their learning and consider how nursing roles can influence perioperative nursing care.

Module Two: Emergency Considerations in Neurosurgery

Module two provides an overview of the potential emergency situations that can be experienced as a perioperative neurosurgical nurse. Considerations for emergency neurosurgical procedures, as well as intraoperative emergencies are explored in this module. The module provides an overview of expectations, nursing roles, emergency supplies, and emergency management. The case study provided at the end of this module allows the learner to apply their knowledge and consider appropriate nursing actions during an emergency neurosurgical procedure.

Module Three: Overview of Neurosurgical Procedures

This module will build upon the foundational overview of perioperative neurosurgical nursing presented in the first module. There are a large variety of neurosurgical procedures, each with their own specifications for patient needs and positioning concerns. This module will explore concepts relating to the understanding patient needs, airway considerations, and appropriate positioning considerations for neurosurgical procedures. There are also helpful tips for nursing practice illuminated throughout the module.

Module Four: Common Instruments Used in Neurosurgery

The next module outlines the instruments and supplies that are specific to neurosurgery. The module content presents the instruments that are commonly used in neurosurgical procedures and provides instructions for how to assemble and care for delicate instruments, implant instrument sets, and general trouble shooting techniques.

Module Five: Common Equipment Used in Neurosurgery

Module five follows a similar format to the previous model by outlining the equipment used in neurosurgical procedures. This module provides an overview of the intricate equipment that is unique to neurosurgery. Quick start references, components, maintenance, and storage of equipment are all outlined in this module. Types of equipment and surgical tables are discussed and indications for their use are provided to assist the perioperative neurosurgical nurse in becoming familiar with the variety of equipment used in neurosurgery.

Module Six: Interprofessional Considerations

This module provides an overview of interprofessional considerations related to neurosurgery including: an overview of all neurosurgical team members, coordination of care, shared decision making, and classification of the neurosurgical perioperative team. The perioperative team consists of different professional working groups including anesthesia, surgical residents, surgeons, nursing, and support staff. Members of each professional group frequently work and learn together to improve the care of the neurosurgical patient. This module is designed to increase understanding and reinforce the importance of perioperative teamwork for neurosurgical patients.

Discussion of Advanced Nursing Practice (ANP) Competencies

Advanced Nursing Practice (ANP) is a broad term that is used to define a registered nurses and nurse practitioners who integrate advanced nursing educational preparation, with their personal in-depth, specialized clinical nursing knowledge and expertise in complex decision-making to meet the needs of patients (Canadian Nurses Association (CNA), 2019). Competencies are the specific knowledge, skills, judgement, and personal attributes that may be required for to safely practice as a nurse. Core competencies for ANP are based on an appropriate depth, breadth, and range of nursing knowledge, theory, and research, enhanced by

clinical experience. According to The CNA (2019), ANP competencies can be separated into six categories: direct comprehensive care, optimizing health systems, educational, research, leadership, and consultation and collaboration. Through the development of this practicum project, elements from some of these competencies have been enacted and demonstrated.

Optimizing Health System Competencies

Advanced nursing practice contributes to the effective functioning of health systems through advocacy, promoting innovative healthcare, and facilitating equitable, client-centered care (CAN, 2019). This can be done by generating and incorporating new nursing knowledge to develop programs, strategies, or protocols to improve existing practices. For this practicum project, I was able to utilize the information acquired through the methods mentioned above to develop an educational resource that supports the existing orientation process for newly hired neurosurgical perioperative nurses. The educational resource will provide a comprehensive overview of the neurosurgical service, something that is not currently provided in the existing orientation tool. The goal of the educational resource is to improve the orientation process so that newly hired nurses have a better knowledge and skill set, and increased confidence when they finish their orientation.

Educational Competencies

Advanced practice nurses are committed to professional growth and learning for all healthcare providers. They contribute to nursing and the healthcare system by disseminating new knowledge through formal and informal channels (CAN, 2019). In the practicum project I have been able to identify the learning needs of neurosurgical perioperative nurses. I was then able to apply this information to develop a resource that can support the orientation process and meet learning needs.

Research Competencies

The CNA (2019) argues that advanced practice nurses must maintain a commitment to generating, synthesizing, critiquing, and applying research evidence. When conducting the literature review, existing literature was evaluated, critiqued, and synthesized to inform the development of an educational resource to support the orientation of neurosurgical perioperative nurses. Data was also collected, evaluated, and synthesized during the environmental scan to demonstrate what tools and resources other healthcare organizations are using to support orientation practices. During the consultations, I was able to collect and analyze data from the interviews to explore topics of interest for the development of the educational resource.

Leadership Competencies

Advanced practice nurses are agents of change and are consistently seeking effective new ways to practice, improve nursing care, and promote ANP. They evaluate programs within the organization, apply theories, and develop innovate approaches to issues (CNA, 2019). Through discussions with colleagues, I was able to identify issues with the current orientation practices used in the neurosurgical perioperative service. As a result of these discussions, I was able to construct the idea for this practicum project to develop a resource that could support the orientation process. I continue to demonstrate leadership competencies by maintaining a commitment to developing the resource with the intent to improve orientation practices.

Next Steps

Following the completion of this practicum project, the orientation resource will be shared with the Perioperative Health Services Manager of the unit for review and approval to distribute to newly hired perioperative neurosurgical nurses. Upon approval, the resource will be made available to all staff currently working in the neurosurgical specialty of the perioperative

services. The resource will be provided electronically via email to all neurosurgical perioperative nursing staff. An email request will also be sent to the Information Technology department within the organization to obtain permission to have a copy of the resource made available on all desktop computers in the neurosurgical operating rooms. The resource will also be shared with the Perioperative Clinical Nurse Educator so that it may be evaluated for inclusion with the orientation of newly hired perioperative neurosurgical nurses. While this resource is specific to neurosurgical perioperative nursing, the goal would be to use this resource as a template to design orientation resources for other perioperative services at the same hospital. Another goal would be for this resource to be shared with other perioperative neurosurgical units across the country.

Evaluation of the orientation will include monitoring of staff feedback and nursing care provided in the perioperative neurosurgical operating rooms. Perioperative neurosurgical nursing job satisfaction and turnover rates will also be monitored as part of the evaluation plan. Resource feedback will be obtained through an anonymous online survey to obtain critical constructive feedback from users of the resource. This electronic evaluation form will be developed and disseminated for the preceptors and orientees to complete and may be attached as a hyperlink to the original email containing the orientation resource. The electronic survey questionnaire will include open ended questions to elicit participant feedback. When participants are verbally expressive and cooperative, open-ended questions allow for participants to share their experiences using their own words which may provide a richer and fuller perspective on the topic of interest (Miller & Lambert, 2014; Polit & Beck, 2021). Participants will be asked if they found the resource helpful during the process of orientation and encouraged to share their thoughts on the structure and content of the resource. There will be space provided for the staff

to provide recommendations for improvement. Content analysis methods will be used to analyze the collected survey data and identify prominent themes and patterns within the data (Polit & Beck, 2021). The results can be monitored by the Perioperative Clinical Nurse Educator of the unit.

Perioperative neurosurgical turnover rates will also be reviewed following the implementation of this resource. Quantitative analysis methods can be used to review nursing turnover data (Polit & Beck, 2021). A decrease in neurosurgical nursing turnover rates within the perioperative department may indicate that the resource is having a positive impact on perioperative neurosurgical nursing confidence and competence. Job satisfaction could also be monitored through anonymous electronic surveys. Neurosurgical perioperative nursing turnover rates and results of the electronic job satisfaction surveys can be monitored by the Perioperative Health Services Manager. Building on this orientation-related project, future work could be directed at strengthening and supporting the orientation and onboarding practices within the perioperative unit for all disciplines to ultimately improve perioperative patient care.

Conclusion

Perioperative nursing requires nurses to have advanced clinical judgement, critical thinking, and clinical leadership skills. Neurosurgery is a complex service line that is different from the other services in terms of surgical instruments, high patient acuity, and complex surgical procedures. Training and education are traditionally provided to nurses who are new to perioperative nursing practice through the processes of orientation and onboarding. The purpose of this practicum project was to develop a neurosurgical unit specific orientation resource that contains relevant information and addresses the unique needs of nurses newly hired to the perioperative neurosurgical specialty. The resource was intended to help address any knowledge gaps and improve perioperative neurosurgical nursing competence and ultimately patient care.

Methods for the project included an integrative literature review, environmental scan, and consultation interviews with key stakeholders. Findings from these methods illuminated valuable information about neurosurgical perioperative orientation and onboarding and provided insights into the learning needs of neurosurgical perioperative nursing staff.

The implementation and evaluation of this orientation resource will be continued after the completion of this practicum project. The implementation process will include submitting the final resource to the Health Services Manager and Clinical Nurse Educator for review and inclusion in the existing orientation program. Feedback surveys will be collected electronically to evaluate the quality and effectiveness of the resource. This orientation resource will provide a stronger foundation of neurosurgical perioperative knowledge and skills to increase clinical competence and confidence upon completion of the orientation and onboarding process.

References

Baumann, A., Crea-Arsenio, M., Hunsberger, M., Fleming-Carroll, B., & Keatings, M. (2019). Work readiness, transition, and integration: The challenge of specialty practice. *Journal of Advanced Nursing*, *75*(4), 823–833. https://doi.org/10.1111/jan.13918 https://onlinelibrary-wiley-com.qe2a-proxy.mun.ca/share/JE2EJ9PMJ5DE7WNSPRSS?target=10.1111/jan.13918

Beitz, J. M. (2019). Addressing the perioperative nursing shortage through education: A perioperative imperative. *AORN Journal*, *110*(4), 403–414. https://qe2a-proxy.mun.ca/login?url?url=https://www.proquest.com/scholarly-journals/addressing-perioperative-nursing-shortage-through/docview/2299137342/se-2?accountid=12378

Bommer, C., Sullivan, S., Campbell, K., Ahola, Z., Agarwal, S., O'Rourke, A., Jung, H. S., Gibson, A., Leverson, G., & Liepert, A. E. (2018). Pre-simulation orientation for medical trainees: An approach to decrease anxiety and improve confidence and performance. *American Journal of Surgery*, *215*(2), 266–271. https://doi.org/10.1016/j.amjsurg.2017.09.038 https://qe2a-proxy.mun.ca/login?url?url=https://www.proquest.com/scholarly-journals/pre-simulation-orientation-medical-trainees/docview/2007531715/se-2?accountid=12378

Clarke, D. B., Gaililee, A. I., Kureshi, N., Hong, M., Fenerty, L., & D'Arcy, R. C. N. (2021). Knowledge transfer and retention of simulation-based learning for neurosurgical instruments: a randomised trial of perioperative nurses. *BMJ Simulation & Technology*

Enhanced Learning, *7*(3), 146–153. https://doi.org/doi:10.1136/bmjstel-2019-000576 https://pubmed.ncbi.nlm.nih.gov/35518567/

Duchscher, J. E. (2009). Transition shock: the initial stage of role adaptation for newly graduated Registered Nurses. *Journal of Advanced Nursing*, *65*(5), 1103-1113. https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_webofscience_primary_000264821000020CitationCount

Fearon, M. C. (2018). Knowledge, Accuracy, Precision: Requirements for the periopertive neursourgical nurse. *AORN Journal*, *108*(2), 124-125. https://doi.org/10.1002/aorn.12321 https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_webofscience_primary_000445117500013CitationCount

Fernandez, R., Rosenman, E. D., Olenick, J., Misisco, A., Brolliar, S. M., Chipman, A. K., Vrablik, M. C., Kalynych, C., Arbabi, S., Nichol, G., Grand, J., Kozlowski, S. W. J., & Chao, G. T. (2020). Simulation-based team leadership training improves team leadership during actual trauma resuscitations: A randomised controlled trial. *Critical Care Medicine*, *48*(1), 73–82. https://doi.org/10.1097/CCM.0000000000004077 https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_crossref_primary_10_1097_CCM_0000000000004077

Hope, C., Reilly, J. J., Griffiths, G., Lund, J., & Humes, D. (2021). Factors associated with attrition and performance throughout surgical training: A systematic review and meta-analysis. *World Journal of Surgery*, *45*(2), 429–442. https://doi.org/10.1007/s00268-020-05844-0 https://qe2a-proxy.mun.ca/login?url?url=https://www-proquest-com.qe2a-

proxy.mun.ca/scholarly-journals/factors-associated-with-attrition-performance/docview/2473886799/se-2

Joanna Briggs Institute. (n.d.). *Critical appraisal checklisst for qualitative research*. https://jbi.global/critical-appraisal-tools

Knowles, M. S. (1978). *Andragogy: Adult learning theory in perspective*. *5*(3). https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_sage_journals_10_1177_009155217800500302

Kurnat-Thoma, E., Ganger, M., Peterson, K., & Channell, L. (2017). Reducing annual hospital and registered nurse staff turnover—A 10-element onboarding program intervention. *SAGE Open Nursing*, *3*, 1–13. https://doi.org/10.1177/2377960817697712 https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_doaj_primary_oai_doaj_org_article_b1571fd3898141dea04d2f765130d744

Lalithabai, D. S., Ammar, W. M., Alghamdi, K. S., & Aboshaiqah, A. E. (2021). Using action research to evaluate a nursing orientation program in a multicultural acute healthcare setting. *International Journal of Nursing Sciences*, *8*(2), 181–189. https://doi.org/10.1016/j.ijnss.2021.01.002

Larew, C., Lessans, S., Spunt, D., Foster, D., & Covington, B. G. (2006). Innovations in clinical simulation: Application of Benner's theory in an interactive patient care simulation. *Nursing Education Perspectives*, *27*(1), 16–21. https://qe2a-proxy.mun.ca/login?url?url=https://www-proquest-com.qe2a-proxy.mun.ca/scholarly-journals/innovations-clinical-simulation-application/docview/236667623/se-

2?accountid=12378

Lenihan, A. (2021). *Prep for KT: The perioperative nursing shortage*.

Madhuvu, A. E., Plummer, V., & Morphet, J. (2018). An exploration of participants' experience of an intensive care nursing transition to specialty practice program. *Australian Critical Care, 31*(5), 311–316. https://doi.org/10.1016/j.aucc.2017.08.005 https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_pubmed_primary_28967467

Mayo Foundation. (2022). Perioperative nurse. https://college.mayo.edu/academics/explore-health-care-careers/careers-a-z/perioperative-nurse/

Miller, A. L., & Lambert, A. D. (2014). Open-ended survey questions: Item nonresponse nightmare or qualitative data dream? *Survey Practice, 7*(5). http://doi.org/10.29115/SP-2014-0024

Mollohan, J. K., & Morales, M. (2016). Strategies for successful perioperative orientation. *AORN Journal, 104*(2), 100–110. https://doi.org/10.1016/j.aorn.2016.06.002 https://qe2a-proxy.mun.ca/login?url?url=https://www-proquest-com.qe2a-proxy.mun.ca/scholarly-journals/strategies-successful-perioperative-orientation/docview/1807048943/se-2?accountid=12378

Murray, M., Sundin, D., & Cope, V. (2019). Benner's model and Duchscher's theory: Providing the framewoork for understanding new graduates nurses' transition to practice. *Nurse Education in Practice, 34*, 199–203.

https://doi.org/https://doi.org/10.1016/j.nepr.2018.12.003 https://qe2a-proxy.mun.ca/login?url?url=https://www-proquest-com.qe2a-proxy.mun.ca/scholarly-journals/benners-model-duchschers-theory-providing/docview/2177114008/se-2

Nova Scotia Health Authority. (2022). Perioperative nursing program. https://learninginstitute.nshealth.ca/programs-and-courses/perioperative-nursing-for-rns

Polit, D.F., & Beck, C. T. (2021). *Nursing research: Generating and assessing evidence for nursing practice* (11th ed.). Wolters Kluwer

Renger, S., Macaskill, A., & Naylor, B. (2020). Learning and change within person-centered therapy: Views of expert therapists. *Counselling & Psychotherapy Research*, *20*(3), 535–544. https://search-ebscohost-com.qe2a-proxy.mun.ca/login.aspx?direct=true&AuthType=ip,url,uid&db=pbh&AN=144804878&site=ehost-live&scope=site

Reuter, J., & King, T. S. (2021). Evaluation of a redesigned perioperative specialty elective to address the perioperative nursing shortage. *113*(5), 476–485. https://doi.org/http://doi.org.10.1002/aorn.13375 https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_proquest_journals_2521670959

Sasso, L., Bagnasco, A., Catania, G., Zanini, M., Aleo, G., & Watson, R. (2019). Push and pull factors of nurses' intention to leave. *Journal of Nursing Management*, *27*(5), 946–954. https://onlinelibrary-wiley-com.qe2a-proxy.mun.ca/doi/full/10.1111/jonm.12745

University of Alberta. (2022). Nursing specializations. https://www.ualberta.ca/nursing/about/about-nursing/nursing-specializations.html

Zaheer, S., Ginsburg, L., Wong, H. J., Thomson, K., Bain, L., & Wulffhart, Z. (2019). Turnover intention of hospital staff in Ontario, Canad: Exploring the role of frontline supervisors, teamwork, and mindful organizing. *Human Resources for Health, 17*(66), 1-9. https://doi.org/10.1186/s12960-019-0404-2

Appendices

Appendix I: Literature Review

Literature Review: Development of a Self-Directed Orientation Resource for Nurses Newly Hired to the Neurosurgical Perioperative Specialty

Allison Lenihan

201890286

Memorial University of Newfoundland

Literature Review

Specialty nursing practice requires a supportive orientation that is tailored to accommodate individual learning needs. Specialization in nursing involves focused nursing practice in an identified specific clinical area and is defined as a delimited or concentrated area of clinical expertise with focused knowledge and competencies (University of Alberta, 2022). Perioperative nursing is a term used to describe nurses who work as surgical nurses in operating rooms to provide care to patients undergoing surgical procedures (Mayo Foundation, 2022). Perioperative nursing requires nurses to have advanced clinical judgement, critical thinking, and clinical leadership skills (Nova Scotia Health Authority, 2022). Training and education are traditionally provided to nurses who are new to perioperative nursing practice through the processes of orientation and onboarding. Comprehensive training is essential to provide nurses who are new to the perioperative area with the tools needed to practice competently and confidently.

Orientation is defined as the act or process of training or preparing new employees, and onboarding is described as the action or process in which new employees gain the knowledge and skills that they need to become an effective member of the organization (Cambridge University Press, 2022). When nurses enter the nursing profession, they are required to have a foundation of knowledge, skill and judgement that is based on a set of entry-level competencies (Canadian Nurses Association (CNA), 2022). The CNA (2022) recommends that nurses who are working in specialty areas receive additional education, training, and certification for their specialty practice area. The purpose of this literature review is to evaluate and synthesize the existing literature related to the practices of orientating and onboarding perioperative nursing staff, and to support the need for developing a resource that is best suited to support the

orientation of nurses who are newly hired to the neurosurgical perioperative specialty. Improper orientation and training of perioperative nurses can have negative impacts for patient safety (Steelman et al., 2013; Lenihan, 2021), staff turnover (Baumann et al., 2019), and job satisfaction (Beitz, 2019; Sasso et al., 2019). Working in a perioperative nursing specialty requires specialized training and education so that nurses can become competent in their professional practice as a perioperative nurse. Specialized training and education would prepare nurses to meet the dynamic and complex needs of patients in the perioperative setting (Nova Scotia Health Authority, 2022).

Methods of the Literature Review

To conduct this literature review, a search of the Cumulative Index to Nursing and Allied Health Literature (CINAHL) and PubMed databases was completed in pursuit of articles related to the topic of nursing orientation. The following key words were used in the search: “nursing”, “nurse”, “orientation”, “onboarding”, “training”, “perioperative”, “neurosurgical”, “operating room”, “perioperative nursing”, “surgical”, “neurosurgical”, “residents”, and “surgeons”. The reference lists of selected articles were also searched for additional articles related to the topic of perioperative nursing orientation. To be considered for inclusion, studies must have pertained to orientation and training for perioperative nurses and been published within the last ten years to allow for the retrieval of clinically relevant articles. This time frame was selected to ensure the most recent literature relating to orientation and training for perioperative nurses was examined. Selected quantitative studies were appraised using the Public Health Agency of Canada Toolkit for Critical Appraisal (Public Health Agency of Canada, 2014), while qualitative research was appraised using the Joanna Briggs Institute Checklist for Qualitative Research (Joanna Briggs Institute, n.d.) as this checklist provides guidance for appraising qualitative research. Details of

studies by **Bommer et al. (2018), Clarke et al. (2021), Fernandez et al. (2019), Hope et al. (2020), Kaladheim et al. (2019), Kurnat-Thoma et al. (2017), Lalithabai et al. (2021), Madhuvu et al. (2017),** and **Ndung'u et al. (2022)** can be found in the literature summary table in the Appendix. The purpose of this literature review was to:

1. Support the need for developing an orientation resource for nurses newly hired to the neurosurgical perioperative service.
2. Identify existing strategies for supporting effective orientation to the neurosurgical perioperative nursing service.
3. Evaluate and synthesize any existing literature related to the topic of orientation for surgical training or perioperative nursing; and
4. Provide a foundational understanding of effective orientation and onboarding processes for neurosurgical perioperative nursing to inform the questionnaires used for the consultations.

Significance of the Problem

The increasing complexity of healthcare and rising acuity levels of patients have intensified the demands and expectations that are placed upon new nurses entering the workforce. Nurses must be ready to practice in all clinical settings upon entering the workforce, including specialty practice areas such as perioperative nursing. Nova Scotia is currently experiencing a twenty per cent nursing vacancy rate across the province in all clinical areas (NSGEU, 2019; NSNU, 2019). The Canadian Nurses Association (2021) recognizes that although the overall growth rate of the regulated nursing population eligible to practice in the country was approximately 1.9%, the nursing workforce has diminished by 1.5% from 2018 to

2019. This indicates that there are not enough nurses in the healthcare system to meet the demands of the workplace.

Clinical practice areas such as perioperative nursing are particularly impacted by nursing shortages. Historically, it was unusual to see recently graduated nurses working in the perioperative area as this specialty area was typically limited to nurses with some general nursing experience (Baumann et al., 2019; Reuter & King, 2021). However, due to the severe nursing shortage, perioperative leaders are exploring the option of hiring recently graduated nurses without any prior perioperative experience (Reuter & King, 2021). Perioperative nurses use their knowledge to prioritize activities to protect the patient. Patient safety in the perioperative setting is dependent upon qualified and credentialed nursing care. A lack of perioperative experience and improper perioperative training need to be addressed to reduce patient safety concerns.

A shortage of appropriately trained perioperative nurses has a significant impact for perioperative patients, nurses, and the healthcare organization. A medium quality descriptive study determined that when perioperative nurses are not available to support the surgical team, it can have substantial impacts on the incidence of patient safety issues such as the prevention of wrong site surgeries ($p=0.584$), retained surgical items ($p=0.890$), and medication errors ($p=0.731$) (Steelman et al., 2013). The Association of Perioperative Registered Nurses identified that perioperative nurses serve as patient safety advocates, with the ability to holistically assess and respond to dynamic conditions (Steelman et al., 2013). Without proper training and orientation, it is possible that patient safety may become compromised in the midst of a perioperative nursing shortage as newer, less experienced perioperative nurses enter the field to replace more experienced staff (Lenihan, 2021).

Hiring nurses without any or only limited perioperative nursing experience can have negative impacts on nurses working in the neurosurgical specialty. The literature recognizes that the pressures of orientating new staff can result in increased emotional exhaustion (1.082; 95%CI [1.075-1.089]), poor job satisfaction (0.243; 95%CI [0.219-0.27]) (Sasso et al., 2019), and burnout of staff (Beitz, 2019; Sasso et al., 2019). Nurses who are newly hired to specialty areas can experience transition shock and feel overwhelmed (Baumann et al., 2019). Ineffective orientation and training of new nurses were found to be factors contributing to an increase in turnover rates for newly hired nurses in a medium quality literature review, with as many as 40% of nurses leaving practice within the first year (Baumann et al., 2019).

Background

Nurses hired to the neurosurgical specialty within the perioperative services often do not have any previous perioperative nursing experience. Perioperative nursing competencies are unique to the designated surgical service and are critical for efficient performance in the operating room.

Incidence and Prevalence

One of the major issues facing the neurosurgical perioperative service is the increase in nursing staff turnover rates. A systematic review defines attrition as the departure of employees from an organization for any reason, including resignation, termination, or retirement (**Hope et al., 2020**). Attrition within perioperative training is a challenge, with rates as high as 20-26% in the United States of America (**Hope et al., 2020**) and as high as 15% in Canada (Zaheer et al., 2019). An increase in perioperative nurse turnover may have a negative impact on perioperative patients, nurses, and the healthcare system. The shortage of perioperative nurses can potentially

be managed by implementing an educational resource to support the process of orientating and onboarding newly hired nursing staff to the neurosurgical specialty.

Impact on Patient.

A medium quality existing literature review investigated the perioperative nursing shortage to identify possible solutions and determined that perioperative settings with lower turnover rates also had lower patient mortality and lengths of stay (Reuter & King, 2021). It was also estimated that as many as 50% of new nurses will change positions or leave nursing within the first 3 years of clinical practice in a specialty setting (Baumann et al., 2019). An increase in perioperative nurse turnover can have a negative impact on perioperative patient safety. Two medium quality descriptive studies found that the incidence of patient safety reports rose with the increase in perioperative nursing turnover (Affleck, 2017; Beitz, 2019). Patient safety in the perioperative setting is dependent upon qualified and credentialed nursing care. Perioperative patients often have dynamic and complex care needs and require nursing care from competent and knowledgeable professionals (Lenihan, 2021). Shortages of trained perioperative nurses can jeopardize patient safety and the quality of care provided. Transition into specialty practice areas requires extended orientation and training in order to promote nursing retention. Orientation and training programs that promote work readiness can enhance new nurses' confidence and clinical practice and support their retention (Baumann et al., 2019; Vlach, 2018).

Impact on Nurses and Healthcare System.

Nurses who are new graduates or new to the perioperative environment face many unique challenges as they transition into this specialty role. A new perioperative nurse may need time to adjust to the rigors of the daily perioperative routines, learning new technology, and the

acquisition of surgical knowledge and skills (**Clarke et al., 2021**; Mollohan & Morales, 2016). Much of the existing evidence demonstrates that novice and graduate nurses experience transition shock when faced with the realities of working in a specialty area and often feel overwhelmed and discouraged during the orientation process. This may be a result of the amount of new information, new skills to learn, demands of clinical practice, or adjusting to practicing in a different patient care environment (Baumann et al., 2019; **Clarke et al., 2021**; Mollohan & Morales, 2016). Clinical nurse educators should consider all available resources and educational goals to ensure the best overall training experience possible for nurses entering this complex environment. Providing orientees with adequate resources to support their learning and onboarding to a new area, will ultimately result in nurses who are more prepared for practice and have greater confidence. Perioperative leaders should not assume that nurses who are new to neurosurgical nursing can make a successful transition into practice without the structure and support of orientation and onboarding programs (Mollohan & Morales, 2016).

Contributing Factors

Comprehensive training is needed to effectively prepare nurses who are new the neurosurgical specialty of the perioperative services with the tools needed to become competent in their nursing practice. Competency in specialty nursing areas is essential to providing optimal patient care. There are many factors that contribute to a lack of knowledge and competence in clinical practice. These factors include: limited orientation and onboarding, and lack of nursing knowledge about specialty areas.

Limited Orientation and Onboarding.

The existing literature demonstrates that there is a large variety of approaches to the current practices of orientating and onboarding surgical staff **(Madhuvu et al., 2018; Ndung'u et al., 2022**). Results of a low-quality descriptive study suggest that there is a knowledge gap and an educational need among nurses working in specialty clinical practice areas (**Ndung'u et al., 2022**). Working in the perioperative nursing specialty requires specialized training and education that is unique to each surgical specialty (**Clarke et al., 2021**). Comprehensive training is needed to equip a new perioperative nurse with the tools needed to begin functioning at full competency (Mollohan & Morales, 2016). After nurses are newly hired to the perioperative specialty, they require specialized on-the-job clinical training and education through orientation, onboarding, and preceptorship (Reinhart et al., 2021).

Lack of Knowledge about Specialty Areas of Nursing Practice.

Perioperative nursing curricula is almost non-existent in undergraduate nursing programs (Reinhart & Moore, 2021; Reuter & King, 2021). Practical clinical experience in specialty areas is an essential component of nursing education to allow for the development of skills and competencies (**Clarke et al., 2021**). A lack of exposure to perioperative nursing education and clinical experience focusing on perioperative nursing may cause graduate nurses to question the suitability of perioperative nursing as a career (Baumann et al., 2019; Reuter & King, 2021). Increased complexity of patient care (Baumann et al., 2019), high-stress environment (Baumann et al., 2019; Clarke et al., 2021; Reuter & King, 2021), and lack of confidence (Baumann et al., 2019; Reuter & King, 2021), are among the most common reasons that nurses may not consider a career in perioperative nursing. Recently graduated nurses with perioperative educational experience have a better understanding of the role of a perioperative nurse.

Strategies for Supporting Orientation

Nine studies were conducted to explore orientation and training for healthcare staff working in perioperative settings or other nursing specialty areas, of which one was a high quality systematic review (**Hope et al., 2021**), one was a medium quality systematic review (**Kaldheim et al., 2019**) which is a strong design, three were high quality strong design randomized controlled trials (RCTs) (**Bommer et al., 2018; Clarke et al., 2021; Fernandez et al., 2020**), one medium quality mixed method design (**Lalithabai et al., 2021**) which is a moderate research study design, two were medium quality cross-sectional studies **(Madhuvu et al., 2018; Ndung'u et al., 2022**) which are considered low quality designs, and one low quality poor strength design cross-sectional study **(Kurnat-Thoma et al., 2017**). Three of these studies were conducted in the United States of America **(Bommer et al., 2018; Hope et al., 2021; Kurnat-Thoma et al., 2017**), three were conducted in Canada **(Clarke et al., 2021; Fernandez et al., 2020; Kaldheim et al., 2019**), and one in each country of Saudi Arabia (**Lalithabai et al., 2021**), Australia (**Madhuvu et al., 2018**), and Kenya (**Ndung'u et al., 2022**). Four of the studies were conducted in perioperative clinical areas (**Bommer et al., 2018; Clarke et al., 2021; Hope et al., 2021; Kaldheim et al., 2019**). The remaining five studies were conducted in other specialty practice areas such as emergency departments (**Fernandez et al., 2020; Kurnat-Thoma et al., 2017**), critical care units **(Madhuvu et al., 2018; Ndung'u et al., 2022**), and dedicated nursing units **(Lalithabai et al., 2021**). These studies were included in this literature review as they are conducted within specialty nursing practice areas which are comparable to neurosurgical nursing in terms of the unique knowledge and skill set that is required to work in a specialty area.

Six of the studies included nurses as the study population exclusively (**Clarke et al., 2021; Kaldheim et al., 2019; Kurnat-Thoma et al., 2017; Lalithabai et al., 2021; Madhuvu et al., 2018; Ndung'u et al., 2022**), two of the studies included surgical residents or medical students **(Bommer et al., 2018; Fernandez et al., 2020**), and one study synthesized articles that included surgical residents, surgical nurses, or medical students (**Hope et al., 2021**). The most predominant interventions noted for healthcare staff were simulation-based learning **(Clarke et al., 2021; Bommer et al., 2018; Fernandez et al., 2020; Kaldheim et al., 2019**), comprehensive learning plans **(Kurnat-Thoma et al., 2017; Ndung'u et al., 2022**), and onboarding or orientation programs (**Hope et al., 2021; Lalithabai et al., 2021; Madhuvu et al., 2018**). These interventions were designed to be used for orientation and training of new staff in perioperative clinical settings or other specialty areas of clinical practice.

Simulation-Based Learning

Four of the studies included in this literature review used simulation-based learning to support orientation of neurosurgical perioperative nurses (**Clarke et al., 2021**), surgical residents, medical students (**Bommer et al., 2018; Fernandez et al., 2020**), and specialty practice nurses (**Kaldheim et al., 2019**). Lengths of the simulation session varied from 5 minutes (**Bommer et al., 2018**) to 4 hours (**Fernandez et al., 2020**). Content of the simulation session was specific to the clinical practice area and included topics such as surgical instrumentation (**Clarke et al., 2021**), physical examination, set up of the operating room (**Bommer et al., 2018; Clarke et al., 2021; Kaldheim et al., 2019**), and technical skills (**Bommer et al., 2018; Fernandez et al., 2020; Kaldheim et al., 2019)**.

A medium quality systematic review extracted data to answer the question of what is known about the use of simulation-based learning in the area of perioperative nursing

(Kaldheim et al., 2019). The high quality RCT by **Clarke et al. (2021)** intended to determine the effectiveness of simulation in learning of neurosurgical instruments and assess if these skills were transferable to clinical tasks. Two other high quality RCTs used simulation sessions to support orientation of residents and medical students in surgical practice (**Bommer et al., 2018**), and trauma practice (**Fernandez et al., 2020**). The primary outcomes were confidence **(Bommer et al., 2018; Clarke et al., 2021; Kaldheim et al., 2019**), knowledge **(Bommer et al., 2018; Clarke et al., 2021; Fernandez et al., 2020; Kaldheim et al., 2019**), and patient care **(Bommer et al., 2018; Fernandez et al., 2020**).

A medium quality systematic review (**Kaldheim et al., 2019**) and a medium quality RCT (**Bommer et al., 2018**) found that the oriented group who received simulation-based learning as a part of their orientation training, also demonstrated significantly greater confidence in their clinical practice ($p<0.05$). Other studies concluded that simulation-based training resulted in improved knowledge in perioperative clinical settings **(Clarke et al., 2021; Fernandez et al., 2020; Kaldheim et al., 2019**). For example, in the high-quality RCT by **Clarke et al. (2021)** (n=100), registered nurses in the intervention were 23% quicker in identifying real instruments and did so with better accuracy (93.2% vs 80.6%, $p<0.0001$). These results indicate that nurses who receive simulation-based training can transfer their learning into their clinical practice situations. Comparatively, a high-quality RCT by **Bommer et al. (2018)** (n=24), reported that graduating medical students who had a simulation program as part of their clinical orientation, had greater confidence ($p<0.05$) and clinical decision making ($p<0.05$) compared to the control group. This suggests that simulation-based training can improved perioperative or surgical knowledge (**Bommer et al., 2018; Clarke et al., 2021**). There were no significant differences in patient care quality between groups of surgical residents in another high-quality RCT

(**Fernandez et al., 2020**), but a second RCT found significant improvements in clinical performance scores by medical students for patient care quality for the intervention group ($p<0.05$). Demonstrating that the quality of patient care is improved when staff receive appropriate training (**Bommer et al., 2018**).

Comprehensive Learning Plans to Support Orientation

Two cross-sectional studies examined the use of orientation or onboarding learning plans to support the orientation of nurses hired to the emergency nursing specialty, one was medium quality (**Ndung'u et al., 2022**), and one was a low quality study (**Kurnat-Thoma et al., 2017**). The medium quality study was conducted in Nairobi, Kenya (**Ndung'u et al., 2022**), and the low quality study was conducted in the United States of America (USA) (**Kurnat-Thoma et al., 2017**). The studies had varying periods of follow up, including 90 days **(Kurnat-Thoma et al., 2017**), and immediately (**Ndung'u et al., 2022**), upon completion of orientation. All participants were newly hired Registered Nurses working in adult emergency departments **(Kurnat-Thoma et al., 2017; Ndung'u et al., 2022**). Both studies collected data from facility staffing statistics, exit surveys, research literature, industry exemplars, and post-intervention surveys to formulate learning plans to support the orientation of nurses working in emergency rooms in trauma center hospitals. All participants received an intervention to standardize the onboarding and orientation process for new employees (**Kurnat-Thoma et al., 2017; Ndung'u et al., 2022**). Two studies were conducted to evaluate the use of a learning plan to address the existing knowledge gaps and education needs of nurses newly hired to the emergency department, with the intent to improve nursing knowledge (**Kurnat-Thoma et al., 2017; Ndung'u et al., 2022**), competence **(Ndung'u et al., 2022**), and reduce turnover rates (**Kurnat-Thoma et al., 2017**).

Primary outcomes included improved staff retention (**Kurnat-Thoma et al., 2017**) and increased knowledge (**Kurnat-Thoma et al., 2017; Ndung'u et al., 2022**), and clinical competence (**Ndung'u et al., 2022**). **Ndung'u et al. (2022)** (n=84), reported that there is a knowledge gap and educational need among nurses working in the specialty of emergency nursing. In this medium quality cross-sectional study, developing learning plans showed a significant improvement in educational needs by decreasing the knowledge gap and improving skill competencies for nurses newly hired to the specialty of emergency nursing (78.6%, n=66) (**Ndung'u et al., 202**2). Orientation learning plans can also significantly reduce turnover of newly hired nurses by providing education and support (p=0.04) (**Kurnat-Thoma et al., 2017**).

Orientation and Onboarding Programs

Three studies were conducted to explore the use of orientation programs for surgical training (**Hope et al., 2021**), nurses newly hired to hospitals (**Lalithabai et al., 2021**), and nurses transitioning to specialty practice settings, including perioperative nursing **(Madhuvu et al., 2018**). The three studies included one high quality systematic review (**Hope et al., 2021**), one medium quality descriptive cross-sectional study (**Madhuvu et al., 2018**), and a medium quality mixed methods study (**Lalithabai et al., 2021**). The studies were conducted in Australia (**Madhuvu et al., 2018**), Saudi Arabia (**Lalithabai et al., 2021**), and the systematic review included articles from the USA, Pakistan, and the United Kingdom (**Hope et al., 2021**). Participants included surgical residents (**Hope et al., 2021**), or Registered Nurses newly hired to specialty practice areas (**Lalithabai et al., 2021; Madhuvu et al., 2018**).

The systematic review included controlled trial studies that investigated specialty surgical trainees (**Hope et al., 2021**) to explore factors that influence clinical competence and performance in surgical training. While the medium quality cross-sectional and medium quality

mixed method studies reviewed orientation programs for Registered Nurses working in specialty areas (**Lalithabai et al., 2021; Madhuvu et al., 2018**). Programs included educational sessions, clinical skills workshops (**Lalithabai et al., 2021; Madhuvu et al., 2018**), self-directed learning modules, and a written examination (**Lalithabai et al., 2021**). Programs varied in length from seven days (**Madhuvu et al., 2018**), to three weeks (**Lalithabai et al., 2021**). These programs were designed as resources to support the orientation and onboarding process of nurses new to specialty practice areas (**Lalithabai et al., 2021; Madhuvu et al., 2018**).

The primary outcomes included in these studies were adequate knowledge (**Lalithabai et al., 2021; Madhuvu et al., 2017**), and clinical competence or confidence in ability to perform clinical skills (**Hope et al., 2020; Lalithabai et al., 2021**). In the study by **Madhuvu et al. (2017)**, participants reported having inadequate knowledge upon entering the critical care nursing specialty without having undertook transition to practice programs. Nurses who completed the transition to practice program reported significant improvements ($p<0.001$) in their specialty nursing knowledge (71.8%, n=66) (**Madhuvu et al., 2017**). Comparatively, **Hope et al. (2020)** (n=31), found that clinical competence significantly improved during surgical skill performance after completing the orientation training ($p=0.0467$). Most of the studies also reported on secondary outcomes but none of the measured outcomes related to the topic of this literature review. These findings demonstrate that programs to support orientation can be effective in improving knowledge and clinical competence for specialty nursing practice and surgical training.

Summary of Key Literature Findings

The existing literature illuminates that there are a variety of strategies used to support the orientation and onboarding processes of newly hired perioperative or nursing staff. Simulation-

based learning (**Bommer et al., 2018; Clarke et al., 2021; Fernandez et al., 2020; Kaldheim et al., 2019**), comprehensive learning plans (**Kurnat-Thoma et al., 2017; Ndung'u et al., 2022**), and specialized orientation and onboarding programs (**Hope et al., 2020; Lalithabai et al., 2021; Madhuvu et al., 2017**) are all strategies that were identified by this literature review as being effective in supporting orientation practices. From this literature review, it is apparent that there is a lack of consistency in orientation strategies targeted at nurses working in specialty practice areas. There is an even larger gap in the existing nursing literature about perioperative or neurosurgical nursing. This literature review also illuminates that there is a lack of exposure to perioperative nursing in the existing undergraduate nursing curriculum. Therefore, this may suggest that nurses are not exposed to the perioperative nursing specialty area during their nursing education. Since nurses who are being newly hired to the perioperative area may have no previous experience or knowledge of perioperative or neurosurgical nursing, there is a need for extensive orientation when nurses enter the specialty.

Much of the existing literature indicates that orientation and onboarding are most effective when supported by resources such as learning plans (**Kurnat-Thoma et al., 2017; Ndung'u et al., 2022**), orientation or onboarding programs (**Hope et al., 2021; Lalithabai et al., 2021; Madhuvu et al., 2018**), and simulation-based learning (**Bommer et al., 2018; Clarke et al., 2021; Fernandez et al., 2020; Kaldheim et al., 2019**). This literature review emphasizes the importance of supporting the transition process into specialty nursing areas, such as perioperative nursing. This literature review has indicated that resources designed to support the onboarding and orientation of newly hired nurses can improve competence, knowledge, clinical decision making, which can ultimately lead to improvements in nursing retention and patient care.

Summary of the State of Evidence

Nine intervention-based studies were included in this literature review (**Bommer et al., 2018; Clarke et al., 2021; Fernandez et al., 2020; Hope et al., 2021; Kaldheim et al., 2019; Kurnat-Thoma et al., 2017; Lalithabai et al., 2021; Madhuvu et al., 2018; Ndung'u et al., 2022**). There was direct evidence from strong design studies of high quality (**Bommer et al., 2018; Clarke et al., 2021**) and medium quality (**Kaldheim et al., 2019**) with a clear indication that perioperative orientation requires additional educational and supportive resources. Some of the evidence was extrapolated from high quality studies with a strong design (**Fernandez et al., 2019; Hope et al., 2020**), medium quality studies with a moderate design (**Lalithabai et al., 2021**), medium quality studies with a weak design (**Madhuvu et al., 2017; Ndung'u et al., 2022**), and one weak design study of low quality (**Kurnat-Thoma et al., 2017**). Results from studies that required extrapolation were consistently in favor of implementing additional orientation education for specialty practice settings that are comparable to the neurosurgical perioperative service.

This literature review determined that there is moderate evidence to support that an educational resource to support the orientation and onboarding of nurses newly hired to the neurosurgical perioperative service would be effective. The existing literature provides a noteworthy amount of direct and extrapolated evidence from high and medium quality studies of strong and moderate designs with a clear trend in findings to support the need for the development of further educational resources to support orientation.

Guiding Theoretical Frameworks

Since nursing is a theory and practice-based profession, it is essential to incorporate a theoretical framework into the development of a resource that is aimed at improving nursing practice. Two theoretical frameworks will be used to guide the development of this orientation resource for the neurosurgical specialty of the perioperative services. First, Benner's Novice to Expert theory, which identifies five stages of clinical competence for nursing education, will be used to guide the development of this resource. Second, conceptual elements of Knowles' Adult Learning Theory (ALT) (1978), which focuses on acquiring knowledge through experiences and integrating personal and professional experiences to foster learning, will be integrated into the development of this resource.

Benner's Novice to Expert Theory

Benner's Novice to Expert theory explains that nurses develop skills and an understanding of patient care through the combination of personal experience and a solid educational foundation. Benner argues that the development of knowledge is made up of the extension of knowledge through education and understanding through clinical experiences (Larew et al., 2006; Murray et al., 2019). This theory will be used to guide the development of a resource to support the orientation and onboarding of nurses new to the neurosurgical specialty within the perioperative services.

Benner's Novice to Expert theory identifies five stages of clinical competence for nursing education: novice, advanced beginner, competent, proficient, and expert (Larew et al., 2006; Murray et al., 2019). The theoretical underpinnings focus on building knowledge as the learner progresses through each stage. Each step builds on the previous step as principles are refined and

expanded by experience and clinical expertise (Murray et al., 2019). The development of a resource to support nursing orientation would allow nurses to build on their previous experiences while acquiring new specialty nursing knowledge. Benner's Novice to Expert theory will be implemented through the delivery of the resource. The resource will be designed so that it allows nurses to build on their individual skill sets as they progress from novice to expert neurosurgical perioperative nurses.

Knowles' Adult Learning Theory

Knowles' Adult Learning Theory (ALT) focuses on the concept of andragogy, defined as the method and practice of teaching adult learners (Knowles, 1978; Renger et al., 2020). Knowles' (1978) argues that adults learn differently than children or adolescents, whereby their learning is based on self-directed and independent learning methods. The core assumptions of Knowles' approach to adult learning are that adults need to know why they need to learn before they will learn, and the adult learner's self-concept needs to be acknowledge as being self-directed. This perspective has developed over time and provides the foundation for many current educational approaches (Renger et al., 2020). Principles from Knowles' framework can be utilized to enhance the adult learning experience. Following these principles, part of the resource will include a self-competency assessment tool that can be used at the beginning of the orientation process to identify individual learning needs. This tool may be used to develop an individualized learning plan for orientating and onboarding of the newly hired nurse.

According to Knowles, there are six principles of andragogy including: need to know, building on experience, sense of responsibility, problem solving, problem focused, intrinsic motivation (Knowles, 1978; Renger et al., 2020). An orientation resource for nurses new to the perioperative services will be focused on solving the issue of orientating and onboarding to a

new clinical area. The resource will also be able to build on previous experiences that the orientee has had. The orientee nurse will be able to identify these experiences by completing the competency assessment tool. This assessment will also provide a sense that the nurse is ultimately responsible for their learning experience during the orientation and onboarding process.

Implications for Nursing Practice and Future Research

There is a substantial lack of literature available about the orientation of perioperative nurses. Much of the existing literature focuses on orientation strategies for surgical residents or nurses working in other nursing specialties. Therefore, additional research in the field of perioperative nursing orientation and onboarding is required. Future research using more robust study designs should be conducted to examine the effectiveness of orientation strategies for the neurosurgical specialty within perioperative nursing. Future research should also explore the use of standardized educational modules or resources for the orientation of newly hired perioperative nurses.

Nurses working in leadership roles have a responsibility to contribute to the expansion and development of the nursing profession. The orientation and onboarding of newly hired nurses is essential to ensure that standards of practice are met. Successful orientation requires targeted clinical support and guidance. Orientation resources can provide structure and support for the orientation process. Precepting nurses can use orientation resources to support and guide newly hired nurses during the onboarding and orientation process. This orientation resource manual may also serve as a reference for nurses who are new to the precepting role, by outlining the orientation concepts. Nurses could use this orientation resource manual as a tool for developing their own leadership skills and confidence in the precepting role.

Conclusion

Specialty nursing practice requires a supportive orientation that is tailored to accommodate individual learning needs. Comprehensive training is needed to equip nurses who are new to the perioperative area with the tools needed to practice competently and confidently. Working in the perioperative nursing specialty requires specialized training and education. The development of an orientation resource manual will improve the new hire experience by streamlining the orientation process. This literature review was conducted to explore existing strategies that were used for new staff orientations and revealed that simulation-based learning, comprehensive learning plans, and onboarding programs can be effective for increasing staff knowledge and competence during orientation. Although the literature supports the use of these interventions for nursing orientation, the quality of the studies analyzed, and limitations should be considered. Many of these studies were descriptive designs, and therefore are considered weak by nature of the design. However, the findings are still valuable as they are indicative that staff orientation requires an intervention to be most effective.

References

Affleck, D. (2017). A Canadian educator perspective on quality perioperative nursing practice. *ORNAC Journal, 35*(3), 13–37. https://web-a-ebscohost-com.qe2a-proxy.mun.ca/ehost/detail/detail?vid=0&sid=a8b142ba-527f-472f-b5f3-8c035daeafa0%40sdc-v-sessmgr02&bdata=JkF1dGhUeXBlPWlwLHVybCx1aWQmc2l0ZT1laG9zdC1saXZlJnNjb3BlPXNpdGU%3d#AN=128847870&db=rzh

Baumann, A., Crea-Arsenio, M., Hunsberger, M., Fleming-Carroll, B., & Keatings, M. (2019). Work readiness, transition, and integration: The challenge of specialty practice. *Journal of Advanced Nursing*, *75*(4), 823–833. https://doi.org/10.1111/jan.13918 https://onlinelibrary-wiley-com.qe2a-proxy.mun.ca/share/JE2EJ9PMJ5DE7WNSPRSS?target=10.1111/jan.13918

Beitz, J. M. (2019). Addressing the perioperative nursing shortage through education: A perioperative imperative. *AORN Journal*, *110*(4), 403–414. https://qe2a-proxy.mun.ca/login?url?url=https://www.proquest.com/scholarly-journals/addressing-perioperative-nursing-shortage-through/docview/2299137342/se-2?accountid=12378

Bommer, C., Sullivan, S., Campbell, K., Ahola, Z., Agarwal, S., O'Rourke, A., Jung, H. S., Gibson, A., Leverson, G., & Liepert, A. E. (2018). Pre-simulation orientation for medical trainees: An approach to decrease anxiety and improve confidence and performance. *American Journal of Surgery*, *215*(2), 266–271. https://doi.org/10.1016/j.amjsurg.2017.09.038

https://qe2a-proxy.mun.ca/login?url?url=https://www.proquest.com/scholarly-journals/pre-simulation-orientation-medical-trainees/docview/2007531715/se-2?accountid=12378

Canadian Nurses Association. (2022). CAN Certification Program. Canadian Nurses Association. https://www.cna-aiic.ca/en/certification/about-certification

Cambridge University Press. (2022). Dictionary. Cambridge Dictionary. https://dictionary.cambridge.org/dictionary/english/orientation

Clarke, D. B., Gaililee, A. I., Kureshi, N., Hong, M., Fenerty, L., & D'Arcy, R. C. N. (2021). Knowledge transfer and retention of simulation-based learning for neurosurgical instruments: a randomised trial of perioperative nurses. *BMJ Simulation & Technology Enhanced Learning*, *7*(3), 146–153. https://doi.org/doi:10.1136/bmjstel-2019-000576 https://pubmed.ncbi.nlm.nih.gov/35518567/

Fernandez, R., Rosenman, E. D., Olenick, J., Misisco, A., Brolliar, S. M., Chipman, A. K., Vrablik, M. C., Kalynych, C., Arbabi, S., Nichol, G., Grand, J., Kozlowski, S. W. J., & Chao, G. T. (2020). Simulation-based team leadership training improves team leadership during actual trauma resuscitations: A randomised controlled trial. *Critical Care Medicine*, *48*(1), 73–82. https://doi.org/10.1097/CCM.0000000000004077 https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_crossref_primary_10_1097_CCM_0000000000004077

Hope, C., Reilly, J. J., Griffiths, G., Lund, J., & Humes, D. (2021). Factors associated with

attrition and performance throughout surgical training: A systematic review and meta-analysis. *World Journal of Surgery, 45*(2), 429–442. https://doi.org/10.1007/s00268-020-05844-0 https://qe2a-proxy.mun.ca/login?url?url=https://www-proquest-com.qe2a-proxy.mun.ca/scholarly-journals/factors-associated-with-attrition-performance/docview/2473886799/se-2

Joanna Briggs Institute. (n.d.). *Critical appraisal checklisst for qualitative research*. https://jbi.global/critical-appraisal-tools

Kaldheim, H. K. A., Bergland, Å., Ølnes, M. A., Hofsø, K., Dihle, A., Creutzfeldt, J., Zhang, C., & Steindal, S. A. (2019). Use of simulation-based learning among perioperative nurses and students: A scoping review. *Nurse Education Today*, *73*(August 2018), 31–37. https://doi.org/10.1016/j.nedt.2018.09.013 https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_crossref_primary_10_1016_j_nedt_2018_09_013

Knowles, M. S. (1978). *Andragogy: Adult learning theory in perspective*. *5*(3). https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_sage_journals_10_1177_009155217800500302

Kurnat-Thoma, E., Ganger, M., Peterson, K., & Channell, L. (2017). Reducing annual hospital and registered nurse staff turnover—A 10-element onboarding program intervention. *SAGE Open Nursing*, *3*, 1–13. https://doi.org/10.1177/2377960817697712 https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_doaj_primary_oai_doaj_org_article_b1571fd3898141dea04d2f765130d744

Lalithabai, D. S., Ammar, W. M., Alghamdi, K. S., & Aboshaiqah, A. E. (2021). Using action research to evaluate a nursing orientation program in a multicultural acute healthcare setting. *International Journal of Nursing Sciences*, *8*(2), 181–189. https://doi.org/10.1016/j.ijnss.2021.01.002

Larew, C., Lessans, S., Spunt, D., Foster, D., & Covington, B. G. (2006). Innovations in clinical simulation: Application of Benner's theory in an interactive patient care simulation. *Nursing Education Perspectives*, *27*(1), 16–21. https://qe2a-proxy.mun.ca/login?url?url=https://www-proquest-com.qe2a-proxy.mun.ca/scholarly-journals/innovations-clinical-simulation-application/docview/236667623/se-2?accountid=12378

Lenihan, A. (2021). *Prep for KT: The perioperative nursing shortage*.

Mayo Foundation. (2022). Perioperative nurse. https://college.mayo.edu/academics/explore-health-care-careers/careers-a-z/perioperative-nurse/

Madhuvu, A. E., Plummer, V., & Morphet, J. (2018). An exploration of participants' experience of an intensive care nursing transition to specialty practice program. *Australian Critical Care*, *31*(5), 311–316. https://doi.org/10.1016/j.aucc.2017.08.005 https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_pubmed_primary_28967467

Mollohan, J. K., & Morales, M. (2016). Strategies for successful perioperative orientation. *AORN Journal*, *104*(2), 100–110. https://doi.org/10.1016/j.aorn.2016.06.002 https://qe2a-

proxy.mun.ca/login?url?url=https://www-proquest-com.qe2a-proxy.mun.ca/scholarly-journals/strategies-successful-perioperative-orientation/docview/1807048943/se-2?accountid=12378

Murray, M., Sundin, D., & Cope, V. (2019). Benner's model and Duchscher's theory: Providing the framewoork for understanding new graduates nurses' transition to practice. *Nurse Education in Practice, 34*, 199–203. https://doi.org/https://doi.org/10.1016/j.nepr.2018.12.003 https://qe2a-proxy.mun.ca/login?url?url=https://www-proquest-com.qe2a-proxy.mun.ca/scholarly-journals/benners-model-duchschers-theory-providing/docview/2177114008/se-2

Ndung'u, A., Ndirangu, E., Sarki, A., & Isiaho, L. (2022). A cross-sectional study of self-perceived educational needs of emergency nurses in two tertiary hospitals in Nairobi, Kenya. *Journal of Emergency Nursing*, *48*(4), 467–476. https://doi.org/10.1016/j.jen.2022.04.001 https://qe2a-proxy.mun.ca/login?url?url=https://www-proquest-com.qe2a-proxy.mun.ca/scholarly-journals/cross-sectional-study-self-perceived-educational/docview/2683119076/se-2?accountid=12378

Nova Scotia Health Authority. (2022). Perioperative nursing program. https://learninginstitute.nshealth.ca/programs-and-courses/perioperative-nursing-for-rns

NSGEU. (2019). *Media Release: NSHA makes nursing shortages worse*. https://nsgeu.ca/home_page/media-release-nsha-makes-nursing-shortages-worse/14733/

NSNU. (2019). *Nova Scotia nurses' union voices concern for nurses and patients*.

https://www.nsnu.ca/resources/newsletters/may-2019/nova-scotia-nurses-union-voices-concern-nurses-and-patients

Public Health Agency of Canada. (2014). *Infection prevention and control guidelines: Critical appraisal tool kit.* http://publications.gc.ca/collections/collection_2014/aspc-phac/HP40-119-2014-eng.pdf

Reinhart, D., & Moore, L. (2021). Creating a Periop 202 course and orientation program for open-heart procedures to increase cardiovascular OR nurse recruitment and retention. *AORN Journal*, *111*(4). https://doi.org/http://doi.org/10.1002/aorn.13504 https://qe2a-proxy.mun.ca/login?url?url=https://www.proquest.com/scholarly-journals/creating-periop-202-course-orientation-program/docview/2579142835/se-2?accountid=12378

Renger, S., Macaskill, A., & Naylor, B. (2020). Learning and change within person-centered therapy: Views of expert therapists. *Counselling & Psychotherapy Research*, *20*(3), 535–544. https://search-ebscohost-com.qe2a-proxy.mun.ca/login.aspx?direct=true&AuthType=ip,url,uid&db=pbh&AN=144804878&site=ehost-live&scope=site

Reuter, J., & King, T. S. (2021). Evaluation of a redesigned perioperative specialty elective to address the perioperative nursing shortage. *113*(5), 476–485. https://doi.org/http://doi.org.10.1002/aorn.13375 https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_proquest_journals_2521670959

Sasso, L., Bagnasco, A., Catania, G., Zanini, M., Aleo, G., & Watson, R. (2019). Push and pull

factors of nurses' intention to leave. *Journal of Nursing Management, 27*(5), 946–954. https://onlinelibrary-wiley-com.qe2a-proxy.mun.ca/doi/full/10.1111/jonm.12745

Steelman, V. M., Graling, P. R., & Perkhounkova, Y. (2013). Priority patient safety issues identified by periopeartive nurses. *AORN Journal, 97*(4), 402-418. DOI: 10.1016/j.aorn.2012.06.016 https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_webofscience_primary_000209647100008CitationCount

University of Alberta. (2022). Nursing specializations. https://www.ualberta.ca/nursing/about/about-nursing/nursing-specializations.html

Vlach, R. J. (2018). Radiology nursing specialty orientation. *Journal of Radiology Nursing*, *37*(2), 112–118. https://doi.org/10.1016/j.jradnu.2017.12.007 https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_gale_infotracacademiconefile_A540303794

Zaheer, S., Ginsburg, L., Wong, H. J., Thomson, K., Bain, L., & Wulffhart, Z. (2019). Turnover intention of hospital staff in Ontario, Canad: Exploring the role of frontline supervisors, teamwork, and mindful organizing. *Human Resources for Health, 17*(66), 1-9. https://doi.org/10.1186/s12960-019-0404-2

Appendix: Literature Summary Table

Study/Design	Methods	Key Results	Comments
Authors: **Bommer et al. (2018)** Design: RCT Purpose: To assess the effect of basic orientation to the simulation environment on anxiety, confidence, and clinical decision making.	n: 24 graduating medical students Country/Setting: Department of surgery, University of Wisconsin Hospital in USA. Intervention Group (n=12): Received an orientation to the simulation before the first session Control Group (n=12): Did not receive any orientation. Both groups participated in a two-week surgery intern preparatory curriculum with three simulations. Data Collection, Outcomes, and Analysis: All tools known V&R. • **Confidence** assessed post simulation. STAI used to evaluate	**Confidence** Greater confidence in all three simulations • $p < 0.05$ **Clinical decision making** Performance scores following all three simulations • $p < 0.05$	Strength of Design: **Strong** Quality: **High** Comments/Issues: • Potential for variability in case facilitation and performance evaluations may increase the risk of information bias. • Self-reporting measures used for data collection could result in response bias. • ANCOVA analysis methods used to evaluate correlation between orientation and outcomes.

Study/Design	Methods	Key Results	Comments
	anxiety and confidence pre and post course. • **Performance** evaluated by surgical faculty to assess clinical decision making using NOTECHS scale.		
Authors: **Clarke et al., (2021)** Design: RCT Purpose: to determine the effectiveness of tablet-based simulation in learning neurosurgical instruments; to assess whether skills learnt in simulation environments are transferable to clinical tasks and retained over time.	n: 100 perioperative neurosurgical nurses Country/Setting: a large health care canter in Canada. Intervention Group (n=53): performed the simulation training before the recognition of real instruments. Three consecutive sessions between 30-40 minutes in length Control Group (n=47): performed recognition of real instruments without prior simulation training Data Collection, Outcomes, and Analysis: • **Knowledge:** Identification of surgical instruments	**Transferability of simulation-based knowledge to real instrument recognition** Intervention Group identified real instruments with 16% greater accuracy, and 23% quicker than Control Group. • p value <0.0001 **Knowledge recall of simulation based learning and real instruments** Group A identified 93.2% of instruments correctly compared to Group B (80.6%) • p value <0.0001	Strength of Design: **Strong** Quality: **High** Comments/Issues: • Researchers were blinded to participant group assignment. • Confounding variables not assessed; regression analysis not used. • Single institution may limit generalizability of the findings.

Study/Design	Methods	Key Results	Comments
	• Reassessed for knowledge recall after 1 week.		
Authors: **Fernandez et al. (2019)** Design: RCT Purpose: To assess the clinical impact of simulation-based leadership training on team leadership and patient care during trauma resuscitations	n: 79 third year residents randomized; 360 resuscitations were analyzed. Country/Setting: Level 1 trauma center hospital in Winnipeg, MB. Intervention: Received a 4-hour simulation-based leadership training and standard orientation Control: standard orientation Data Collection, Outcomes, and Analysis: Sessions were video recorded and coded for leadership behaviors and patient care. Lower scores indicate improvements (V&R not confirmed). Analysis included descriptive statistical and coefficient modeling methods.	**Post training leadership** Simulation-based training led to improved leadership skills in trauma resuscitations Intervention: 11.29 95%CI (9.99-12.59) Control: 7.23 95%CI (6.33-8.13) • $p<0.001$ • $d = 1.07$ **Patient care** No significant differences noted between groups Intervention: 62.38 95%CI (58.43-66.33) Control: 60.38 95%CI (57.69-63.07) • p value = 0.99 • $d = 0.15$	Strength of Design: **Strong** Quality: **High** Comments/Issues: • Large sample size sufficient to power study. • Researchers were trained in data collection and blind to study hypothesis and experimental; conditions of participants. • Confounders controlled for with appropriate randomisation and linear regression analysis methods used.
Authors: **Hope et al. (2020)**	n: 31 articles comprising of 17,407 surgical residents	**Surgical Competence** Improved performance through program training • p value =0.0467	Strength of Design: **Strong** Quality: **High**

Study/Design	Methods	Key Results	Comments
Design: Systematic review with meta-analysis Purpose: To identify factors that influence attrition or performance during surgical training	Country/Setting: Studies from USA (29), Pakistan (1), UK (1) Data Collection, Outcomes, and Analysis: Independent data extraction, analysis and synthesis from two authors. Study quality: 5 high bias risk; 15 moderate; 11 low. • **Surgical Competence** Six studies examined factors that predicted surgical competence.	Improved attrition through program training • 17% (95%CI 14-20%)	Comments/Issues: • Majority of studies appraised as moderate or low risk of bias • Diverse sample
Authors: Kaldheim et al. (2019) Design: Systematic review Purpose: To investigate works published on the use of simulation-based learning in the field of perioperative nursing.	n: 9 articles and 1 doctoral thesis Country/Setting: Articles conducted in USA (3), Canada (3), UK (3), and Brazil (1). Data Collection, Outcomes, and Analysis: Data collected independently then reviewed together and synthesized to discuss inclusion criteria and relevance to research question. • **Confidence** Four articles reported improved confidence.	**Confidence** SBL had contributed to increased confidence in performing surgical skills. **Knowledge** Three articles reported increased levels of knowledge with SBL	Strength of Design: **Strong** Quality: **Medium** Comments/Issues: • Small sample size. • Unclear definitions may increase the risk of information bias. • Search restrictions may have excluded relevant literature.

Study/Design	Methods	Key Results	Comments
	• **Knowledge** Three articles reported increased knowledge.		
Authors: **Kurnat-Thoma et al. (2017)** Design: Cross-sectional Purpose: To analyze the impact of turnover and onboarding programs on staff turnover rates emergency departments in Kenya	n: 101 newly hired RNs Country/Setting: Large acute care hospital in Washington, DC. Data Collection, Outcomes, and Analysis: Analysis of hospital turnover records from 2009 to 2013; exit survey interview transcripts – employer characteristics including hospital orientation, management, culture and workload.	**Improved staff retention** Reduction in new-hire turnover with intervention • p value = 0.04	Strength of Design: **Weak** Quality: **Low** Comments/Issues: • Small sample size; limited to only 1 hospital setting; restricted generalizability of findings. • Potential for selection bias: convenience sampling. • Potential for information bias: data collection from single source.
Authors: **Lalithabai et al. (2021)** Design: Mixed methods Purpose: To examine the impact of orientation programs on new nurses hired to healthcare organizations	n: 70 newly employed registered nurses Country/Setting: Multicultural tertiary hospital in Saudi Arabia. Intervention: 3-week orientation program for new nurses including educational	**Competence** New nurses showed more competence in the following areas after completing the orientation program **Managing Clinical Situations** • p value = 0.09	Strength of Design: **Moderate** Quality: **Medium** Comments/Issues: • Self-reporting of data may cause potential for information bias.

Study/Design	Methods	Key Results	Comments
	sessions and clinical skills workshops. Data Collection, Outcomes and Analysis: • **Competence** • **Managing Clinical Situations** Nurse Competence Scale (Known V&R): likert-scale questionnaire categories include the nursing role, diagnostic function, managing situations, and therapeutic intervention. Collection during focus group via self-assessment survey. Analysis methods included independent sample t-tests.		• Small sample size limits generalizability of findings. • Subjective evaluation of participants competence.
Authors: **Madhuvu et al. (2017)** Design: Cross-sectional Purpose: To explore the effects of an intensive care nursing transition to specialty practice program.	n: 166 registered nurses working in intensive care. Country/Setting: Large healthcare center with two ICUs (Hospital A: 14 beds, Hospital B: 24 beds) in Victoria, Australia. Intervention: 7-day orientation program to support transition to specialty practice for ICU nursing. Included lectures,	**Knowledge** Participants felt their knowledge was inadequate upon entering into this specialty nursing practice area. • 71.8% (n=62) • p value <0.001 **Supported orientation and preceptorship**	Strength of Design: **Weak** Quality: **Medium** Comments/Issues: • Participants selected from single source: convenience sampling, snowball sampling. • Appropriate statistics used for data analysis.

Study/Design	Methods	Key Results	Comments
	self-directed learning, online modules, case studies, clinical practice and competencies, and a written examination. Data Collection, Outcomes, and Analysis: • **Knowledge** • **Supportive Orientation** Survey questionnaire tool: V&R confirmed; Likert-scale questions; 3 sections: demographics, experience, current practice. Analysis methods include descriptive statistics, and chi-square test.	Participants expected to receive support and guidance during their orientation. • 89.2% (n=74) • p value <0.001	• Researcher employed by hospital A. • Self-reporting of data may be potential source of information bias.
Authors: **Ndung'u et al. (2022)** Design: Cross-sectional Purpose: To highlight educational needs specific to nurses working in emergency departments in Kenya	n: 84 registered nurses working in adult and pediatric emergency departments. Country/Setting: 2 emergency departments in Nairobi, Kenya Data Collection, Outcomes, and Analysis: • **Educational needs** Self-administered, Likert-style survey questionnaire tool; V&R confirmed. Descriptive statistical analysis methods used.	**Educational needs: Knowledge and skill competencies** Specialty area of emergency nursing has high need for further education • 78.6% (n=66)	Strength of Design: **Weak** Quality: **Medium** Comments/Issues: • Small sample size; limited to only 2 hospital settings; restricted generalizability of findings. • No statistical significance.

Study/Design	Methods	Key Results	Comments
			• Potential for selection bias: convenience sampling. • Potential for information bias: self-reporting.

Legend:

ANCOVA = Analysis of covariance
CI = Confidence interval
DC = District of Columbia
ICUs = Intensive care units
NOTECHS = Non-technical skills system
MB = Manitoba
RNs = Registered nurses
RCT = Randomized controlled trial
SBL = Simulation based learning
STAI = State trait anxiety index
UK = United Kingdom
USA = United States of America
V&R = Validity and reliability

Appendix II: Environmental Scan Report

Environmental Scan Report: Development of a Self-Directed Orientation Resource for Nurses Newly Hired to the Neurosurgical Perioperative Specialty

Allison Lenihan

201890286

Memorial University of Newfoundland

Environmental Scan Report

Environmental scans can be an important tool for informing decision-making on policy, planning, and program development in the healthcare sector (Charlton et al., 2019). Environmental scanning often entails the processes of seeking, gathering, interpreting, and using information from internal and external environments of an organization to inform strategic decision-making and to direct organizational actions. This environmental scan will explore what resources are available to support perioperative nurses working in neurosurgical perioperative specialties at other healthcare organizations. Environmental scans have been used in healthcare as an effective approach to review the current state of services and programs, identifying service gaps, assessing professional education, and training needs across Canada (Charlton et al., 2019). The environmental scan for this project may also provide insights as to other methods of onboarding and orientation education that have been effective and will be potentially utilized to inform the development of an educational resource to support the orientation and onboarding of newly hired neurosurgical perioperative nurses at the Halifax Infirmary hospital.

Background

The perioperative service at the Halifax Infirmary hospital has seen an influx of new staff recently. As the largest trauma center in Atlantic Canada, the perioperative service is a fast paced, high acuity environment. This specialty area of nursing requires advanced training and specialized orientation to meet the learning needs of nurses practicing in a perioperative setting, so that they can provide optimal patient care. Working in a perioperative nursing specialty requires specialized training and education so that nurses can become competent in their professional practice as perioperative nurses. Nurses new to perioperative nursing, or new to the neurosurgical perioperative service, should receive orientation that is specific to their learning

needs and the unique needs of this service line. Specialized training and education would prepare nurses to meet the dynamic and complex needs of patients in the neurosurgical perioperative setting.

Prior to the start of this practicum project, I met with the perioperative clinical nurse educator to discuss the objectives of the project and obtain any existing resources that are used to support the orientation and onboarding of newly hired neurosurgical perioperative nurses. The orientation resource that is presently in place for nurses newly hired to the neurosurgical perioperative specialty is in the form of a checklist. This checklist is not specific to neurosurgery but provides an outline for a general perioperative training and orientation. This existing orientation checklist does not address individual learning needs or support nurses who are newly hired to the neurosurgical specialty within the perioperative services. This practicum project aims to develop a unit orientation resource that contains relevant information for nurses working in the perioperative neurosurgical specialty. The purpose of this orientation resource is to support newly hired nurses to become more knowledgeable and competent in their neurosurgical practice. This resource will also provide clarity and support for neurosurgical nurses training nurses who are new to perioperative nursing.

Results of a literature review determined that there is a significant gap in perioperative nursing knowledge for newly hired nurses (Baumann et al., 2019; Clarke et al., 2021; Reinhart & Moore, 2021; Reuter & King, 2021). Perioperative nursing practice requires specialized training and education so that nurses can become competent in their professional practice as a perioperative nurse. Patient safety in the perioperative setting is dependent upon qualified and credentialed nursing care and can become compromised when nurses are not appropriately trained (Baumann et al., 2019; Clarke et al., 2021; Lenihan, 2021). Nurses new to perioperative

nursing, or new to the neurosurgical perioperative service, should receive orientation that is specific to their learning needs and the unique needs of the neurosurgical perioperative service to acquire the necessary specialized knowledge required to practice competently in this area. The Canadian Nurses Association (2022) recommends that nurses who are working in specialty areas receive additional education, training, and certification for their specialty practice area to practice competently and safely.

Specific Objective(s) for the Environmental Scan

This environmental scan was conducted to identify any existing resources, educational materials, and practices that are used to support neurosurgical perioperative nursing orientation and onboarding. Key objectives of the environmental scan are to:

1. identify specific examples of orientation plans relevant to onboarding newly hired nursing staff to neurosurgical perioperative services;
2. identify specific resources and educational resources that are available to support orientation or onboarding of newly hired neurosurgical perioperative nursing staff in other healthcare organizations across Canada; and,
3. identify surgical programs with demonstrated effective onboarding processes for neurosurgical perioperative nursing.

Recruitment and Data Collection

According to Charlton et al. (2019), there are four modes of environmental scanning including undirected viewing, conditioned viewing, enacting, and searching. Both undirected viewing and conditioned viewing are passive forms of information seeking. In contrast, enacting and searching involve actively intruding into the environment for information seeking purposes

(Charlton et al., 2019). For the purposes of this environmental scan, conditioned viewing methods were used for data collection. Conditioned viewing involves information seeking on specific issues of concern (Charlton et al., 2019). To conduct this environmental scan, a brief internet search was conducted to explore unpublished literature and publicly available information. Search terms included: Canada, neurosurgery, surgical, hospital, and perioperative nursing. The search also intended to identify other healthcare organizations with perioperative settings that were comparable to the perioperative services at the Halifax Infirmary hospital.

Characteristics of the search included organizations with comparative numbers of annual surgical procedures, organizations that provided neurosurgical perioperative services, and organizations that provided neurosurgical-specific orientation for newly hired perioperative nurses. The intent of this environmental scan was to gather and interpret information from the internal environments of other health care organizations to help direct the development of an orientation resource for neurosurgical perioperative nurses. The search was limited to publicly funded healthcare organizations within Canada. Data were collected through email consultation and inquiry with the specified organizations. An email template was drafted in the initial plan for the environmental scan, see Appendix A. The email was sent to organizations that offered neurosurgical perioperative services under a publicly funded healthcare model as identified by the search. Data sources included primarily clinical guidelines for organizational orientation practices that are specific to neurosurgical perioperative nursing, as provided by the participants.

Participants in the environmental scan including Eastern Health in Newfoundland and Labrador; Sunnybrook Health Sciences Center in Toronto, Ontario; and Trillium Health Partners in Mississauga, Ontario are outlined in Appendix B. Contact was made with clinical nurse educators at each facility to request their participation in this environmental scan. Email requests

were also sent to representatives from University of Alberta Hospital, but they did not provide any response. Participating organizations complete between 31,000 (Eastern Health, 2021; Sunnybrook Health Sciences Center, 2022) and 64,000 (Trillium Health Partners, 2020) surgical procedures annually between 2020 and 2021. Comparatively, there were 60,613 surgical procedures completed at the Halifax Infirmary site in 2020-2021 (Nova Scotia Health Authority, 2021), approximately 15% were neurosurgical procedures (Halifax Neurosurgery, 2021). None of these organizations provided a further breakdown of the annual numbers of neurosurgical procedures completed.

Data Management and Analysis

Data collected through the environmental scan was organized and managed according to Table 1. Data management processes were focused on creating organized, documented, accessible, and usable research data for the purposes of this practicum project. Following data collection, data were organized according to content concepts to identify common themes. Data were transcribed digitally according to quality assurance standards to maintain consistency. The data obtained through this environmental scan were comprehensively organized to ensure the results could be easily accessed and effectively communicated.

Concept analysis methods were used to identify concepts relating to orientation and training practices that are used in other healthcare organizations. For the purposes of this practicum project, the concept being analyzed with the data set was the orientation and training of perioperative neurosurgical nurses. Other concepts relating to the concept of interest are nursing competence, skills, and knowledge. Data analysis sought to explore the resources used to support the orientation of nurses working in perioperative specialties at healthcare organizations across Canada.

Ethical Considerations

Ethical considerations for this environmental scan included obtaining informed agreement and voluntary participation. Key contacts and participants were provided adequate details of the rationale for the environmental scan to encourage free participation. The contacts were advised that any shared information would remain confidential and would only be shared with the practicum supervisor for the development of this practicum project. Participants were also advised that I would request their written permission prior to using any information that they shared. All information and contacts that were collected were stored on a password protected computer. The computer has a secure network and multiple firewalls for additional security and protection from unauthorized individuals accessing stored information. All information obtained for the purposes of this practicum project will be permanently deleted and destroyed upon completion of the project. A review by the Health Research Ethics Review Board was not required for the purposes of this environmental scan, according to the document found in Appendix C.

Results

Three neurosurgical programs across Central and Atlantic Canada responded to the initial email inquiry and shared their information that they currently use for orientating newly hired nurses to the neurosurgical perioperative service. Table 1 provides an overview of the results of the environmental scan.

Table 1: Summary of Results

Program & Healthcare organization	Response to Inquiry	Type of Resource	Service Specific	Notes
Eastern Health, Newfoundland, and Labrador	☑	• Neurosurgery handbook • Pictures in operating theatres to model set ups.	☑	Handbook distributed at the time of clinical orientation.
Sunnybrook Health Sciences Center, Toronto, Ontario	☑	• Neurosurgery skills checklist • Neurosurgery equipment checklist • Neurosurgical Service Review Manual	☑	Provided to orientees at the time of hire. Hard copy of review manual and surgeon preference lists kept in operating theatres.
Trillium Health Partners, Mississauga, Ontario	☑	• Competency evaluation checklist specific to neurosurgery	☑	Used to evaluate novice nurses' progress during orientation.
University of Alberta Hospital, Edmonton, Alberta	No response received.	N/A	N/A	N/A

Three of the healthcare organizations currently use a neurosurgery specific orientation checklist to support the process of onboarding new perioperative nursing staff. Two of the healthcare organizations currently provide an educational resource manual with picklist and procedures that is specific to neurosurgery for newly hired perioperative nurses to review when they begin their practice in neurosurgical perioperative nursing. One of these manuals is in the form of a hard copy and is kept in the operating theatre for neurosurgical nurses to refer to when needed. Table 2 outlines the content that is covered in the orientation resources used by other healthcare organizations.

Table 2: Content Included in Neurosurgical Perioperative Orientation Resources from Other Healthcare Organizations

Content Included in the Neurosurgical Perioperative Orientation Resources
• Overview of operating room policies and procedures. • Checklist for evaluating perioperative nursing competencies. • Overview of perioperative resource management. • Overview of neurosurgical procedures. • Overview of neurosurgical equipment and technology. • Overview of neurosurgical supplies and instruments.

The neurosurgical orientation checklists and resources used by other healthcare organizations provide a guideline of surgical procedures, operating room equipment and supplies, operating room procedures and expectations, and operating room technologies to be reviewed during the onboarding process. The checklists outline the competencies required to practice as a neurosurgical perioperative nurse and are to be completed by the orientee and preceptor during the onboarding process. These tools are useful for measuring the orientee's progress during the process of orientation and onboarding. Measuring progress in this manner is consistent with Benner's Novice to Expert theory for measuring clinical competence (Larew et al., 2006; Murray et al., 2019). As a beginner, the orientee is still learning to anticipate and incorporate special skills into efficient planning, actions, and clinical decision making for perioperative nursing care. During this time, their performance typically requires supervision, coaching, mentoring, and precepting. At the end of the onboarding phase, the orientee is considered intermediate as they can confidently apply knowledge and skills in the perioperative

setting and are capable of functioning independently in routine circumstances. This is consistent with the competent stage of Benner's Novice to Expert theory, where the nurse can practice independently but may still require supervision, support, and mentoring in some situations (Larew et al., 2006; Murray et al., 2019).

Two of the organizations also use an educational manual that provides a comprehensive overview of the neurosurgical procedures, technology, surgeon preferences, and picklists. The hard-copy educational handbook is distributed by the perioperative educator at the time of clinical orientation. The education resource includes pictures, diagrams, and explanations of all neurosurgical procedures that could be performed. One of the organizations also displays pictures in the operating theatres to show how the surgical instruments should be set up to aid the novice nurse as they are scrubbing. Both educational manuals provide a brief overview of the surgical procedures, rationale for the procedure, and helpful tips for nurses working in neurosurgery. This type of resource is valuable as it provides a concrete foundation for acquiring the skills and knowledge base required for neurosurgical perioperative nursing.

Implications

The environmental scan was insightful for the development of an educational resource to support the orientation and onboarding process for newly hired neurosurgical nurses. The environmental scan provided an overview of the resources and educational materials that are currently being used at other neurosurgical perioperative settings across Canada. The data collected during the environmental scan illuminated that the checklists and resource manuals used at other organizations are effective for improving neurosurgical perioperative nursing knowledge and competence. The nurse educators and managers have found that these tools have

been effective for measuring the newly hired nurses progress during the orientation and onboarding period.

Conclusion

Conducting an environmental scan of other healthcare organizations across Central and Atlantic Canada with comparable neurosurgical perioperative specialties provided an overview of the educational resources that are currently being used to support orientation of newly hired staff in other regions. Results of the environmental scan provided an overview of content to consider for inclusion in the development of a resource manual to support the orientation of neurosurgical perioperative nurses working at the hospital. Through this environmental scan, it was determined that there was no existing resource available to adequately support the learning needs of neurosurgical perioperative nurses that could be adapted or adopted for use in this clinical area. Therefore, the results of this environmental scan support the need for the development of a new resource that is comprehensive and relevant for nurses newly hired to the perioperative neurosurgical service.

References

Baumann, A., Crea-Arsenio, M., Hunsberger, M., Fleming-Carroll, B., & Keatings, M. (2019). Work readiness, transition, and integration: The challenge of specialty practice. *Journal of Advanced Nursing*, *75*(4), 823–833. https://doi.org/10.1111/jan.13918 https://onlinelibrary-wiley-com.qe2a-proxy.mun.ca/share/JE2EJ9PMJ5DE7WNSPRSS?target=10.1111/jan.13918

Canadian Nurses Association. (2022). CAN Certification Program. Canadian Nurses Association. https://www.cna-aiic.ca/en/certification/about-certification

Clarke, D. B., Gaililee, A. I., Kureshi, N., Hong, M., Fenerty, L., & D'Arcy, R. C. N. (2021). Knowledge transfer and retention of simulation-based learning for neurosurgical instruments: a randomised trial of perioperative nurses. *BMJ Simulation & Technology Enhanced Learning*, *7*(3), 146–153. https://doi.org/doi:10.1136/bmjstel-2019-000576 https://pubmed.ncbi.nlm.nih.gov/35518567/

Charlton, P., Doucet, S., Azar, R., Nagel, D. A., Boulos, L., Luke, A., Mears, K., Kelly, K. J., Montelpare, W. J. (2019). The use of environmental scan in health services delivery research: a scoping review protocol. *BMJ Open*, *9*(e02980). doi:10.1136/bmjopen-2019-029805 https://bmjopen.bmj.com/content/bmjopen/9/9/e029805.full.pdf

Eastern Health (2021). *Annual performance report*. Eastern Health. https://www.easternhealth.ca/

Halifax Neurosurgery. (2021). Annual Report. https://cdn.dal.ca/content/dam/dalhousie/pdf/faculty/medicine/departments/department-sites/surgery/neurosurgery/Annual%20Report%202021.pdf

Larew, C., Lessans, S., Spunt, D., Foster, D., & Covington, B. G. (2006). Innovations in clinical simulation: Application of Benner's theory in an interactive patient care simulation. *Nursing Education Perspectives*, *27*(1), 16–21. https://qe2a-proxy.mun.ca/login?url?url=https://www-proquest-com.qe2a-proxy.mun.ca/scholarly-journals/innovations-clinical-simulation-application/docview/236667623/se-2?accountid=12378

Lenihan, A. (2021). *Prep for KT: The perioperative nursing shortage*.

Murray, M., Sundin, D., & Cope, V. (2019). Benner's model and Duchscher's theory: Providing the framewoork for understanding new graduates nurses' transition to practice. *Nurse Education in Practice*, *34*, 199–203. https://doi.org/https://doi.org/10.1016/j.nepr.2018.12.003 https://qe2a-proxy.mun.ca/login?url?url=https://www-proquest-com.qe2a-proxy.mun.ca/scholarly-journals/benners-model-duchschers-theory-providing/docview/2177114008/se-2

Nova Scotia Health Authority (2021). *2020-21 Annual report.* Nova Scotia health by the numbers 2020-21. https://www.nshealth.ca/AnnualReport2020-21/numbers.html

Reinhart, D., & Moore, L. (2021). Creating a Periop 202 course and orientation program for open-heart procedures to increase cardiovascular OR nurse recruitment and retention.

AORN Journal, *111*(4). https://doi.org/http://doi.org/10.1002/aorn.13504 https://qe2a-proxy.mun.ca/login?url?url=https://www.proquest.com/scholarly-journals/creating-periop-202-course-orientation-program/docview/2579142835/se-2?accountid=12378

Reuter, J., & King, T. S. (2021). Evaluation of a redesigned perioperative specialty elective to address the perioperative nursing shortage. *113*(5), 476–485. https://doi.org/http://doi.org.10.1002/aorn.13375 https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_proquest_journals_2521670959

Sunnybrook Health Sciences Center (2022). *Facts and figures*. About Sunnybrook. https://sunnybrook.ca/content/?page=statistics

Trillium Health Partners (2020). *Annual report 2019/20.* Trillium Health Partners. https://trilliumhealthpartners.ca/AR2020/Assets/Home.html

Appendix A: Sample email letter of inquiry

To Whom It May Concern:

I am writing to you to inquire about the orientation practices for neurosurgical perioperative nursing at your organization. Do you have any specific orientation resources available to nurses transitioning into neurosurgical perioperative nursing? If so, could you please provide a copy of your orientation resource? I would appreciate hearing from you by October 31.

I am the Perioperative Clinical Nurse Educator and Coordinator with the **xxx** at the **xxx**. I am presently working on obtaining my Master in Science of Nursing degree from Memorial University.

As part of the program, I am completing a practicum project to develop an orientation resource for nurses new to the neurosurgical perioperative nursing specialty. As part of my practicum project, I am completing an environmental scan to identify specific examples of orientation plans, resources, or programs that are used to support nursing orientation in other facilities.

This information will only be shared with my practicum supervisor. If I do wish to use this material for my project, I will contact you for your written permission before using any material that you provide.

I look forward to hearing from you.

Kindly,

Allison Lenihan BScN, RN
Perioperative Educator / Skills Center Coordinator, xxx
MScN Student, Memorial University

Appendix B: List of Healthcare Facilities Contacted

- Eastern Health, Newfoundland, and Labrador
- Sunnybrook Health Sciences Center, Toronto, Ontario
- Trillium Health Partners, Mississauga, Ontario
- University of Alberta Hospital, Edmonton, Alberta

Appendix C: Health Research Ethics Authority (HREA) Screening Tool

Student Name: Allison Lenihan

Working Title of Practicum Project: Development of a resource manual to support the onboarding process for nurses in the neurosurgical specialty of the perioperative services.

Date Checklist Completed: 2022.10.30

This project is exempt from Health Research Ethics Board approval as I will not be conducting a research study for the sense of this practicum project. Similar research processes will be used for data collection and analysis to develop a resource for neurosurgical perioperative nurses. This project most closely aligns with item 3 from the checklist below.

1. Research that relies exclusively on publicly available information when the information is legally accessible to the public and appropriately protected by law; or the information is publicly accessible and there is no reasonable expectation of privacy.
2. Research involving naturalistic observation in public places (where it does not involve any intervention staged by the researcher, or direct interaction with the individual or groups; individuals or groups targeted for observation have no reasonable expectation of privacy; and any dissemination of research results does not allow identification of specific individuals).
3. **Quality assurance and quality improvement studies, program evaluation activities, performance reviews, and testing within normal educational requirements if there is no research question involved (used exclusively for assessment, management or improvement purposes).**
4. Research based on review of published/publicly reported literature.
5. Research exclusively involving secondary use of anonymous information or anonymous human biological materials, so long as the process of data linkage or recording or dissemination of results does not generate identifiable information.
6. Research based solely on the researcher's personal reflections and self-observation (e.g. auto-ethnography).
7. Case reports.
8. Creative practice activities (where an artist makes or interprets a work or works of art).

For more information, please visit the Health Research Ethics Authority (HREA) at https://rpresources.mun.ca/triage/is-your-project-exempt-from-review/

Appendix III: Consultation Report

Consultation Report: Development of a Self-Directed Orientation Resource for Nurses Newly Hired to the Neurosurgical Perioperative Specialty

Allison Lenihan

201890286

Memorial University of Newfoundland

Consultation Report

This practicum project entails the development of an educational resource to support the orientation and onboarding process for newly hired neurosurgical perioperative nurses. An integrative literature review was conducted to explore and synthesize the existing literature pertaining to orientation practices for perioperative nursing staff. The need for this orientation resource was determined through the integrative literature review in which there was strong evidence to indicate that educational interventions for healthcare professionals may be effective for improving clinical competence and knowledge for perioperative staff (Baumann et al., 2019; Bommer et al., 2018; Clarke et al., 2021; Fernandez et al., 2020; Hope et al., 2021). An environmental scan explored resources that are currently used to support orientation for neurosurgical perioperative nurses at other healthcare organizations within Central and Atlantic Canada. The environmental scan determined that neurosurgical specific orientation resources can be effective for supporting the orientation process. Orientation resources that provide further education tailored to the clinical setting can lead to improved clinical competence (Clarke et al., 2021; Ndung'u et al., 2022), increase in self-efficacy (Bommer et al., 2019; Clarke et al., 2021), improved job satisfaction (Beitz, 2019; Sasso et al., 2019) and ultimately safer patient outcomes (Lenihan, 2021; Steelman et al., 2013).

The purpose of the consultations was to identify specific areas or gaps in the onboarding process and to identify specific topics to include in an orientation resource for neurosurgical perioperative nurses. The findings from both the integrative literature review and the environmental scan helped to inform the consultations with staff. This consultation report will overview the nature of the practicum project, provide an overview of the consultation process,

summarize findings, and the implications of the consultation results on the development of an educational resource to support the onboarding process for neurosurgical perioperative nurses.

Brief Overview of the Project

The neurosurgical perioperative service has seen an influx of new staff recently. At a large trauma center hospital, the neurosurgical specialty of the perioperative services is a fast paced, high acuity, work environment. Working in the perioperative nursing specialty requires specialized training and education so that nurses can become competent in their professional practice as a perioperative nurse. Neurosurgical perioperative patient outcomes are based on the collective competence of the surgical team, which includes perioperative nurses (Fearon, 2018). Therefore, specialized training and education can prepare nurses to adequately meet the dynamic and complex needs of patients in the perioperative setting.

Results of a literature review on neurosurgical perioperative nursing orientation and onboarding revealed that there is a significant gap in perioperative nursing knowledge for newly hired nurses. This knowledge gap can result in an increase in nursing turnover, with up to 50% of new nurses leaving their position within the first year because of transition shock and feeling unprepared (Baumann et al., 2018; Clarke et al., 2021; Mollohan & Morales, 2016). Clinical experience and knowledge are considered critical resources of perioperative healthcare. Patient safety may be put at risk when newer, less experienced perioperative nurses are not trained effectively (Beitz, 2019). Comprehensive training is needed to equip nurses who are new to perioperative nursing with the tools and education necessary to practice competently and confidently (Baumann et al., 2019; Clarke et al., 2021; Hope et al., 2021; Mollohan & Morales, 2016; Reinhart & Moore, 2021). Nurses new to the neurosurgical perioperative service, should

receive education that is specific to their learning needs and the unique needs of the neurosurgical perioperative service.

The resources currently in place to support orientation processes for neurosurgical perioperative nurses are in the form of a generalized perioperative orientation checklist. The checklist is based on a general orientation to the physical environment of the perioperative services. The existing checklist does not provide any overview of the individual surgical services, including the neurosurgical service, which has been an area deemed necessary for further development of orientation materials. This indicates that there is a lack of knowledge about the neurosurgical perioperative nursing specialty and necessitates the development of an educational resource to support nurses who are newly hired to the neurosurgical specialty within the perioperative services to practice safely and competently. This practicum project aims to develop a neurosurgical orientation resource that contains relevant information for nurses working in the neurosurgical perioperative specialty. The purpose of this educational resource is to support newly hired nurses as they become more knowledgeable and competent in their neurosurgical perioperative nursing practice. This educational resource will also provide clarity and support for senior staff training newly hired staff to the neurosurgical specialty. The overall goal of the consultation process was to retrieve information from staff working in the perioperative services that is specific and relevant to the orientation and onboarding process for neurosurgical nurses.

Specific Objectives for the Consultations

The objectives for the consultations were as follows:

1. identify specific areas or gaps in the onboarding process for nurses newly hired to

the neurosurgical specialty of the perioperative services from the perspectives of novice neurosurgical perioperative nurses, experienced neurosurgical perioperative nurses, the perioperative clinical supervisors, the perioperative clinical nurse educator, and the perioperative health services manager; and

2. identify specific topics to include in an orientation resource to support the onboarding of perioperative neurosurgical nurses.

Methods

Methods of the consultations included conducting interviews with perioperative nursing staff. Consultations will be held with members of the team who are primarily involved in the process of orientating and onboarding new nurses are an essential component for the development of an orientation resource manual for the neurosurgical perioperative service.

Setting and Sample

The setting for the consultations was a large Level 1 Trauma Center and teaching hospital in an Atlantic Canadian province. Twelve healthcare professionals were interviewed regarding their experiences with the process of orientation for newly hired neurosurgical perioperative nurses. This included eight nurses working in the neurosurgical perioperative service, one perioperative clinical nurse educator, two perioperative clinical supervisors, and one perioperative health service manager. Participants were recruited using convenience sampling methods. Convenience sampling entails using the most readily available people as participants and often involves sampling a group with certain characteristics (Polit & Beck, 2021). For this project, convenience sampling methods were used to select participants working in the neurosurgical perioperative setting. Recruitment involved explaining the purpose and overall objectives of the practicum project and asking for participation via email, see Appendix A.

Of the eight nurses who agreed to participate, four were novice nurses (i.e., have worked in the neurosurgical service for less than twelve months), and four were experienced nurses (i.e., one or more years of neurosurgical experience). This was to try and acquire a variety of perspectives of the orientation process, issues, and suggestions for areas of improvements. The clinical nurse educator and perioperative supervisors were included as their roles are to oversee the orientation process. The perioperative supervisors are also a resource for newly hired nurses and are knowledgeable about the existing orientation practices. The two perioperative clinical supervisors have worked in their roles for three and five years. The clinical nurse educator was consulted for their expertise on the learning needs of newly hired neurosurgical perioperative nurses, and effective teaching strategies. The perioperative health service manager was included as they are ultimately responsible for overseeing the perioperative department. Both the perioperative clinical nurse educator and health services manager of the perioperative services have worked in their roles for seven and ten years, respectively.

Data Collection

Consultations typically involve the gathering of information by interviewing participants. Personal interviews are regarded as one of the best methods of collecting survey and consultation data because of the quality of information that they yield (Canada 2021; Polit & Beck, 2021). Participants were asked if they would prefer a phone interview or an in-person interview and provided a variety of options for scheduling. Consultation data was collected through phone interviews as per the participants requests. By scheduling a time for a phone interview, participants provided verbal agreement to participate in the consultation process.

Interviews were conducted with nurses working in the neurosurgical specialty, the perioperative clinical supervisors, the perioperative clinical nurse educator, and the health

services manager of the perioperative services. Personal interviews were conducted via phone as per participants request and ease of scheduling. Interviews were approximately 15 minutes in duration. Personal interviews are regarded as one of the most efficient methods of collecting consultation data because they provide high quality data and often have low refusal rates for participation (Canada, 2021; Polit & Beck, 2021). The interviews provided an opportunity for participants to share their experiences and perspectives using their own words. Interviews were guided by a set of predetermined open ended questions as outlined in Appendices B, C, D, and E. Nurses working in the neurosurgical perioperative service for less than 12 months were interviewed using the questions outlined in Appendix B. Nurses working in the neurosurgical perioperative service for longer than 12 months and have precepted or assisted in orientating a novice nurse were interviewed using the questions outlined in Appendix C. Interview questions for the perioperative clinical nurse educator, and clinical supervisors and manager are outlined in Appendices D and E, respectively. Participants were encouraged to answer questions to their comfort level until they felt they had no new details to discuss. Interviews were conducted by following the questions outlined in the appendices. There was some overlap of common questions that were asked to all participants. Comprehensive note taking during the phone interviews helped to ensure an objective approach, increased consistency, and quality of the data collection process. Note taking is encouraged to ensure the highest possible reliability of data and to prevent total information loss (Polit & Beck, 2021). I clarified any statement that I did not understand by repeating the information and having the participants validate or clarify as needed.

Data Management and Analysis

Data management processes were focused on creating organized, documented, accessible, and usable research data for the purposes of this practicum project. Interview notes were transcribed digitally according to quality assurance standards to maintain consistency. All information and contacts that were collected were stored on a password protected computer. The computer has a secure network and firewalls for additional security and protection from unauthorized individuals accessing stored information. Upon completion of this project, all interview notes and emails pertaining to the consultations will be permanently destroyed and deleted.

Consultation data were analyzed using content analysis to identify common themes or concepts. Content analysis is a qualitative research technique that is useful for finding patterns in communication using a systematic method (Canada, 2021; Polit & Beck, 2021). Content analysis illuminated the presence and meaning of the consultation data by revealing the correlations between learning needs and practice issues with relation to the orientation and onboarding process. Topic modeling and sentiment analysis techniques were used to analyze the consultation responses. Topic modeling is a way of looking for patterns and themes within a text that can be used to guide research. Creating categories of themes and patterns can capture the substance of a topic and allow the data to be thought about in new and different ways (Polit & Beck, 2021). Comparatively, sentiment analysis identifies the emotional content of the words to examine subjective results (Canada, 2021; Polit & Beck, 2021). Analysis of interview notes focused on the participants responses to the interview questions. Similar responses illuminated themes which indicated that there are gaps in the existing orientation and onboarding process.

Ethical Considerations

Ethical considerations for the consultations included obtaining informed agreement and voluntary participation. Any response to the initial email inquiry implied informal voluntary consent to participate in the consultations. At the start of the interview, participants were reminded that their participation was voluntary and that they could withdraw at any time or refuse to answer any questions. The participants were advised that any shared information would be safely stored on a private, password protected computer. Participants were advised that any information provided would only be shared with my practicum supervisor and used for the development of this practicum project. All confidential information will be permanently deleted from the computer hard drive after the completion of this practicum project. To determine if the consultations for this practicum project required ethical review by the Health Research Ethics Review Authority (HREA), the HREA screening tool was completed. Since this project focuses on quality improvement, it was determined that an HREA review was not required for the consultations. A completed copy of the screening tool can be found in Appendix F.

Results

Consultation interviews were completed with twelve key stakeholders to discuss their experiences and learning needs with orientating new staff to the neurosurgical perioperative service. Two of the novice neurosurgical perioperative nurses were unable to be reached during the time of the consultation process. Four novice nurses working in the neurosurgical specialty for less than one year, four experienced nurses working in the neurosurgical specialty for longer than one year, two perioperative supervisors, one clinical nurse educator, and one perioperative health services manager participated in the interview process. The semi-structured interviews were conducted over the phone with each individual participant between November 8th and

November 15th, 2022. Through content analysis of interview notes, three major themes including issues, resource content, and delivery method were identified and explored as outlined in Table 1. Limited education, confidence, workplace stress, and feeling unprepared were all concepts connected to the theme of issues. Resource content consisted of concepts such as surgeon preferences, surgical procedures, surgical instruments, and specialty surgical equipment. Finally, the delivery method theme outlined preferences for an educational resource to support the orientation and onboarding of newly hired neurosurgical perioperative nurses. Selection of a resource delivery method will involve consideration of all perspectives and preferences provided by the participants.

Table 1

Major Themes of the Consultations

Major themes of the Consultations
• Issues • Resource Content • Resource Delivery Methods

Issues

Both novice and experienced neurosurgical perioperative nurses were asked about their personal experiences during the process of orientating or being oriented to the neurosurgical perioperative service. The nurses were also questioned about how effective they found the current orientation checklist to be for the orientation process. Comparatively, the clinical supervisors, perioperative clinical nurse educator, and perioperative health science manager were

also asked how relevant they found the current orientation checklist to be for neurosurgical orientation. Lack of neurosurgical specific education, confidence, and organizational challenges were commonly identified throughout the interviews and were identified as subthemes for issues with the orientation and onboarding of newly hired neurosurgical perioperative nurses.

Lack of Neurosurgical Specific Education

The interviews with novice and experienced neurosurgical perioperative nurses highlight that there is inconsistency in the existing orientation processes for nurses newly hired to the neurosurgical perioperative specialty. Four of the experienced nurses were familiar with the current orientation checklist but felt that it would be more beneficial if it included neurosurgical specific criteria. Two of the novice nurses used the existing orientation checklist during their orientation and felt that it provided structure for their orientation process. Two other novice nurses did not use the orientation checklist during their orientation process. These findings were consistent with the interviews with the perioperative supervisors, perioperative clinical nurse educator, and perioperative health service manager, who all confirmed they did not feel the existing checklist provided a comprehensive orientation to neurosurgery.

Although some participants (n=8) felt that the existing orientation checklist provided a general overview of the perioperative unit, there was a unanimous conclusion that neurosurgical perioperative orientation could be enhanced by providing more education that is focused on neurosurgical perioperative nursing. Several nurses (n=4) noted that their neurosurgical knowledge came from conducting their own research and reading and making notes on their phones. One nurse discussed how they learned to set up the room for a surgical procedure by taking photos of previous surgical setups. The nurse would store these photos in a file on their phone and make notes that they could refer to if needed.

Interviews with the perioperative clinical nurse educator and perioperative health services manager illuminated how nurses who are newly hired to the neurosurgical specialty often have great difficulty learning the amount of specialty equipment that is used in neurosurgery. Specialty equipment and instruments was also consistently identified as an orientation issue during the interviews with novice nurses.

The consensus from the interview consultations is that there is not a comprehensive learning resource for perioperative neurosurgery that effectively meets the learning needs of newly hired nurses. The consultations also illuminated that there is not a consistent approach to the process of orientation and onboarding for newly hired neurosurgical perioperative nurses. The nurses all expressed that they did not receive any neurosurgical specific education or training prior to their orientation. The development of an orientation resource manual could streamline the orientation and onboarding process and help provide a comprehensive learning experience for nurses that are newly hired to the neurosurgical specialty of the perioperative services. Two of the experienced nurses also indicated that an updated orientation resource could provide a quick "go-to" resource for any staff working in the area.

Confidence and Feeling Unprepared

When asked about how relevant the existing orientation checklist was when used during the orientation process, many of the novice nurses (n=3) expressed that they lacked confidence in their neurosurgical perioperative nursing skills upon completion of their orientation. The clinical nurse educator also noted that nurses almost always ask for an extension to their orientation to neurosurgery. The clinical nurse educator discussed how nurses often feel that they are not ready to begin practicing independently as a neurosurgical perioperative nurse. During the interview with the clinical nurse educator, I used neutral probing questions to explore the process of what

happens when a nurse asks for an extension to their orientation. The clinical nurse educator informed me that a meeting is held with the individual nurse, the preceptor, and the clinical nurse educator to evaluate individual learning needs. The clinical nurse educator elaborated to say that in almost all cases when the nurse asks for an extension to their orientation, they are in fact ready to practice on their own, but they are often lacking confidence.

Organizational Challenges

Many of the nurses acknowledged that there were organizational challenges to orientating newly hired neurosurgical perioperative nurses. Staffing issues were of the greatest concern and were noted by each of the nurses (n=8) as impacting the orientation process. Many of the novice nurses (n=3) noted that consistency of preceptors was a challenge during their orientation. The experienced nurses (n=4) all reported that they often received a lot of questions related to neurosurgical perioperative nursing when working with nurses who had recently completed their orientation process. The perioperative health service manager and perioperative supervisors noted that having a consistent preceptor is ideal, but not always possible due to staffing challenges. One novice nurse spoke about how during their orientation, there was two nurses onboarding to neurosurgery at the same time. The nurse spoke about how this was challenging to ensure that learning needs and experiences were met for both orientees. Another novice nurse spoke about the challenges of onboarding to neurosurgery during the COVID-19 pandemic, a time when non-emergent surgical procedures were cancelled.

Resource Content

All participants were asked several questions to provide opportunities for them to share any ideas, thoughts, or feelings toward content development for a neurosurgical orientation

resource. Throughout each interview the recurring ideas that were mentioned by participants included: anatomy and pathophysiology, neurosurgical procedures, neurosurgical instruments, specialty neurosurgical equipment, and surgeon preferences. These ideas will be used as content for the development of an educational resource manual to support the onboarding process for nurses in the neurosurgical specialty of the perioperative services.

Anatomy and Pathophysiology

Some of the experienced nurses (n=3) commented that the novice nurses seemed intimidated by neurosurgery. The novice nurses (n=4) all expressed feeling overwhelmed when beginning their orientation to neurosurgery because of the complexities associated with neurosurgery. Some of the novice nurses (n=2) confirmed they did not have a solid foundational knowledge base about neurosurgery. The clinical nurse educator also thought it could be beneficial to include a brief overview of the neurological anatomy and pathophysiology during the orientation process. The novice nurses (n=4) felt that having a better understanding of the neuroanatomy and pathophysiology could improve their practice as newly hired neurosurgical perioperative nurses.

Neurosurgical Procedures

The novice nurses were asked what skills are the most challenging when starting to work in the neurosurgical perioperative service. Some novice nurses (n=2) expressed they felt overwhelmed by the amount of knowledge they needed to acquire to become familiar with the surgical procedures and surgeon preferences. Novice nurses were probed to further inquire about which neurosurgical procedures they feel should be included for overview in the development of an orientation resource. The results are provided in Table 2.

Table 2

Neurosurgical Procedures

Neurosurgical Procedures for Overview
• Arteriovenous Malformation Resection • Carotid Endarterectomy • Microvascular Decompression • Skull Base Craniotomies • Pituitary Surgery • Craniotomy for Aneurysm Repair • Craniotomy for Brain Tumor Excision • Minimally Invasive Spine Surgery • Spinal Laminectomy • Spinal Fusion • Epilepsy Neurosurgery • Ventriculoperitoneal Shunt Surgery • Ventriculostomy

Neurosurgical Instruments and Specialty Equipment

Many of the neurosurgical perioperative nurses (n=5) recalled having difficulty with learning the surgical instruments when they were onboarding to the neurosurgical service. The clinical nurse educator also confirmed that many novice nurses have difficulty learning the neurosurgical instruments and specialty equipment that is used in neurosurgery. While some of

the experienced nurses (n=2) suggested that spending some time outside of the clinical area to learn about the equipment may be beneficial, many nurses (n=6) felt that it would be beneficial to include an overview of the equipment and instruments that are unique to neurosurgery in an educational resource. Two experienced nurses also felt that this would also serve as a quick reference resource for nurses to refer to when equipment or technical difficulties arise in clinical practice. The nurses provided a list of the neurosurgery specific equipment that should be included in the development of an orientation resource, outlined in Table 3.

Table 3

Neurosurgery Specific Equipment

Neurosurgical Equipment for Overview
• Bipolar Electrocautery Machine • Medtronic Stealth Station Surgical Navigation System (2022) • Integra Cavitron Ultrasonic Surgical Aspirator System (2019) • Neurosurgical Microscope

Surgeon Preferences

The novice nurses (n=4) felt that learning the surgeon preferences was the biggest challenge during their orientation process. Surgeon preferences are recorded on their picklists which are automatically generated when a surgeon books a case. Some of the novice nurses felt that it would be helpful if the picklists could be printed off and kept in the operating rooms for quick referencing. This is a strategy that was also identified during the environmental scan, where one organization has a binder of surgeon preference lists in each operating room.

Resource Delivery Method

All participants were asked what changes could be made to improve the existing process for orientating and onboarding newly hired neurosurgical perioperative nurses. When asked about what delivery method for the educational resource would be preferred, there was division noted between the nurses and the clinical supervisors and manager. The perioperative clinical supervisors and manager felt an electronic copy would be most beneficial and economical. An electronic copy will also ensure that the resource can easily be edited to ensure it is current and accurate. The nurses expressed that they would prefer a physical copy of an educational resource, so that they could refer to it when needed. Some of the nurses (n=6), also expressed concerns around having limited access to a computer when in the operating theatre. One of the experienced neurosurgical perioperative nurses suggested that in-person educational sessions should be held outside of the clinical area to review surgical instruments and equipment. However, the clinical nurse educator had concerns about having in-person sessions as they are often difficult to schedule so that staff can attend.

Both novice and experienced neurosurgical perioperative nurses were asked how effective they found self-directed learning modules to be for addressing their learning needs. Many of the novice and experienced neurosurgical perioperative nurses (n=7), felt that self-directed learning modules would be effective for supporting the orientation process. Table 4 provides an overview of the identified possible modes of delivery for the orientation resource. The orientation resource manual will be developed and offered in both digital and printed copies to accommodate all delivery method factors identified by the consultations.

Table 4

Possible Modes of Delivery

Possible Modes of Delivery for the Orientation Resource
• Electronic resource manual • Printed paper resource manual • Educational sessions • Self-directed learning modules

Implications

The consultations were insightful for the development of the educational resource to support the orientation and onboarding of neurosurgical perioperative nurses. The consultation interviews provided an opportunity for participants to share their experiences and perspectives related to the process of orientation and onboarding. The data collected during the interviews with novice and experienced nurses illuminated some of the challenges that are encountered during the orientation process. Interviews with the perioperative clinical supervisors, manager, and clinical nurse educator confirmed that there are issues with the existing orientation checklist. All participants confirmed that the existing orientation checklist is insufficient for providing a comprehensive orientation for newly hired neurosurgical perioperative staff. From the consultations with novice and experienced nurses it was apparent that an orientation resource for neurosurgery should include a comprehensive overview of the specialty. The participants identified that the resource should include the topics of neurosurgical procedures, surgeon

preferences, and neurosurgical equipment. Information gathered through the consultation process will help inform the development of the orientation resource.

Conclusion

Conducting consultations was an essential component in the development of an educational resource to support the orientation and onboarding process for newly hired neurosurgical perioperative nurses The development of an orientation resource manual was identified as a need by nurses working in the neurosurgical specialty within the perioperative services. The orientation resource manual will be offered in a digital and printed copy as per the information gathered in the consultations. The data collected through these consultation interviews provided an enriched understanding of the individualized and unique learning needs of nurses working in the neurosurgical service. Developing this resource will provide a comprehensive overview of the content specific to orientating perioperative nurses. This will serve as a reference point for preceptors, while providing orientees with a resource to support their learning. The theoretical frameworks of the Adult Learning Theory (Knowles, 1978) and Novice to Expert (Larew et al., 2006; Murray et al., 2019) theories will be used to guide the development of this resource. Nurses newly hired to the neurosurgical specialty of perioperative nursing will be able to use this resource with the support and guidance of their preceptor, to build on their existing clinical experiences and knowledge as they progress from a novice to expert in the field of perioperative nursing.

References

Baumann, A., Crea-Arsenio, M., Hunsberger, M., Fleming-Carroll, B., & Keatings, M. (2019). Work readiness, transition, and integration: The challenge of specialty practice. *Journal of Advanced Nursing*, *75*(4), 823–833. https://doi.org/10.1111/jan.13918 https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_webofscience_primary_000462161100014

Beitz, J. M. (2019). Addressing the perioperative nursing shortage through education: A perioperative imperative. *AORN Journal*, *110*(4), 403–414. https://qe2a-proxy.mun.ca/login?url?url=https://www.proquest.com/scholarly-journals/addressing-perioperative-nursing-shortage-through/docview/2299137342/se-2?accountid=12378

Bommer, C., Sullivan, S., Campbell, K., Ahola, Z., Agarwal, S., O'Rourke, A., Jung, H. S., Gibson, A., Leverson, G., & Liepert, A. E. (2018). Pre-simulation orientation for medical trainees: An approach to decrease anxiety and improve confidence and performance. *American Journal of Surgery*, *215*(2), 266–271. https://doi.org/10.1016/j.amjsurg.2017.09.038 https://qe2a-proxy.mun.ca/login?url?url=https://www.proquest.com/scholarly-journals/pre-simulation-orientation-medical-trainees/docview/2007531715/se-2?accountid=12378

Canada (2021). *Lesson 1. What to do with all this data?* Government of Canada. https://www.canada.ca/en/privy-council/services/public-engagement-resources/content-analysis-consultations/what-to-do-data.html

Clarke, D. B., Gaililee, A. I., Kureshi, N., Hong, M., Fenerty, L., & D'Arcy, R. C. N. (2021). Knowledge transfer and retention of simulation-based learning for neurosurgical instruments: a randomised trial of perioperative nurses. *BMJ Simulation & Technology Enhanced Learning, 7*(3), 146–153. https://doi.org/doi:10.1136/bmjstel-2019-000576 https://pubmed.ncbi.nlm.nih.gov/35518567/

Fearon, M. C. (2018). Knowledge, accuracy, precision: Requirements for the perioperative neurosurgical nurse. *AORN Journal*, *108*(2), 124-125. https://doi.org/10.1002/aorn.12321

Fernandez, R., Rosenman, E. D., Olenick, J., Misisco, A., Brolliar, S. M., Chipman, A. K., Vrablik, M. C., Kalynych, C., Arbabi, S., Nichol, G., Grand, J., Kozlowski, S. W. J., & Chao, G. T. (2020). Simulation-based team leadership training improves team leadership during actual trauma resuscitations: A randomised controlled trial. *Critical Care Medicine*, *48*(1), 73–82. https://doi.org/10.1097/CCM.0000000000004077 https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_crossref_primary_10_1097_CCM_0000000000004077

Hope, C., Reilly, J. J., Griffiths, G., Lund, J., & Humes, D. (2021). Factors associated with attrition and performance throughout surgical training: A systematic review and meta-analysis. *World Journal of Surgery*, *45*(2), 429–442. https://doi.org/10.1007/s00268-020-05844-0 https://qe2a-proxy.mun.ca/login?url?url=https://www-proquest-com.qe2a-proxy.mun.ca/scholarly-journals/factors-associated-with-attrition-performance/docview/2473886799/se-2

Integra. (2019). CUSA Clarity Ultrasonic Tissue Ablation System. https://www.integralife.com/file/general/1551373888.pdf

Knowles, M. S. (1978). *Andragogy: Adult learning theory in perspective*. *5*(3). https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_sage_journals_10_1177_009155217800500302

Larew, C., Lessans, S., Spunt, D., Foster, D., & Covington, B. G. (2006). Innovations in clinical simulation: Application of Benner's theory in an interactive patient care simulation. *Nursing Education Perspectives*, *27*(1), 16–21. https://qe2a-proxy.mun.ca/login?url?url=https://www-proquest-com.qe2a-proxy.mun.ca/scholarly-journals/innovations-clinical-simulation-application/docview/236667623/se-2?accountid=12378

Lenihan, A. (2021). *Prep for KT: The perioperative nursing shortage*.

Medtronic. (2022). Stealth Station Surgical Navigation System. Neurosurgery and Spine Procedures. https://www.medtronic.com/ca-en/healthcare-professionals/products/neurological/surgical-navigation-systems/stealthstation.html

Mollohan, J. K., & Morales, M. (2016). Strategies for successful perioperative orientation. *AORN Journal*, *104*(2), 100–110. https://doi.org/10.1016/j.aorn.2016.06.002 https://qe2a-proxy.mun.ca/login?url?url=https://www-proquest-com.qe2a-proxy.mun.ca/scholarly-journals/strategies-successful-perioperative-orientation/docview/1807048943/se-2?accountid=12378

Murray, M., Sundin, D., & Cope, V. (2019). Benner's model and Duchscher's theory: Providing

the framework for understanding new graduates nurses' transition to practice. *Nurse Education in Practice*, *34*, 199–203. https://doi.org/https://doi.org/10.1016/j.nepr.2018.12.003 https://qe2a-proxy.mun.ca/login?url?url=https://www-proquest-com.qe2a-proxy.mun.ca/scholarly-journals/benners-model-duchschers-theory-providing/docview/2177114008/se-2

Ndung'u, A., Ndirangu, E., Sarki, A., & Isiaho, L. (2022). A cross-sectional study of self-perceived educational needs of emergency nurses in two tertiary hospitals in Nairobi, Kenya. *Journal of Emergency Nursing*, *48*(4), 467–476. https://doi.org/10.1016/j.jen.2022.04.001 https://qe2a-proxy.mun.ca/login?url?url=https://www-proquest-com.qe2a-proxy.mun.ca/scholarly-journals/cross-sectional-study-self-perceived-educational/docview/2683119076/se-2?accountid=12378

Polit, D.F., & Beck, C. T. (2021). *Nursing research: Generating and assessing evidence for nursing practice* (11th ed.). Wolters Kluwer

Reinhart, D., & Moore, L. (2021). Creating a Periop 202 course and orientation program for open-heart procedures to increase cardiovascular OR nurse recruitment and retention. *AORN Journal*, *111*(4). https://doi.org/http://doi.org/10.1002/aorn.13504 https://qe2a-proxy.mun.ca/login?url?url=https://www.proquest.com/scholarly-journals/creating-periop-202-course-orientation-program/docview/2579142835/se-2?accountid=12378

Reuter, J., & King, T. S. (2021). Evaluation of a redesigned perioperative specialty elective to address the perioperative nursing shortage. *113*(5), 476–485.

https://doi.org/http://doi.org.10.1002/aorn.13375
https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_proquest_journals_2521670959

Sasso, L., Bagnasco, A., Catania, G., Zanini, M., Aleo, G., & Watson, R. (2019). Push and pull factors of nurses' intention to leave. *Journal of Nursing Management, 27*(5), 946–954. https://onlinelibrary-wiley-com.qe2a-proxy.mun.ca/doi/full/10.1111/jonm.12745

Steelman, V. M., Graling, P. R., & Perkhounkova, Y. (2013). Priority patient safety issues identified by periopeartive nurses. *AORN Journal, 97*(4), 402-418. DOI: 10.1016/j.aorn.2012.06.016
https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_webofscience_primary_000209647100008CitationCount

Appendix A: Sample email request for interviews with neurosurgical perioperative nurses, perioperative clinical nurse educator, perioperative clinical supervisors, and perioperative services manager

To Whom It May Concern:

I am writing to you to request your participation in a 20-minute interview about neurosurgical perioperative nursing onboarding practices. The interview may be completed in person or by phone. I would like to schedule the interview between **November 5th** and **November 15th.** Confidentiality will be ensured. Any information shared with me during the interviews will only be shared with myself and my practicum supervisor.

I am the Perioperative Clinical Nurse Educator and Coordinator with the **xxx** at the **xxx**. I am presently working on obtaining my Master in Science of Nursing degree from Memorial University.

As part of the program, I am completing a practicum project to develop an orientation resource for nurses new to the neurosurgical perioperative nursing specialty at the **xxx** hospital. As part of my practicum project, I am completing consultation interviews to identify gaps in the onboarding process and topics to include in the development of an educational resource.

Thank you for taking the time to consider this request. Please do not hesitate to contact me should you have any questions or concerns.

Kindly,

Allison Lenihan BScN, RN

Perioperative Educator / Skills Center Coordinator, **xxx**

MScN Student, Memorial University

Appendix B: Interview Questions for Newly Oriented Nurses

1. How long have you worked in the perioperative area?
2. How long have you worked in the neurosurgical specialty?
3. How was your orientation and onboarding experience to the perioperative neurosurgical team?
4. How relevant did you find the current orientation checklist for your learning in this service line?
5. What gaps and inconsistencies did you experience? How could these be improved upon with regards to the orientation process?
6. What ways, if any, can the current orientation learning checklist be improved for use in future practice specifically relating to the neurosurgical service line? Please explain.
7. What are the skills that you found most challenging when starting work in the neurosurgical perioperative service?
8. What topics within the neurosurgical perioperative orientation are the most difficult to understand?
9. What strategies have you used to obtain knowledge during the onboarding process specific to neurosurgery?
10. Is there anything else related to the orientation and onboarding process for the neurosurgery specialty that we have not covered that you would like to discuss?
11. How effective do you find self-directed learning modules?

Appendix C: Interview Questions for Precepting Nurses

1. How long have you worked in the perioperative area?
2. How long have you worked in the neurosurgical specialty?
3. How comfortable are you orientating newly hired nurses to the neurosurgical team?
4. If you could add to, or take away from the current orientation checklist, what information would you keep and what would you remove? Please explain.
5. What are the most common concerns noted by newly hired nursing staff during the orientation process?
6. How relevant do you feel our current orientation checklist is in preparing nurses to start working in the perioperative services?
7. Are there any differences noted in the orientation of novice versus experienced neurosurgical perioperative nurses?
8. What topics do you think are most important to include in a neurosurgical perioperative orientation resource?
9. What other supports and resources would you like to see in place to facilitate senior staff orienting new hires to the perioperative neurosurgical setting?
10. How effective do you find self-directed learning modules?

Appendix D: Interview Questions for the Clinical Nurse Educator

1. How effective do you feel our current orientation checklist is in preparing nurses to start working in the neurosurgical specialty of the perioperative services?
2. In what ways, if any, do you think the current orientation structure can be improved for nurses entering the neurosurgical perioperative specialty? Please explain.
3. What are the skills that newly hired staff find most difficult once hired to the neurosurgical specialty?
4. How often do nurses ask for an extension to their orientation to neurosurgery?
5. Are there any differences noted in the orientation of novice versus experienced neurosurgical perioperative nurses?
6. Do you think that nurses orientating to the neurosurgical specialty of the perioperative services could benefit from an updated orientation resource manual? Please explain.

Appendix E: Interview Questions for the Perioperative Clinical Supervisors and Perioperative Health Services Manager

1. How long have you worked in your role within the perioperative services?
2. How many neurosurgical perioperative patient-safety related incidents occur on the unit annually? How many of these are directly related to newly hired nursing staff?
3. How many nursing staff are hired to the perioperative services each year? How many of those hired nurses are new to the perioperative area, versus perioperative-experienced nurses relocating from another area?
4. How relevant do you find the current orientation checklist is for neurosurgical perioperative nursing?
5. In what ways, if any, do you think the current orientation structure can be improved for nurses entering the neurosurgical service? Please explain.
6. What topics do you think are most important to include in a neurosurgical perioperative orientation resource?

Appendix F: Health Research Ethics Authority (HREA) Screening Tool

Student Name: Allison Lenihan

Working Title of Practicum Project: Development of a resource manual to support the onboarding process for nurses in the neurosurgical specialty of the perioperative services.

Date Checklist Completed: 2022.09.21

This project is exempt from Health Research Ethics Board approval as I will not be conducting a research study for the sense of this practicum project. Similar research processes will be used for data collection and analysis to develop a resource for neurosurgical perioperative nurses. This practicum project is related to item number 3 on the HREA screening tool checklist.

1. Research that relies exclusively on publicly available information when the information is legally accessible to the public and appropriately protected by law; or the information is publicly accessible and there is no reasonable expectation of privacy.
2. Research involving naturalistic observation in public places (where it does not involve any intervention staged by the researcher, or direct interaction with the individual or groups; individuals or groups targeted for observation have no reasonable expectation of privacy; and any dissemination of research results does not allow identification of specific individuals).
3. **Quality assurance and quality improvement studies, program evaluation activities, performance reviews, and testing within normal educational requirements if there is no research question involved (used exclusively for assessment, management or improvement purposes).**
4. Research based on review of published/publicly reported literature.
5. Research exclusively involving secondary use of anonymous information or anonymous human biological materials, so long as the process of data linkage or recording or dissemination of results does not generate identifiable information.
6. Research based solely on the researcher's personal reflections and self-observation (e.g. auto-ethnography).
7. Case reports.
8. Creative practice activities (where an artist makes or interprets a work or works of art).

For more information, please visit the Health Research Ethics Authority (HREA) at https://rpresources.mun.ca/triage/is-your-project-exempt-from-review/

Appendix IV: Orientation Resource

Perioperative Neurosurgical Orientation Resource Manual: A Self-Directed Learning Resource for Nurses New to the Neurosurgical Perioperative Nursing Specialty

Allison Lenihan

201890286

Memorial University of Newfoundland

Perioperative Neurosurgical Orientation Resource Manual

A Self-Directed Learning Resource for Nurses New to the Neurosurgical Perioperative Nursing Specialty

Developed by:

Allison Lenihan BScN, RN

Spring 2023

Table of Contents

Introduction

Welcome to the self-directed orientation resource for onboarding to the neurosurgical perioperative service. This resource is designed to educate nurses who work in the neurosurgical perioperative service so that they can meet the dynamic and complex health needs of neurosurgical perioperative patients. This resource may be used as a tool to guide the orientation and onboarding process, as well as a quick reference tool to support further professional development. The development of this resource was informed by findings from an integrative literature review of recently published scholarly evidence; a review of regional resources available across Central and Atlantic Canada; and interviews with key stakeholders, including neurosurgical perioperative nurses, the perioperative clinical nurse educator, the preoperative clinical supervisors, and the perioperative health service manager.

The resource will be divided into six modules that each explore different concepts and topics including: **an overview of perioperative neurosurgical nursing, neurosurgical emergency considerations, an overview of neurosurgical procedures, neurosurgical instruments and equipment, and interdisciplinary collaboration**. These key concepts are outlined in the table of contents. The modules can be completed at your own pace and contain learning activities such as case studies and reflexive exercises to enhance the learning experience. Answers to the case studies are provided in Appendix C. Completing these activities as you progress through the modules is recommended to help further enrich

your understanding and learning as you develop your perioperative neurosurgical nursing practice.

The modules will also provide tips and tricks to assist in your daily perioperative nursing practice. Relevant policies and procedures will also be referenced throughout the learning modules. Key terms are bolded throughout and explored in the glossary in Appendix D. **Nurses should have a basic understanding and competency for general perioperative nursing practices including but not limited to basic surgical set-up, surgical asepsis, and perioperative patient care.**

In the next section you will find a pre-test. Taking this test is encouraged to assess your baseline knowledge about neurosurgical perioperative nursing. Once you have completed the learning resource modules, there will be a post-test at the end of Module Six that is designed to evaluate your learning. Answers to the pre-test and post-test are provided in Appendix B.

Pre-test

The following questions are designed to test your baseline knowledge about neurosurgical perioperative nursing. These questions will be repeated as a posttest in Appendix A at the end of the learning modules to evaluate your learning. Answers to the questions can be found in Appendix B.

1. Name the two roles that neurosurgical perioperative nurses may assume.

2. _____ is the key responsibility of the scrub nurse during a neurosurgical procedure.

3. List four responsibilities of the neurosurgical circulating nurse.

4. Define surgical conscious and aseptic technique as used in neurosurgery.

5. List three subjects that should be documented in the neurosurgical perioperative chart.

6. List four key strategies for promoting patient safety in the neurosurgical operating room (OR).

7. What would a surgical wound that encounters the sinus be classified as?

8. Identify a significant intraoperative complication of the craniotomy procedure that nurses should be prepared for, and appropriate actions for the neurosurgical perioperative nurse.

9. Define arteriovenous malformation.

10. Explain why the neurosurgical scrub nurse must remain sterile and maintain their sterile set up until the patient is extubated following a carotid endarterectomy.

11. What is the common positioning for patients undergoing a microvascular decompression?

12. In which neurosurgical procedure do patients often receive local anesthesia, such as lidocaine, during the first part of the surgery?

13. _____ provides a 6-point fixation system for firm cranial stabilization during cranial neurosurgical procedures.

14. True or False: During any surgical procedure, it is critical that both the circulating nurse and scrub nurse must remain attentive to the evolving events of the surgery.

15. The _____ was developed with the intent to decrease surgical errors and adverse events, and increase teamwork and communication in surgery.

16. Explain the meaning of the phrase “time is brain”.

17. True or False: The circulating nurse is a member of the sterile neurosurgical team.

18. True or False: The anesthesia technologist is a member of the unsterile neurosurgical team.

19. True or False: A formal request for an industry representative personnel must be submitted prior to them attending the surgical procedure.

The answers for the pre-test can be found in Appendix B.

Module One

Overview of Neurosurgical Perioperative Nursing

Module One

Overview of Neurosurgical Perioperative Nursing

This module will provide an overview of the nursing roles, competencies, and skills required for neurosurgical perioperative nursing practice. This will provide you with an understanding of the significant role that perioperative nurses play in the care and management of neurosurgical perioperative patients. The module includes an overview of the perioperative nursing roles, necessary skills, and competencies that are required to provide care to patients with dynamic health needs.

Learning Objectives

1. Define the role of the scrub nurse and the circulating nurse.
2. Identify the responsibilities associated with the role of the neurosurgical scrub and circulating nurse during an emergency.
3. Identify the competencies required to practice as a neurosurgical perioperative nurse.
4. Identify the specific skill set that is required for neurosurgical perioperative nursing practice.

Perioperative Neurosurgical Nursing Roles

Perioperative nurses use a comprehensive, multidisciplinary approach to patient care by assisting surgeons and surgical teams to care for patients before, during and after their surgical procedure. Neurosurgical perioperative nurses have a unique scope of practice. Typically, during daily working hours, there will be three nurses assigned to a neurosurgical operating room. Two nurses will work as circulating nurses, while the third will assume the role of the scrub nurse. The overall scope of practice for a neurosurgical perioperative nurse is a continuum ranging from basic to advanced clinical nursing activities.

Source. From Microsoft Word Stock Images.

Neurosurgical perioperative nurses have specific responsibilities that must be enacted to achieve optimal patient outcomes. During neurosurgery the perioperative nurse is responsible for preparing and monitoring surgical equipment, assisting the surgeon and anesthesiologist, helping to monitor vital signs and cardiac rhythms, monitoring the usage of supplies, positioning the patient appropriately for the procedure, and promoting patient safety (Kahan, 2019; Unfried, 2022).

Neurosurgical Scrub Nurse

The scrub nurse must use sterile technique to scrub, gown, and glove for the surgical procedure. Neurosurgical scrub nurses are ultimately responsible for promoting patient safety by maintaining sterility practices and the sterile field. Maintaining sterility is the key responsibility of the scrub nurse. The scrub nurse is responsible for setting up any instruments or supplies that are required for the surgical procedure. They must ensure that all instruments and supplies are sterile and in good working order prior to the start of the surgery. During the surgical procedure, they will be required to select and pass instruments to the operating surgeon. Scrub nurses may also assist the surgical team by donning scrubbed team members with sterile gowns and gloves.

Please refer to the AORN (2018) position statement for an overview of scrub nurse roles and responsibilities.

https://aornjournal.onlinelibrary.wiley.com/doi/epdf/10.1002/aorn.12293

Other specific responsibilities of the neurosurgical scrub nurse include:

- Performing initial sponge, instrument, and sharps counts according to the policy (D'lima et al., 2014; Nova Scotia Health, 2014a). Please review the following NS Health policy for OR counts:

  Operating Room Count - Policy # SS 05-071 (Nova Scotia Health, 2014a).

Neurosurgical Circulating Nurse

The neurosurgical circulating nurse will meet with the patient prior to the surgical procedure. In this role, the neurosurgical perioperative nurse works outside of the sterile field. Circulating nurses provide additional supplies and instruments as needed during the procedure and assist other team members in monitoring the status of the patient during the procedure. Neurosurgical circulating nurses also promote patient safety by assisting with positioning of the patient for the procedure (Association of Perioperative Registered Nurses (AORN), 2019; Kahan, 2019; Mathenge, 2020). Refer to Module Two for specific **positioning considerations** for neurosurgical procedures.

Please refer to the AORN (2019) position statement on perioperative registered nurse circulators for a review of circulating nurse responsibilities.

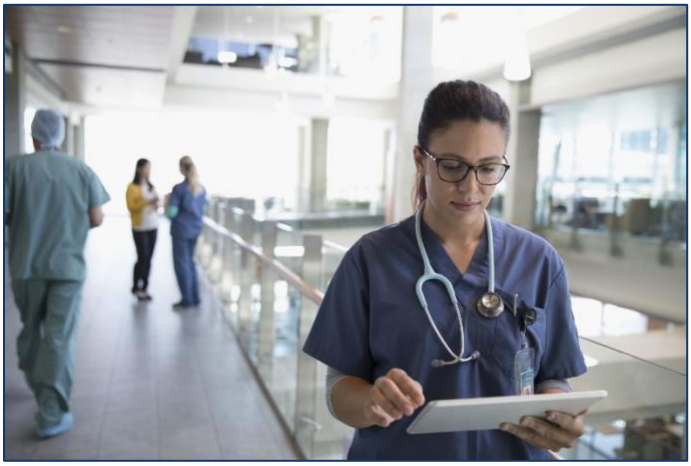
https://www.aorn.org/docs/default-source/aorn/guidelines/position-statements/posstat_rn_circulator.pdf

Other specific responsibilities of the neurosurgical circulating nurse include:

- Review consent documents, and other documentation prior to the procedure. Consider the patient's level of consciousness and ability to give informed consent. Please review the following Nova Scotia Health policy **Consent to Treatment – Policy # CH 30-045** (Nova Scotia Health, 2014c).

Perioperative Nursing Roles During Neurosurgical Emergency Procedures

Neurosurgical perioperative nurses play a key role in the management of emergent neurosurgical procedures. Proper planning and understanding of the predictable neurosurgical procedure are essential for the coordination of an emergency neurosurgical procedure. Planning and coordination should include consideration of the workload, patient safety risks, and resources (Merlino, 2019). The planning should also consider the unique threats to life, limb, and neurological function faced by the patient. Many neurosurgical interventions are effective and may return patients to full function. However, in some circumstances the neurosurgical procedure may be lifesaving but may also significantly impact the ability to achieve a meaningful functional recovery and quality of life. The perioperative neurosurgical team is often involved in the shared decision-making process with the patient or family to determine the surgical plan of care (Lee et al., 2020). Having a solid foundational understanding the predictable neurosurgical procedure, can enable the neurosurgical perioperative nurse to anticipate the trajectory of the surgical plan of care for an emergency.



Source. From Microsoft Word Stock Images.

During an emergency neurosurgical procedure, all neurosurgical nurses must remain focused and attentive during an emergency neurosurgical procedure to maintain their situational awareness. This will be discussed in further detail in the **Intraoperative Complications** subsection.

Scrub Nurse Key Responsibilities During an Emergency Neurosurgical Procedure

- Perform sterile scrub for procedure (Croke, 2021).
- Set up any necessary sterile surgical instruments and supplies in a timely fashion (Croke, 2021).
- Assist operating surgeon with donning of sterile PPE to begin procedure swiftly (Croke, 2021; Merlino, 2019).

The perioperative neurosurgical scrub nurse must identify the instruments required and be prepared to begin the surgical procedure (Clarke et al., 2021; Croke, 2021; Merlino, 2019). It is *critical* that the perioperative neurosurgical scrub nurse has the following instruments assembled and ready for immediate use:

1. Surgical scalpel and blade for skin incision.
2. Drill with perforator and craniotome attachments for removing the skull bone.
3. Suction.
4. Syringe for irrigation.

Circulating Nurse Key Responsibilities During an Emergency Neurosurgical Procedure

- Assess patient and verify patient identity (Merlino, 2019).
- Discuss the plan of care for the neurosurgical perioperative patient (Croke, 2021; Merlino, 2019).
- Consider the requirements for blood products and discuss with the surgical team.
- Ensure any necessary equipment is positioned nearby and functioning (Merlino, 2019).

The set up for emergency neurosurgical procedures is an extremely busy, and sometimes stressful time, for perioperative neurosurgical nurses. It is critical that all members of the perioperative neurosurgical team perform their responsibilities and work to the full scope of their role to ensure the procedure can begin as soon as possible so that optimal patient outcomes may be achieved (Croke, 2021; Merlino, 2019).

An interdisciplinary approach to preparedness is required to promote efficiency and facilitate the neurosurgical emergent procedure (Croke, 2021; Merlino, 2019). Breakdowns in communication between perioperative teams are associated with adverse perioperative events (Columbus et al., 2018). Effective communication between the neurosurgical perioperative team is essential during a perioperative emergency procedure and patient safety must remain a priority (Columbus et al., 2018; Croke, 2021; Merlino, 2019).

During a level 1 neurosurgical procedure, time is of the essence. A common saying in neurosurgery is "time is brain!", which emphasizes that human nervous tissue is rapidly and irretrievably lost as time progresses. Therefore, early neurosurgical intervention is essential to preserve neurological functioning.

Refer to Module Two for further details on perioperative nursing roles during neurosurgical emergencies.

Pause and Think: Reflection Activity 1.1

Source. From Microsoft Word Stock Images.

Think of your first day working in the perioperative neurosurgical service.

Was it challenging to identify the nursing roles?

What observations did you notice about the scrub nurse?

What observations did you notice about the circulating nurse?

Neurosurgical Perioperative Nursing Skills and Competencies

Neurosurgical perioperative nursing requires specialized knowledge, skills, professional practice, and leadership competencies to provide safe and competent nursing care to patients with dynamic healthcare needs. Perioperative nursing competencies can be organized into the following categories: ethical and professional practices, patient safety, infection prevention and control, perioperative phases, and anesthesia.

Ethical and Professional Practices

Perioperative nurses have a significant obligation to provide safe, professional, and ethical patient care (CNA, 2020). The neurosurgical perioperative nurse should:

- Demonstrate leadership skills by communicating, collaborating, and promoting evidence-informed practice (AORN, 2019; CNA, 2020).
- Demonstrate advocacy for privacy, dignity, and confidentiality for the perioperative patient.
- Demonstrate surgical conscious and aseptic technique (Chambers, 2013).

> **Surgical Conscious** is a 360-degree awareness of everything within the nurse's sterile and unsterile environment. **Aseptic technique** involves the incorporation of this awareness into daily activities of care (Chambers, 2013). Neurosurgical patient safety has a direct association with lack of adequate aseptic technique and poor surgical conscience (Chambers, 2013).

Patient Safety in the Neurosurgical OR

The perioperative neurosurgical team is focused on optimizing safety in the OR to achieve best possible patient outcomes. Strategies to promote patient safety include technical excellence, optimizing communication between the neurosurgical team, improving neurosurgical team dynamics, streamlining the OR process, and effective use of the surgical safety checklist (Sankaran et al., 2020; World Health Organization (WHO), 2023).

Click on the link below to review the Operating Room Nurses Association of Canada (ORNAC) standards for perioperative patient safety:

ORNAC Standards of Practice for Patient Safety (ORNAC, 2023).

Click on the link below to review the surgical safety checklist.

WHO Surgical Safety Checklist (WHO, 2023).

According to the Canadian Nurses Association (CNA) (2020), the perioperative nurse should also promote patient safety by:

- Participating in all phases of the surgical safety check list with the interprofessional health-care team. Please review the following NS Health (2017) as required:

  Operating Room Team Surgical Safety Checklist Policy and Procedure – Policy # SS-OR-001 (Nova Scotia Health, 2017).
- Manage the surgical counts as per the policy. Please review the following NS Health policies as required:

Operating Room Count - Policy # SS 05-071 (Nova Scotia Health, 2014a).

Incorrect Counts – Policy # SS 05-070 (Nova Scotia Health, 2014b).

- Facilitate safe patient positioning. Positioning specifics are outlined here in **Module Three**.
- Implement the safe use of all neurosurgical perioperative equipment. Equipment specifics will be outlined in **Module Five**.

Infection Prevention and Control

In neurosurgery, the overall incidence rate of surgical site infections (SSI) is around 2% worldwide and varies according to risk factors and type of surgery (Rachel et al., 2017). Infection prevention and control strategies require a multidisciplinary approach in the neurosurgical perioperative setting. Operative duration is the predominant risk factor for SSI. Given that neurosurgical procedures are often greater than 90 minutes, the risk of developing SSI more than doubles for neurosurgical patients (Abdel-Latif et al., 2022; Patel et al., 2019).

Risk factors for increasing the incidence of SSI include:

- Advanced age (Abdel-Latif et al., 2022)
- Elevated body mass index (Abdel-Latif et al., 2022)
- Instrumentation/drain use (Patel et al., 2019)
- Operative duration (Abdel-Latif et al., 2022; Patel et al., 2019)

According to the CNA (2020), all perioperative nurses must practice infection prevention and control strategies including:

- Routine practices with additional precautions (e.g., airborne, droplet, contact, **prion diseases**). Please review the following Nova Scotia Health policies.

  Airborne Precautions – Policy # IC 04-010B (Nova Scotia Health, 2013a).

  Contact Precautions – Policy # IC 04-008B (Nova Scotia Health, 2013b).

  Droplet Precautions – Policy # IC 04-011B (Nova Scotia Health, 2013c).

  Management of Patients with Suspect/Clinically Diagnosed CJD in the Operating Room – Policy # IPC-CP-005 (Nova Scotia Health, 2016).

- Traffic control – minimizing OR traffic and the opening of doors in the OR can reduce the risk of surgical site infections. This is particularly important in neurosurgical procedures that are of longer duration (Andrew & Florez, 2021).

Click on the following link to watch a video of how one Canadian hospital is taking strides to reduce OR traffic flow to improve patient outcomes.

https://www.youtube.com/watch?v=dJrGTHGTctQ

Source. From “Curbing traffic in the operating room” by Sunnybrook Hospital,

https://www.youtube.com/watch?v=dJrGTHGTctQ

- Surgical attire. Please review the following NS Health policy:

  Operating Room Dress Code – Policy # SS-OR-015 (Nova Scotia Health, 2018).

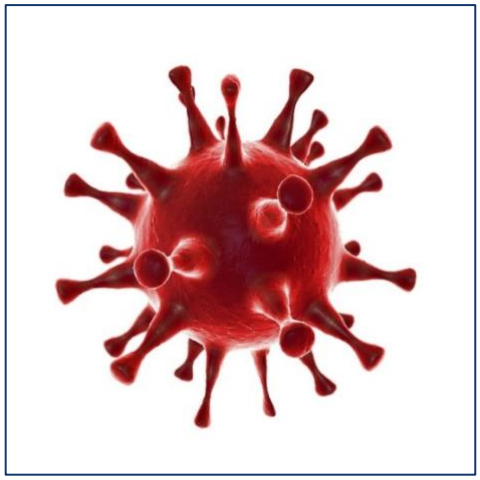
- Skin Preparation (e.g., hair removal, selection, and application of prep solution). Please review the following NS Health policy:

  Surgical Site Infection Prevention Guideline – Policy # SS-SR-005 (Nova Scotia Health, 2021).

- Assess, verify, and document the **surgical wound classification** at the end of the procedure.

One of the major infection control related concerns in the neurosurgical perioperative setting is the incidence and prevalence of surgical site infections (Abdel-Latif et al., 2022). Surgical site infections are some of the most common and costly health care related infections. Neurosurgical perioperative

nurses can employ a variety of evidence-based best practices to prevent surgical site infections including hand hygiene, preoperative patient skin preparation, and antimicrobial irrigation as requested by the attending surgeon (Bashaw & Keister, 2018; Rachel et al., 2017). Table 1 provides an overview of the classification of surgical site infections.



Source. From Microsoft Word Stock Images

Table 1.1

Surgical Site Classification Grades (I-IV) as Defined by the CDC (National Healthcare Safety Network, 2023).

Surgical Wound Classification Grades (I-IV) as Defined by the CDC

Class I/Clean: An uninfected operative wound in which no inflammation is present, and the respiratory, alimentary, genital, or uninfected urinary tract is not entered. In addition, clean wounds are primarily closed and, if necessary, drained with closed drainage. Operative incisional wounds that follow no penetrating trauma should be included in this category if they meet the criteria.

Figure 1.1: Primary closure of a hemicraniectomy as an example of a Class I neurosurgical wound. From Eltabl et al. (2022). https://doi.org/10.1186/s41984-022-00155-z

Class II/Clean-Contaminated: An operative wound in which the respiratory, alimentary, genital, or uninfected urinary tract are entered under controlled conditions and without any unusual contamination. Specifically, operations involving the biliary tract, appendix, vagina, and oropharynx are included in this category, provided no evidence of infection or major break in a sterile technique is encountered.

Figure 1.2: Surgical procedures entering the sinus provide an example of Class II neurosurgical wounds. From Kelley (2022). https://kanwarkelleymd.com/ent-conditions/sinus-surgery/

Class III/Contaminated*:* Open, fresh, accidental wounds. In addition, operations with major breaks in sterile technique or gross spillage from the gastrointestinal tract, and incisions in which acute or no purulent inflammation is encountered are included in this category.

Figure 1.3: The surgical wound condition of three different patients with a post operative infection following spinal surgery demonstrates a Class III neurosurgical wound. From Yilmaz et al. (2018). https://www.cureus.com/articles/13056-wound-closure-after-posterior-multi-level-lumbar-spine-surgery-an-anatomical-cadaver-study-and-technical-note#!/

Class IV/Dirty-Infected: Old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing postoperative infection were present in the operative field before the surgical procedure.

Figure 1.4: Patient with penetrating object implanted in skull, presents an example of a Class IV Dirty/Infected neurosurgical wound. From Abdelhameid & Saro (2019). https://doi.org/10.1186/s41984-019-0048-5

Perioperative Phases and Anesthesia

According to the CNA (2020), the neurosurgical perioperative nurse must:

- Understand the types of anesthesia and the required monitoring, documentation, and potential complications of general anesthesia, regional anesthesia, local anesthesia, and procedural sedation (Benze et al., 2021; CNA, 2020).

Local anesthetics are commonly used in neurosurgical procedures for their analgesic effects postoperatively (Becker & Reed, 2012; Potters & Klimek, 2018). Local anesthetics vary in their duration of action due to their affinity for protein. Duration of anesthesia is influenced by the time a local anesthetic remains near neural fibers (Becker & Reed, 2012). Pharmacological and technical considerations are outside the scope of this resource.

Some examples of commonly used local anesthesia medications include lidocaine, bupivacaine, mepivacaine (Becker & Reed, 2012; Potters & Klimek, 2018).

Helpful tips for assisting with general anesthesia:

The emphasis remains on the provision of good operative conditions, which includes reducing noise levels in the OR during induction and intubation of neurosurgical patients (Benze et al., 2021; Dinsmore, 2007; Lawler, 2017). The neurosurgical circulating nurse should establish a supportive environment by reducing background noise and assist the anesthesiologist by preoxygenating the patient. The neurosurgical circulating nurse may also identify any special considerations (e.g., bariatric, geriatric, obstetric) or potential complications (Benze et al., 2021).

Regional anesthesia such as scalp or peripheral nerve blocks are commonly used in neurosurgical procedures for their analgesic and hemodynamic effects (Tonkovic et al., 2019).

Some examples of regional anesthesia medications include lidocaine and bupivacaine.

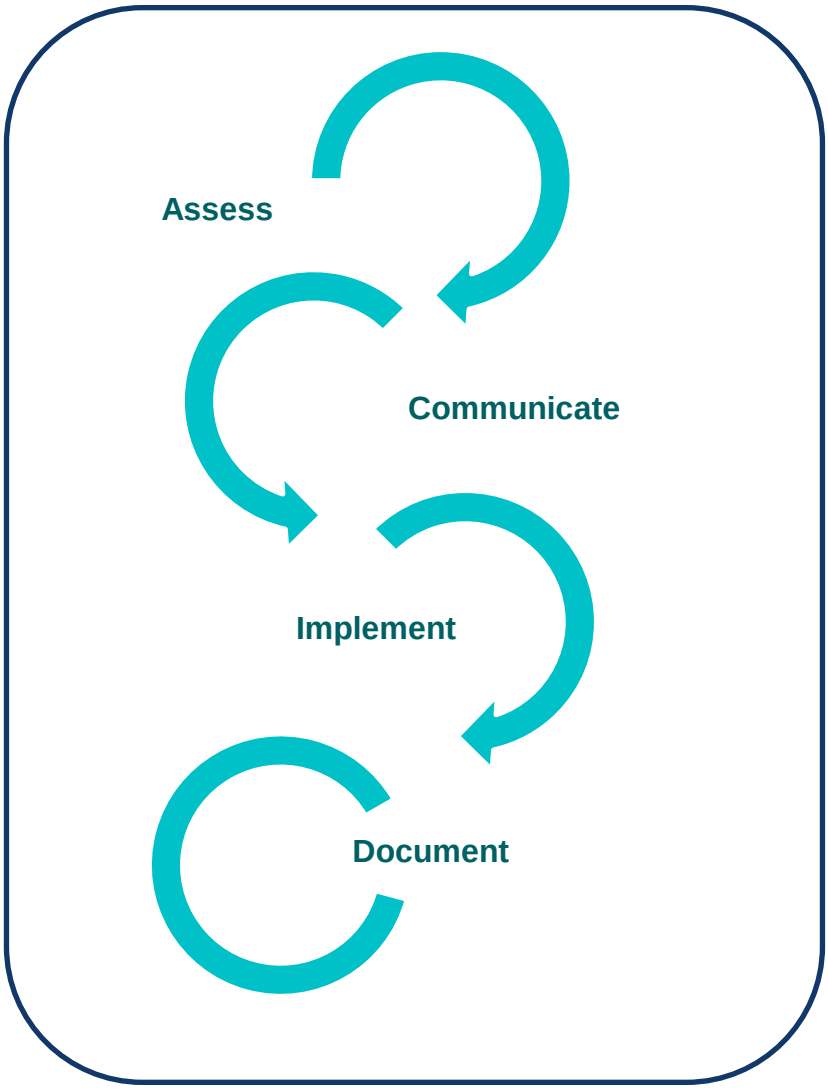
Helpful tips for assisting with local or regional anesthesia and procedural sedation:

Consider positioning and monitoring requirements. Identify any potential complications (e.g., toxicity, anaphylaxis, respiratory arrest). Consider the level of consciousness as a potential complication for procedural sedation (Benze et al., 2021).

During the intraoperative phase, the perioperative neurosurgical circulating nurse must continuously monitor the patient to adapt the plan of care for patients whose protective reflexes or self-care abilities are potentially compromised during surgical procedures. Although the neurosurgical circulating nurse works collaboratively with other perioperative professionals, the nurse is accountable for patient outcomes resulting from the nursing care provided during the neurosurgical procedure (AORN, 2019). Using clinical knowledge, judgement, and clinical-reasoning skills the neurosurgical circulating nurse will plan, implement, and continuously revise the nursing care plan to address the physical, psychological, and spiritual needs of neurosurgical patients.

Figure 1.5 below outlines the continuous monitoring, planning, and implementation of the intraoperative plan of care.

Figure 1.5 Development of the Intraoperative Plan of Care



Assess

Neurosurgical procedures are often of long duration and have an increased risk of cerebral hemorrhage. As a result, the neurosurgical circulating nurse should continuously assess intake/output, blood loss, skin integrity, pressure ulcer/injury risk, and temperature (Benze et al., 2021; Khan et al., 2019; Patel et al., 2019). Strategies for the **management of intraoperative hemorrhage are explored** in detail in **Module Three**.

Communicate

When developing the surgical plan of care the neurosurgical circulating nurse should communicatee assessment findings with the interdisciplinary perioperative team (Benze et al., 2021; Kahan, 2019; Koh et al., 2011).

Implement

During the continuous assessment and monitoring of the patient throughout the surgical procedure the neurosurgical circulating nurse should implement changes to the surgical plan of care that may be required to improve patient outcomes (AORN, 2019; Kahan, 2019; Mitchell & Flin, 2008).

Document

The neurosurgical circulating nurse should document any assessment findings and the intraoperative plan of care in the perioperative patient chart (AORN, 2019).

Conclusion

Perioperative neurosurgical nurses must have the necessary skills and competences required to provide care to patients with dynamic health needs. Module one will outline the advanced knowledge and skill set required to work in the neurosurgical service. An overview of nursing roles including scrub and circulating nurse responsibilities will be presented to encourage awareness and accountability of perioperative nursing roles, duties, and actions. Neurosurgical nursing requires focus and dedication, nursing knowledge, and the ability to work as a team

Case Study 1.1

Perioperative Nursing Care

F.M. is a 46-year-old male scheduled for a **craniotomy** for total resection of a frontal brain tumor. Following the preoperative assessment, the circulating nurse escorts F.M. to the operating theatre where the neurosurgical perioperative team awaits. Upon arriving to the operating room, F.M. quickly notes that he is the only one not wearing a mask. He looks around the room to see a large amount of gleaming silver instruments laying on a stainless-steel table and everything draped in sterile drapes. The circulating nurse then asks F.M. to shift over to an uncomfortable bed. As he lays back, he sees an upside-down head.

"Okay Mr. M, my name is Dr. Johnson, and I will be putting you to sleep for your surgery. I'm going to place this mask over your mouth and nose, and I want you to take deep breaths in through your nose and out through your mouth."

Mr. M tries to speak but suddenly feels weightless and drowsy. His eyes close and his breath becomes slow and steady.

"Dr. Davis, the patient is asleep. Just give me a few more minutes to insert some lines and then we are good to go. Now let's pause and discuss the surgery".

The circulating nurse, scrub nurse, attending surgeon, resident, and anesthesiologist all discuss the surgical procedure.

Questions:

Answer the following questions independently after completing this module. Answers to the questions will be provided in **Appendix C** at the end of the resource manual.

1. What are the circulating nursing roles and responsibilities for providing neurosurgical perioperative patient care?

2. What are some notable concerns that should be addressed in this scenario?

References

AORN. (2018). AORN position statement on orientation of the registered nurse and surgical technologist to the perioperative setting. *AORN Journal, 108*(1), 59-63. https://doi.org/10.1002/aorn.12293

AORN. (2019). AORN position statement on perioperative registered nurse circulator dedicated to every patient undergoing an operative or otherwise invasive procedure. *AORN Journal, 110*(1), 82-85. https://doi.org/10.1002/aorn.12741

Abdelhameid, A.K., & Saro, A. (2019). Non-missile penetrating brain injuries: cases registry in Sohag University Hospital. *Egyptian Journal of Neurosurgery, 34*(24). https://doi.org/10.1186/s41984-019-0048-5

Abdel-Latif, A. M., Moharram, A. A., Higazy, A., Ghoneim, N. I., Shafei, O., Abdelhady, S. G., Assal, G. & Ibrahim, A. (2022). Incidence and perioperative risk factors for surgical site infections in neurosurgery: prospective observational study. *Egyptian Journal of Neurosurgery, 37*(2). https://doi.org/10.1186/s41984-021-00142-w

Andrew, M. E., & Florez, J. V. (2021). Decreasing operating room traffic to improve patient safety in an academic medical center. *Journal of Infection Control, 49*(6). DOI:https://doi.org/10.1016/j.ajic.2021.04.044

Becker, D. E., & Reed, K. L. (2012). Local anesthetics: Review of pharmacological

considerations. *The Journal of Sedation and Anesthesiology, 59*(2), 90-102. doi: 10.2344/0003-3006-59.2.90

Benze, C., Spruce, L., & Groah, L. (2021). AORN perioperative nursing: Scope and standards of practice. http://www.aorn.org/doocs/default-source/aorn/guidelines/standards-of-practice/periop-nursing-scope-standards-of-practice.pdf

Canadian Nurses Association. (2017). Ethics for Registered Nurses. Canadian Nurses Association. https://www.cna-aiic.ca/en/nursing/regulated-nursing-in-canada/nursing-ethics

Canadian Nurses Association. (2020). Exam blueprint and specialty competencies. perioperative nursing certification. https://hl-prod-ca-oc-download.s3-ca-central-1.amazonaws.com/CNA/2f975e7e-4a40-45ca-863c-5ebf0a138d5e/UploadedImages/documents/perioperative_blueprint_and_competencies_e.pdf

Chambers, K. L. (2013). Patient safety equals: Aseptic technique, surgical conscience, and time out. *The Surgical Technologist*, 109-117. https://www.ast.org/pdf/351.pdf

Clarke, D. B., Gaililee, A. I., Kureshi, N., Hong, M., Fenerty, L., & D'Arcy, R. C. N. (2021). Knowledge transfer and retention of simulation-based learning for neurosurgical instruments: a randomised trial of perioperative nurses. *BMJ Simulation & Technology Enhanced Learning*, *7*(3), 146–153. https://doi.org/doi:10.1136/bmjstel-2019-000576 https://pubmed.ncbi.nlm.nih.gov/35518567/

Columbus, A. B., Castillo-Angeles, M., Berry, W. R., Haider, A. H., Salim, A., & Havens,

J. M. (2018). An evidence-based intraoperative communication tool for emergency general surgery: A pilot study. *Journal of Surgical Research, 228*(1), 281-289. https://doi.org/10.1016/j.jss.2018.03.007

Croke, L. (2021). Guideline for prevention of unintentionally retained surgical items. *AORN Journal, 114*(6), https://doi.org/10.1002/aorn.13579

Davrieux C. F., Palermo M., Serra E., Houghton E. J., Acquafresca P. A., Finger C, Giménez M. E. Stages and factors of the “perioperative process”: Points in common with the aeronautical industry. *Brazilian Archives of Digestive Surgery, 7*(32), e1423. doi: 10.1590/0102-672020180001e1423

Dinsmore, J. (2007). Anaesthesia for elective neurosurgery. *British Journal of Anaesthesia, 99*(1), 68-74. https://doi.org/10.1093/bja/aem132

D’lima, D., Sacks, M., Blackman, W., & Benn, J. (2014). Surgical swab counting: A qualitative analysis from the perspective of the scrub nurse. *Journal of Perioperative Practice, 24*(5), 103-111. https://doi.org/10.1177/175045891402400503

Eltabl, M. A., Ammar, A. S., & Saif, D. S. (2022). Evaluating the retro-auricular incision versus reversed question mark incision and Kempe’s ‘T-bar’ incision for decompressive hemicraniectomy. *Egyptian Journal of Neurosurgery, 37*(1). https://doi.org/10.1186/s41984-022-00155-z

Kahan, N. (2019). Neurosurgical operating room nurses’ roles and

responsibilities. *Florence Nightingale Journal of Nursing, 19*(3), 179-186. https://fnjn.org/en/neurosurgical-operating-room-nurse-s-roles-and-responsibilities-13812

Kelley, K. Sinus surgery. Side Health. https://kanwarkelleymd.com/ent-conditions/sinus-surgery/

Khan, E. S., Know, R. Y., Arifin, K. B., Komahen, C., Low, C. L., & Lim, B. C. (2019). Factors associated with deep surgical site infection following spinal surgery. A pilot study. DOI: 10.7759/cureus.4377

Koh, R. Y., Park., T., Wickens, C. D., Ong, L. T., & Chia, S. N. (2011). Differences in attentional strategies by novice and experienced operating theatre scrub nurses. *Journal of Experimental Psychology, 17* (3), 233-246. https://doi.org.qe2a-proxy.mun.ca/10.1037/a0025171

Lawler, E. (2007). Safety: Quiet please: Noise distractions in the OR. AORN Outpatient Surgery. https://www.aorn.org/outpatient-surgery/article/2017-November-safety-quiet-please-noise-distractions-in-the-or

Lee, R. P., Kaisorn, C., Huang, J., Tamargo, R. J., Caplan, J. M. (2018). Neurosurgical emergencies. In: Nelson, S., Nyquist, P. (eds) Neurointensive Care Unit. Current Clinical Neurology. Humana, Cham. https://doi.org/10.1007/978-3-030-36548-6_15

Mathenge, C. (2020). The importance of the perioperative nurse. *Community Eye Health Journal, 33*(110), 44-45.

https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_pubmedcentral_primary_oai_pubmedcentral_nih_gov_8115701

Merlino, M. (2019). Creating our future through preparedness. *AORN Journal, 110*(3), 229-231. https://doi.org/10.1002/aorn.12795

Mitchell, L., & Flin, R. (2008). Non-technical skills of the operating theatre scrub nurse: Literature review. *Journal of Advanced Nursing, 63*(1), 15-24. https://doi.org/10.1111/j.1365-2648.2008.0465.x

National Healthcare Safety Network. (2023). Surgical site infection event. https://www.cdc.gov/nhsn/pdfs/pscmanual/9pscssicurrent.pdf

Nova Scotia Health. (2013a). Infection prevention and control manual policy and procedure: Airborne infection precautions. https://policy.nshealth.ca/Site_Published/DHA9/document_render.aspx?documentRender.IdType=6&documentRender.GenericField=&documentRender.Id=44365

Nova Scotia Health. (2013b). Infection prevention and control manual policy and procedure: Contact precautions. https://policy.nshealth.ca/Site_Published/DHA9/document_render.aspx?documentRender.IdType=6&documentRender.GenericField=&documentRender.Id=44363

Nova Scotia Health. (2013c). Infection prevention and control manual policy and procedure: Droplet precautions. https://policy.nshealth.ca/Site_Published/DHA9/document_render.aspx?documentRender.IdType=6&documentRender.GenericField=&documentRender.Id=44048

Nova Scotia Health. (2014a). Perioperative manual policy and procedure: Operating room count. https://policy.nshealth.ca/Site_Published/DHA9/document_render.aspx?documentRender.IdType=6&documentRender.GenericField=&documentRender.Id=48707

Nova Scotia Health. (2014b). Perioperative manual policy and procedure: Incorrect count. https://policy.nshealth.ca/Site_Published/DHA9/document_render.aspx?documentRender.IdType=6&documentRender.GenericField=&documentRender.Id=48699

Nova Scotia Health. (2014c). Administrative manual policy and procedure: Consent to treatment. https://policy.nshealth.ca/Site_Published/DHA9/document_render.aspx?documentRender.IdType=6&documentRender.GenericField=&documentRender.Id=50984

Nova Scotia Health. (2016). Infection prevention and control manual policy and procedure: Management of patients with suspect/clinically diagnosed Creutzfeldt-Jakob Disease (CJD) in the operating room. https://policy.nshealth.ca/Site_Published/NSHA/document_render.aspx?documentRender.IdType=6&documentRender.GenericField=&documentRender.Id=89034

Nova Scotia Health. (2017). Perioperative policy and procedure: Operating room team surgical safety checklist. https://policyy.nshealth.ca/Site_Published/NSHA/document_render.aspx?documentRender.IdType=6&documentRender.GenericField=&documentRender.Id=89694

Nova Scotia Health. (2018). Perioperative policy and procedure: Operating room dress

code. https://policy.nshealth.ca/Site_Published/NSHA/document_render.aspx?documentRender.IdType=6&documentRender.GenericField=&documentRender.Id=89696

Nova Scotia Health. (2021). Guideline: Surgical site infection prevention. https://policy.nshealth.ca/Site_Published/NSHA/document_render.aspx?documentRender.IdType=6&documentRender.GenericField=&documentRender.Id=89702

Nova Scotia College of Nursing. (2017). Standards of Practice for Registered Nurses. Nova Scotia College of Nursing. https://cdn1.nscn.ca/sites/default/files/documents/resources/RN%20Standards%20of%20Practice.pdf

ORNAC. (2023). Patient safety. https://ornac.ca/en/education/patient-safety

Patel, S., Thompson, D., Innocent, S., Narbad, V., Selway, R., & Barkas, K. (2019). Risk factors for surgical site infections in neurosurgery. *The Royal College of Surgeons of England, 101*(3), 220-225. doi: 10.1308/rcsann.2019.0001

Potters, J. W., Klimek, M. (2018). Local anesthetics for brain tumor resection: current perspectives. *Local and Regional Anesthesia, 11,* 1-8. doi: 10.2147/LRA.S135413

Rachel, S., Frenette, C., & Thirion, D. (2017). Reducing surgical site infections in neurosurgery: A multidisciplinary approach. *American Journal of Infection Control*, *45*(6), S110–S110. https://doi.org/10.1016/j.ajic.2017.04.184

Radford, E. J., & Fotis, T. (2018). The lived experiences of operating theatre scrub nurses learning technical scrub skills 'I'm doing this right, aren't I? Am I doing this right?' *Journal of Perioperative Practice, 28*(1), 355-361. Doi.10.1177/1750458918780159

Sankaran, S., Andrews, J. P., Chicas, M., Wachter, R. M., Berger, M. S. (2020). Patient safety movement in neurological surgery: the current state and future directions. *Journal of Neurosurgery, 132*(1), 313-323. https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_proquest_miscellaneous_2301441345

Tonkovic, D., Pavlovic, D. B., Baronica, R., Virag, I., Bublic, M. M., Kovac, N., & Zeljko, D. (2019). Regional anesthesia for neurosurgery. *Acta Clinica Croatica, 58*(1), 48-52. doi: 10.20471/acc.2019.58.s1.07

Unfried, A., (2022). Patient management and nursing protocols in neurosurgery. American Association of Colleges of Nursing. https://study.com/academy/lesson/patient-management-nursing-protocols-in-neurosurgery.html

World Health Organization (WHO). (2023). WHO surgical safety checklist. https://www.who.int/teams/integrated-health-services/patient-safety/research/safe-surgery/tool-and-resources

Yilmaz, E., Tawfik, T., O'Lynnger, T. M., Iwanaga, J., Blecher, R., Abdul-Jabbar, A., Tubbs, S. R., Schmidt, C. K., Oskouian, R. J., & Chapman, J. (2018). Lumbar spine surgery: An anatomical cadaver study and technical note. *Cureus*.

https://www.cureus.com/articles/13056-wound-closure-after-posterior-multi-level-lumbar-spine-surgery-an-anatomical-cadaver-study-and-technical-note#!/

Module Two

Emergency Considerations in Neurosurgery

Module Two

Emergency Considerations in Neurosurgery

Module five will overview considerations for emergency neurosurgical procedures including outlining expectations, nursing roles, emergency supplies, and emergency management. This overview will provide a guideline for potential emergency situations that may be encountered in your neurosurgical perioperative nursing practice.

Nursing roles and expectations during a Level 1 Trauma procedure will be outlined. The information provided in this module will provide a better understanding of the roles and expectations during emergency neurosurgeries. After completing this module, you will feel more confident to practice as a neurosurgical perioperative nurse.

Learning Objectives:

1. Explain the difference between emergent, urgent, and elective neurosurgical procedures.
2. Identify emergent neurosurgical procedures.
3. Understand the difference between traumatic neurosurgical injuries and nontraumatic pathological neurological conditions.
4. Discuss the nursing roles, actions, and expectations during an emergency.
5. Understand how to prepare for an emergency neurosurgical procedure.

Neurosurgery Emergency Procedures

Given the intricacies of the neurological system, neurological trauma such as injury to the brain, spine or nerves conditions can often progress rapidly. Emergency intervention and management is essential to minimize further neurological damage. Most neurological conditions that result in emergency surgery involve diversion of cerebrospinal fluid, control of intracranial pressure, decompression of brain parenchyma and cranial nerves, or control of bleeding (Lee et al., 2020). Typically, most neurosurgical emergencies must be managed surgically within 24 hours to achieve better patient outcomes. If surgery is delayed, it can lead to an increase in the morbidity and mortality rates for the patient (Kulkarni, 2017). Neurosurgical emergencies can also occur intraoperatively as the result of a critical event. These may include aneurysm rupture, uncontrolled bleeding in spinal or cranial procedures, increased intracranial pressure, vasospasm, or seizures during cranial procedures (Society for Neuroscience in Anesthesia and Critical Care, 2018). Perioperative neurosurgical nurses are positioned to provide assessment, planning and evaluation of activities to keep patients safe when responding to emergency events (Merlino, 2019).

Source. From Microsoft Word Stock Images

Acute neurosurgical emergency procedures are often the result of traumatic injuries or the progression of non-traumatic pathological conditions. Neurosurgical emergency procedures may be categorized on a priority basis depending on the pattern of the neurosurgical conditions (Kulkarni, 2017; Society for Neuroscience in Anesthesia and Critical Care, 2018). Figure 2.1 outlines the categorization of neurosurgical emergencies.

Figure 2.1 Categorization of Neurosurgical Emergency Procedures

Traumatic Injuries are injuries that occur as the result of a trauma (Kulkarni, 2017; Society for Neuroscience in Anesthesia and Critical Care, 2018). These may include:

- **Skull fractures** – including fractures to the skull base, linear skull vault, and depressed skull fractures. Note that skull fractures are often indicative of an intracranial hemorrhage.
- **Intracranial injuries** – including subdural or epidural hematomas, subarachnoid hemorrhages, and ruptured aneurysms.

- **Spinal injuries** – including fracture of the cervical, thoracic, or lumbar vertebrae; and spinal cord injuries.
- **Polytrauma injuries** – including unstable neurological patients with multi-system injuries.

Non-traumatic Pathological Conditions are pathological conditions that may require emergent or urgent surgical intervention (Kulkarni, 2017; Society for Neuroscience in Anesthesia and Critical Care, 2018). These conditions include:

- **Cranial conditions** – abscess, empyema, aneurysms, AVMs, pituitary apoplexies, hydrocephalus.
- **Spinal conditions** – spinal epidural abscess or empyema, cauda equina syndrome, cervical myelopathy, spinal epidural hematoma, vertebral tumors, extramedullary spinal tumors.

It is the responsibility of the attending physician or resident delegate to classify the level of the procedure when booking the surgery. The classification is ultimately depending on the clinical assessment of the patient, as conducted by the attending surgeon or resident.

Table 2.1 outlines examples of neurosurgical procedures that may fall into each category of emergent, critical, urgent, and expedited surgical procedures (Nova Scotia Health Authority, 2019). Key terms are defined in the glossary in **Appendix D.**

Table 2.1

Neurosurgery Emergency Procedures

Neurosurgery Emergency Procedures by Level			
Level 1: Emergent	**Level 2: Critical**	**Level 3: Urgent (<48 hours)**	**Level 4: Expedited (<1 week)**
• Acute epidural hematoma • Acute subdural hematoma with midline shift or decrease level of consciousness • Acute intracerebral hematoma or hemorrhage • AVM or cerebral aneurysm • Acute hydrocephalus with altered level of consciousness • Cauda equina syndrome • Cervical dislocations with incomplete spinal cord injury • Decompressive craniotomy • Brain abscess/empyema	• Cauda equina syndrome • Brain tumors with altered level of consciousness • Chronic subdural hematoma • Spinal cord compression • Unstable spinal fractures • Ventriculoperitoneal shunt revision		• Spinal fractures (stable) • Lumbar discs with intractable pain • Myelopathy with acute progression • Wound infections

Classification of Surgical Procedures

All nurses employed by Nova Scotia Health must have Health Care Provider (HCP) Cardiopulmonary Resuscitation (CPR) certification and the skills required to recognize and respond to cardiovascular emergencies (Nova Scotia Health Authority, n.d.). The perioperative neurosurgical nurse should also have a concrete understanding of the classification and leveling of surgical procedures.

Surgical procedures are classified as emergent, urgent, or elective and booked according to the corresponding levels of surgical complexity. Nova Scotia Health Authority has set criterion for determining the level of a procedure. The surgeon will determine which level the surgical procedure should be classified as when booking the case. Table 3 outlines the classification of surgical procedures.

Table 2.2

Classification of Surgical Procedures

Level		Category	Description	Target time to OR
Emergent	**1**	Immediate	Lifesaving or limb/organ saving. Resuscitation with surgical treatment	Immediately, proceed to next available OR.
	2	Critical	Conditions that threaten life, limb, or organ survival AND can wait 4 hours. Relief of distressing symptoms.	Within 4 hours.
Urgent	**3**	Urgent	Non-emergent threats to life, limb, or organ survival in stable patients.	Within 48 hours.
Elective	**4**	Expedited	Elective conditions that may require earlier interventions.	Within days (<1 week).
	5	Elective	Planned procedure.	Scheduled in advance.

Emergency Equipment

Many neurosurgical emergency cases will require the standard neurosurgical equipment as reviewed in **Module Five.** Emergency case carts are used only during emergent procedures and are designed as an access point for all necessary surgical instruments and supplies that will be required for during emergency surgical procedures.

Emergency Case Carts

Located inside the inner core of the perioperative services, just outside of the Charge Nurse office, are emergency case carts for specific surgical procedures. Cart composition was designed an approved by the neurosurgical perioperative team to contain all necessary equipment, instruments, and supplies that would be required for the designated surgical procedure. There is one case cart that is specific to neurosurgery for craniotomy procedures, and a basket of emergency supplies for a carotid enterectomy. Specialty supply case carts have quality improvement implications for patient outcomes in emergency situations (Fahrenkopf & Eichhorn, 2019).

Photo: Neurosurgical Emergency Case Cart

Having all supplies stored on the emergency case cart can significantly reduce the amount of time to treat patients (Fahrenkopf & Eichhorn, 2019). The carts are stored in a central location so that they may be easily accessed to significantly reduce the time to treatment for neurosurgical perioperative patients.

Unidentified Patient in the OR

In the event of a trauma where the patient has sustained neurological injury, a patient may arrive to the hospital and subsequently the operating room, without any identification. If a patient's identity is unknown prior to treatment and there is no family member or reliable source available to correctly verify the patient's identity, the patient must be issued a Uniquely Assigned Name and Medical Record Number (MRN) to provide interim identification until a positive identification is made (Nova Scotia Health Authority, 2022). A computer-generated identification bracelet must be placed on the patient. The charting documentation will be electronically printed from the admitting department and coded with the same assigned name and MRN. Ensure the electronic perioperative chart matches the assigned name and MRN for the patient.

Please review the following NS Health (2022) policy regarding patient identification practices:

Patient Identification – Policy # CL-SR-025

Source. From Microsoft Word Stock Images

Intraoperative Complications

The most common intraoperative complications associated with neurosurgical procedures include hemorrhages or uncontrolled bleeding, intraoperative trauma or unintended structural damage, and cerebrospinal fluid leak (Fulgate, 2015; Himes et al., 2017; Van Lindert et al., 2016).

During any surgical procedure, it is critical that both the scrub and circulating nurse *must remain attentive* to the evolving events of the surgical procedure. Patient safety is enhanced by being attentive to the patient at each moment and maintaining focus during the surgical procedure (Ingvarsdottir & Halldorsdottir, 2018). Neurosurgical perioperative nurses must be aware of the potential complications associated with neurosurgical procedures and the appropriate responses to ensure optimal patient outcomes. The physical and mental requirements of surgical team members may increase as the surgical procedure becomes more complex.

Nontechnical skills are cognitive and social behaviors affecting the performance and clinical competence of perioperative neurosurgical nurses. Nontechnical cognitive skills include situational awareness and quick decision making. Situational awareness can be defined as the perception of elements within the perioperative environment over a specific period, the comprehension of their meaning, and the projection of their status (Yousefiazar et al., 2021).

Nontechnical social skills include leadership, communication, and teamwork. During an emergency procedure, the role of the perioperative neurosurgical nurse requires the effective use of nontechnical skills to anticipate the surgeon's need and respond to them in a timely and efficient manner (Yousefiazar et al., 2021).

Patient Death in the OR

The perioperative death of a patient is a significantly stressful event for any care provider involved. The intraoperative death of an anesthetized patient is considered a more common occurrence, with an estimated prevalence of 1-30:100,000. The majority of which occur during emergency surgical procedures (Attri et al., 2016). Intraoperative death may occur unexpectedly or as the result of an injury or trauma, with as much as 44% of deaths in the operating room occurring as the result of major bleeding myocardial injury and sepsis (Spence et al., 2019).

Preoperative physical assessments, evaluations, and extensive perioperative monitoring of the neurosurgical patient are techniques that have proven to reduce the risk of intraoperative death (Attri et al., 2016). Other factors that may influence the potential of death occurring on the operating table include advanced age, associated comorbidities, and the surgical site. Findings from previous studies have indicated that patients undergoing emergency neurosurgical procedures are at a higher risk than other surgeries (Attri et al., 2016; Spence et al., 2019).

The loss of a patient's life can precipitate enormous personal and professional anxiety and stress, profound grief, and loss of self-confidence for the perioperative team. Repeated trauma exposure can have significant impacts on both the physical and mental health of the staff involved (Kostka et al., 2021; Scott et al., 2022; Taylor et al., 2008). In clinical settings, the term debriefing refers to a group meeting during which clinical events and decision-making processes are reviewed and discussed to improve clinical practices (Scott et al., 2022). Following this situation, a team debriefing is encouraged to help staff process the event and minimize the risk of developing symptoms of traumatic stress, depression, and anxiety. There is evidence to suggest that debriefing with staff

working in clinical settings can reduce posttraumatic distress symptoms following the death of a patient (Scott et al., 2021).

Nursing responsibilities following a patient death in the OR:

- Respectfully provide patient care according to the following NS Health (2015) policy:

  Care of the Patient After Death - Policy # CC 90-040

NS Health offers easily accessible supports and resources. These resources can support nurses through the loss of a patient or traumatic event in the workplace. Click on the link below to explore employee supports and resources.

Employee Supports and Resources

Pause and Think: Reflection Activity 2.1

Source. From Microsoft Word Stock Images.

Think about a time you encountered a stressful situation in a professional setting.

What strategies did you use to manage your personal feelings? Were they effective?

Are there any other approaches you could identify to help work through stressful situations?

Conclusion

This module intended to provide an overview of considerations for emergency neurosurgical procedures to increase awareness of the roles and expectations surrounding emergency and trauma procedures. Surgical cases are booked and classified as emergent, critical, urgent, expedited, or elective according to the clinical assessment performed by the attending surgeon or resident. Emergent neurosurgical procedures may be a result of a trauma, injury, or pathological condition. Neurosurgical perioperative nurses play a key role in the management of emergent neurosurgical procedures. With proper planning, understanding of the predictable neurosurgical procedure, and coordination with the interdisciplinary neurosurgical perioperative team, nurses can ensure that emergency procedures run smoothly and efficiently to achieve optimal patient outcomes.

Case Study 2.1

Emergency Neurosurgical Case

A 67-year-old female was getting groceries when she slipped and fell on ice. It was determined that the patient had hit her head when she fell in the parking lot. Another shopped found her unconscious and called an ambulance. She was then rushed to hospital by ambulance where she regained consciousness.

During her initial assessment, the healthcare team in the emergency room determined that she had lost consciousness for approximately one hour and remained in an altered state of consciousness. Diagnostic imaging in the emergency department confirmed a large right-sided focal subdural hematoma.

The neurosurgical resident and staff surgeon determined she would require emergent surgery. The neurosurgical perioperative team was notified, and the procedure was booked as a Level 1 case.

Questions:

Answer the following questions independently after completing this module. Answers to the questions will be provided in **Appendix C** at the end of the resource manual.

1. What initial interventions should the circulating nurse prioritize at this moment?

2. What initial interventions should the scrub nurse prioritize in this moment?

3. What are the priority instruments required to begin this procedure?

4. What perioperative interventions can the circulating nurse anticipate?

References

Attri, J.P., Makhni, R., Chatrath, V., Bala, N., Kumar, R., & Jain P. Perioperative death: Its implications and management. *Saudi Journal of Anesthesiology, 10*(4), 436-439. doi: 10.4103/1658-354X.177338

Columbus, A. B., Castillo-Angeles, M., Berry, W. R., Haider, A. H., Salim, A., & Havens, J. M. (2018). An evidence-based intraoperative communication tool for emergency general surgery: A pilot study. *Journal of Surgical Research, 228*(1), 281-289. https://doi.org/10.1016/j.jss.2018.03.007

Croke, L. (2021). Implementing emergency manuals to respond to perioperative crises: The official voice of perioperative nursing. *AORN Journal, 114*(3), 4-6. doi:https://doi.org/10.1002/aorn.13508

Fahrenkopf, M. P., & Eichhorn, M. G. (2019). Development of a plastic surgery supply cart: Patient outcomes and quality of care. *International Open Access Journal of the American Society of Plastic Surgeons*, *7*(2). doi: 10.1097/GOX.0000000000002111

Fulgate, J. E. (2015). Complications of neurosurgery. Continuum (Minneapolis, Minn.), 21(5), https://doi.org/10.1212/CON.0000000000000227

Himes, B. T.; Mallory, G. W.; Abcejo, A. S.; Pasternak, J.; Atkinson, J. L. D.; Meyer, F. B.; Marsh, W. R.; Link, M. J.; Clarke, M. J.; Perkins, W.; & Van Gompel, J. J. (2017). Contemporary analysis of the intraoperative and perioperative complications of neurosurgical procedures performed in the sitting position. *Journal of Neurosurgery*, *127*(1), 182–188. https://doi.org/10.3171/2016.5.JNS152328

Ingvarsdottir, E., & Halldorsdottir, S. (2018). Enhancing patient safety in the operating theatre:

from the perspective of experienced operating theatre nurses. *Scandinavian Journal of Caring Sciences*, *32*(2), 951–960. https://doi.org/10.1111/scs.12532

Kostka, A. M., Borodzicz, A., & Krzemińska, S. A. (2021). Feelings and emotions of nurses related to dying and death of patients – A pilot study. *Psychology Research and Behavior Management*. *14*. 705-717 https://doi.org/10.2147/PRBM.S311996

Kulkarni, D. K. (2017). Pattern and categorization of neurosurgical emergencies. Journal of Neuroanaesthesiology and Critical Care, 4(4), S6-S8. https://doi.org/10.4103/2348-0548.199941

Lee, R. P., Kaisorn, C., Huang, J., Tamargo, R. J., Caplan, J. M. (2018). Neurosurgical emergencies. In: Nelson, S., Nyquist, P. (eds) Neurointensive Care Unit. Current Clinical Neurology. Humana, Cham. https://doi.org/10.1007/978-3-030-36548-6_15

Merlino, M. (2019). Creating our future through preparedness. *AORN Journal, 110*(3), 229-231. https://doi.org/10.1002/aorn.12795

Nova Scotia Health. (2015). Policy and procedure: Care of the patient after death. https://policy.nshealth.ca/Site_Published/DHA9/document_render.aspx?documentRender.IdType=6&documentRender.GenericField=&documentRender.Id=64511

Nova Scotia Health. (2019). Operating Room Management - Perioperative Policy and Procedure (Policy # SS-OR-030). https://policy.nshealth.ca/Site_Published/nsha/document_render.aspx?documentRender.IdType=6&documentRender.GenericField=&documentRender.Id=74659

Nova Scotia Health. (2022). Policy and procedure: Patient identification. https://policy.nshealth.ca/Site_Published/NSHA/document_render.aspx?documentRender.IdType=6&documentRender.GenericField=&documentRender.Id=97193

Nova Scotia Health. (n.d.). Mandatory Training and Certifications. http://www.cdha.nshealth.ca/education-learning-8

Scott, Z., O'Curry, S., & Mastroyannopoulou, K. The impact and experience of debriefing for clinical staff following traumatic events in clinical settings: A systematic review. *Journal of Trauma and Stress*. *35*(1):278-287. DOI: 10.1002/jts.22736

Society for Neuroscience in Anesthesiology and Critical Care. (2018). Neuroanesthetic emergencies critical event treatment guidelines. https://www.snacc.org/wp-content/uploads/2019/05/SNACC-Cognitive-Aids-for-Neuroanesthetic-Emergencies.pdf

Spence, J., LeManach, Y., Chan, M. T. V., Wang, C. Y., Sigamani, A., Xavier, D., Pearse, R., Alonso-Coello, P., Garutti, I., Srinathan, S. K., Duceppe, E., Walsh, M., Borges, F. K., Malaga, G., Abraham, V., Faruqui, A., Berwanger, O., Biccard, B. M., Villar, J. C., & Devereaux, P. J. (2019). Association between complications and death within 30 days after noncardiac surgery: *Canadian Medical Association Journal, 191*(30), E830-E837. doi:https://doi.org/10.1503/cmaj.190221

Taylor, D., Hassan, M.A., Luterman, A., & Rodning, C. B. Unexpected intraoperative patient death: The imperatives of family- and surgeon-centered care. *The Archives of Surgery*. *143*(1):87–92. doi:10.1001/archsurg.2007.27

Van Lindert, E. J.; Arts, S.; Blok, L.; Heniks, M.; Tielens, L. K.; Bilsen, M. W.; & Delye, H. (2016). Intraoperative complications in pediatric neurosurgery: review of 1807 cases. *Journal of Neurosurgery. Pediatrics*, *18*(3), 363–371. https://doi.org/10.3171/2016.3.PEDS15679

Yousefiazar, A., Vafaeiardeh, S., Nabavi, A., & Ahmadzadeh, J. (2021). Influence of

perioperative practice on cognitive function of scrub nurses: A cross-sequential study. *The Journal of Continuing Education in Nursing, 52*(12), 565-574. doi:https://doi.org/10.3928/00220124-20211108-08

Module Three

Overview of Neurosurgical Procedures

Module Three

Overview of Neurosurgical Procedures

Many neurosurgical procedures are offered at this healthcare institution, including but not limited to those presented in this module. This module will provide an overview of some of the commonly performed neurosurgical procedures. This will provide you with a foundational understanding of the neurosurgical pathophysiology, rationale for the surgical procedure, and perioperative expectations. The knowledge acquired from this module may be beneficial to the neurosurgical perioperative nurse as they provide emotional support and preoperative education to patients and families.

Learning Objectives:

1. Understand the different types of neurosurgical procedures.
2. Understand the neurosurgical anatomy and pathophysiology and rationale for the surgical procedure.
3. Identify neurosurgical perioperative nursing interventions during neurosurgical procedures.
4. Understand how preoperative circumstances and diagnosis can influence preoperative preparation and the neurosurgical procedure.
5. Identify the principles of patient safety as they pertain to patient positioning.
6. Identify nursing interventions for patient positioning for neurosurgery.

Review of Neurological Anatomy and Physiology

The brain is a complex organ that controls thoughts, memories, emotions, motor and sensory skills, vision, breathing, temperature, and all other regulatory processes of the body.

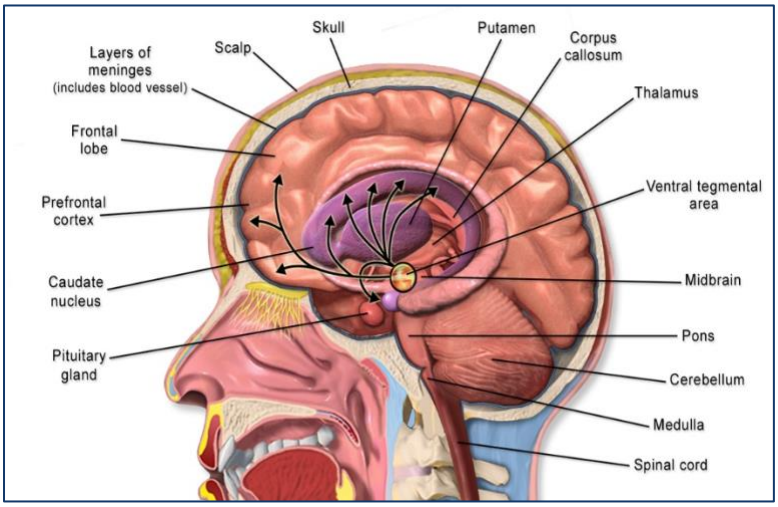


Figure 3.1 Anatomy of the brain. From Wikimedia Commons (2021). https://commons.wikimedia.org/wiki/File:Brain_Anatomy_Striatum.png

Visit the following websites to review anatomy of the brain in further detail:

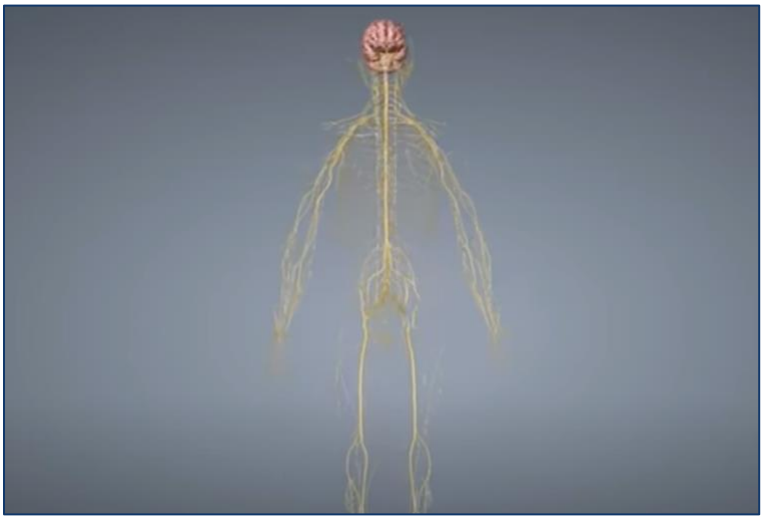
- **Brain anatomy and how the brain works (**Johns Hopkins Medicine, 2023).
- **Anatomy of the brain (**Mayfield Brain & Spine, 2023).

Read the following article to review anatomy of the brain in further detail:

- **Anatomy, Central Nervous System** (Thau et al., 2022).

Together the brain and spinal cord form the central nervous system. Click on the link below to watch a video explaining the anatomy of the central nervous system.

https://www.youtube.com/watch?v=44B0ms3XPKU



Source. From “The Nervous System” by CTE Skills.com, https://www.youtube.com/watch?v=44B0ms3XPKU

Visit the following website to review neurological physiology in greater detail:

- **Canadian Cancer Society** (Canadian Cancer Society, 2020).
- **Elsevier Nervous System Anatomy and Physiology** (Elsevier, 2023).

POSITIONING CONSIDERATIONS FOR NEUROSURGICAL PROCEDURES

All neurosurgical procedures require careful positioning consideration to reduce patient safety risks. Intraoperative positioning injuries can be devastating to the patient and the neurosurgical team. Injuries may be short term, such as neuropathy that may resolve spontaneously, or long term, such as pressure injuries that can lead to the development of a pressure ulcer (Nursing Management, 2006).

Please visit the following websites to review surgical positioning as required to review positioning for surgical procedures.

Positioning Patients (BC Campus, n. d.).

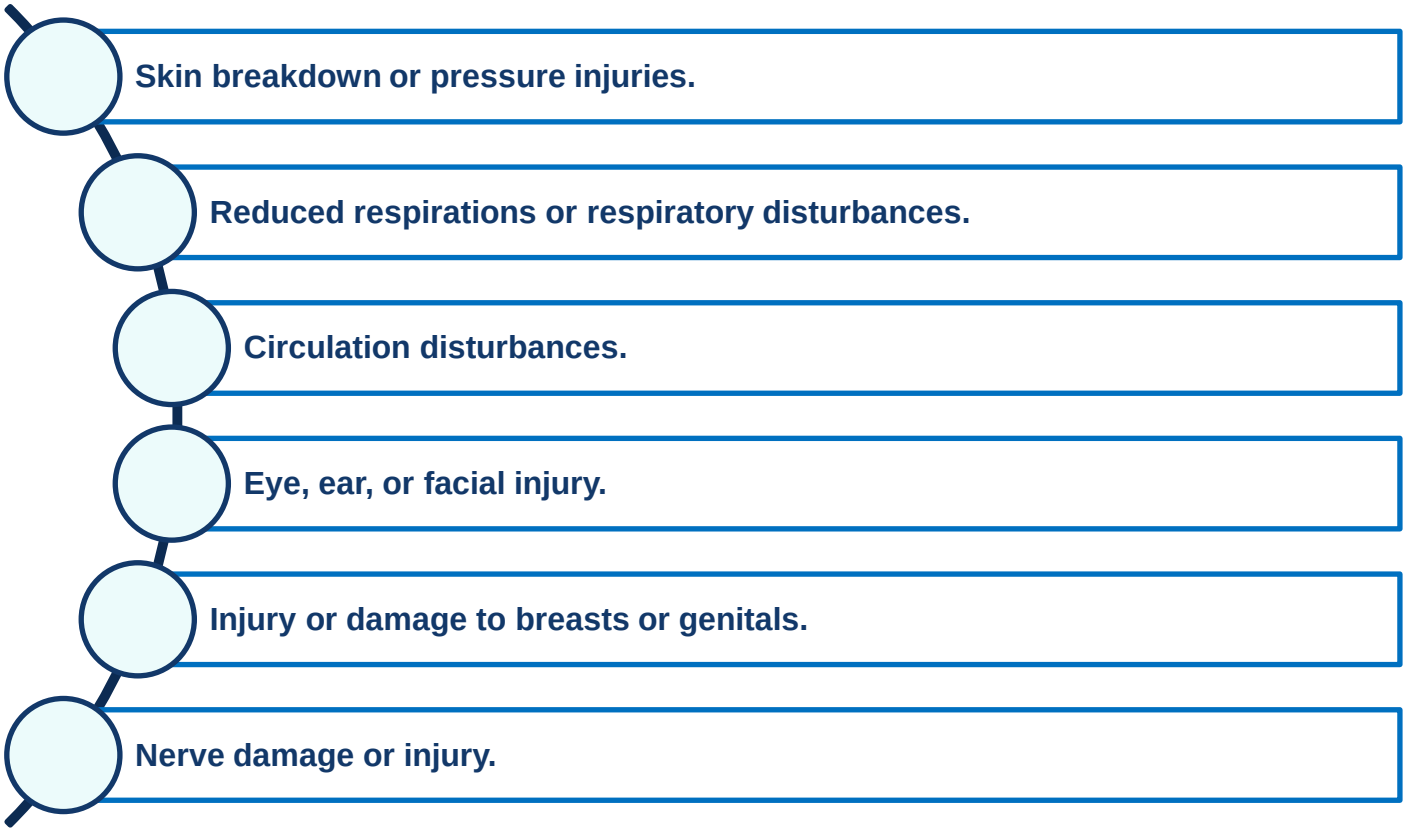
Patient positioning for surgical procedures (Winnipeg Regional Health Authority, 2019).

The video below provides a review of surgical positioning techniques and safety considerations. Click on the link below to watch the video. **https://www.youtube.com/watch?v=SQRpKAB2fGA**

Source. From “Patient positioning” by Incision, https://www.youtube.com/watch?v=SQRpKAB2fG

The anesthetized patient may be susceptible to skin breakdown and pressure injuries due to the length and intricacies of neurosurgical procedures. Pressure and nerve injuries may also occur because of improper positioning or insufficient use of offloading positioning devices (Rozet & Vavilala, 2007). Figure 3.2 below outlines potential complications of neurosurgical positioning.

Figure 3.2 Potential Complications of Neurosurgical Positioning



Following the anesthetic induction phase, the surgeon, or surgical resident delegate, will lead positioning to ensure that the patient is in an ideal position to facilitate the surgical procedure and obtain optimal exposure. For cranial neurosurgical procedures, the head may rest on a gel cushion or is secured to the OR bed using a clamp device – called the **Mayfield head clamp** - to ensure the head does not move during the procedure. Cranial neurosurgical procedures may be performed in the supine, lateral, prone, or sitting position depending on the surgical approach.

Evidence-informed recommendations for neurosurgical patient positioning include careful consideration of the perioperative neurosurgical team, padding, length of surgical procedure, and increased vigilance to reduce the risk of positioning injuries (Kwee et al., 2015).

Nursing interventions for reducing the risk of pressure and skin injuries in neurosurgical patients

- **Conduct a preoperative skin assessment to observe pressure points before the surgical procedure.**
- **Identify areas to protect with extra padding such as foam, gel pads, or pillows intraoperatively (Arthur et al., 2018; Kwee et al., 2015).**
- **Place and support all extremities in a neutral position, if possible, to avoid any peripheral nerve injuries (Kwee et al., 2015; Madden et al., 2016).**
- **Prior to the procedure, ensure the proper function and bed attachment of the Mayfield clamp. Improper application of the clamp may result in slipping which can impact the surgical procedure (Arthur et el., 2018; Rozet & Vavilala, 2007).**

Neurosurgical Specific Positioning Considerations for Prone Position

Prone positioning may increase the risk of bleeding in patients undergoing spinal surgery procedures, as it can increase abdominal venous pressure. The anesthesia team will monitor the patient's vitals and airway pressures to maintain respiratory function. If the Mayfield clamp is used for prone positioning, ensure that the patient's nose and chin are not touching on the head holder or mattress. A padded foam mask may also be used to support the face and head. Always be mindful that the patient's eyes are free from pressure during prone positioning, to reduce the risk of eye injury. To protect the brachial plexus, use a piece of foam or soft padding under the axilla and have both arms flexed with an angle less than 90 degrees if placed on an arm board (Madden et al., 2016; Rozet & Vavilala, 2007).

Neurosurgical Specific Positioning Considerations for Lateral Position

Align the head, neck, and body when the patient is positioned in the lateral position. Arms should be supported with the arm boards, pillows, and adequate padding to prevent injuries. Lower extremities should be positioned with the upper leg extended and the lower leg flexed, with adequate padding to prevent pressure injuries. Adhesive tape or safety straps may be used to secure the patient (Arthur et al., 2018; Rozet & Vavilala, 2007).

Neurosurgical Procedures

Module Two will build upon the foundational overview of perioperative neurosurgical nursing presented in the first module. This module will provide an overview of some of the more common neurosurgical procedures. This information serves as a resource to provide trustworthy information that is evidence based on a wide range of neurosurgical conditions, diseases, and surgical treatments. This module will explore concepts relating to the understanding surgical procedures, patient care needs, and positioning related to neurosurgical surgeries.

Source. From Microsoft Word Stock Images

- Arteriovenous malformation (AVM) repair
- Brain tumor management
- Management of cerebral aneurysms and subarachnoid hemorrhage
- Carotid endarterectomy
- Craniotomy for microvascular decompression
- Deep brain stimulation

- Epilepsy related surgical procedures
- Transsphenoidal surgical approaches
- Spinal surgical approaches
- Ventriculoperitoneal shunt procedures
- Ventriculoscopy

ARTERIOVENOUS MALFORMATION (AVM) REPAIR

An AVM is a tangle of abnormal and poorly formed blood vessels (arteries and veins). They have a higher rate of bleeding than normal vessels. AVMs can occur anywhere in the body. Brain AVMs are of special concern because of the damage they cause when they bleed (Government of Alberta, 2022; Mayo Foundation, 2023). They are very rare and occur in less than 1% of the general population (Mayo Foundation, 2023). AVMs that occur in the coverings of the brain are called dural AVMs.

Embolization

Under general anesthesia a small catheter (plastic tube) is advanced from the groin, into the brain vessels and then into the AVM. A liquid, non-reactive glue is injected into the vessels which form the AVM to block the AVM off. There is a small risk to this procedure and the chances of completely curing the AVM using this technique depend on the size of the AVM. It is frequently combined with the other treatments such as radiation or surgery (Mayo Foundation, 2023).

Surgery

This is the standard method for treating AVMs. The AVM is surgically removed in an operating room under general anesthesia. Since AVMs do not grow back, the cure is immediate and permanent if the AVM is removed completely. The risks of surgery are high for AVMs that are in deeper areas of the brain with very important functions. Following the repair of the AVM, the surgeon may request to have

dye injected to view the vessels under fluoroscopy to ensure the repair was successful (Government of Alberta, 2022; Mayo Foundation, 2023).

Intraoperative Nursing Interventions for AVM Repair

Be prepared for an increased risk of bleeding. With any craniotomy procedure, there is a risk of hemorrhage (Mayo Foundation, 2023). The neurosurgical perioperative nurses need to be aware of the risk and how to manage this situation appropriately. This will be discussed in depth in a later module about emergency situations. During the initial stages of the procedure, the surgeon will select two clips to use in case the vessel ruptures, ensure these clips are properly loaded on the clip applier and ready to use in the event of bleeding. Also ensure that suction is connected and in good working order.

Patients may be positioned supine or lateral for this type of procedure, depending on the location of the AVM (Government of Alberta, 2022). It is important to use appropriate positioning devices such as double mattresses, shoulder supports, safety straps, and other offloading supplies or devices to prevent skin breakdown, pressure injuries, and other patient safety concerns.

BRAIN TUMOR MANAGEMENT

A brain tumor is a mass resulting from increased multiplication or uncontrolled growth of cells. They may also be referred to as lesions, neoplasms, or growths (American Association of Neurosurgical Surgeons, 2023). Brain tumors may be benign or malignant. A benign tumor is one that is made up of cells which are slow growing. A malignant tumor is comprised of cells which are fast growing and are often referred to as “aggressive”, often infiltrating normal brain structures and can be difficult to remove (American Association of Neurosurgical Surgeons, 2023).

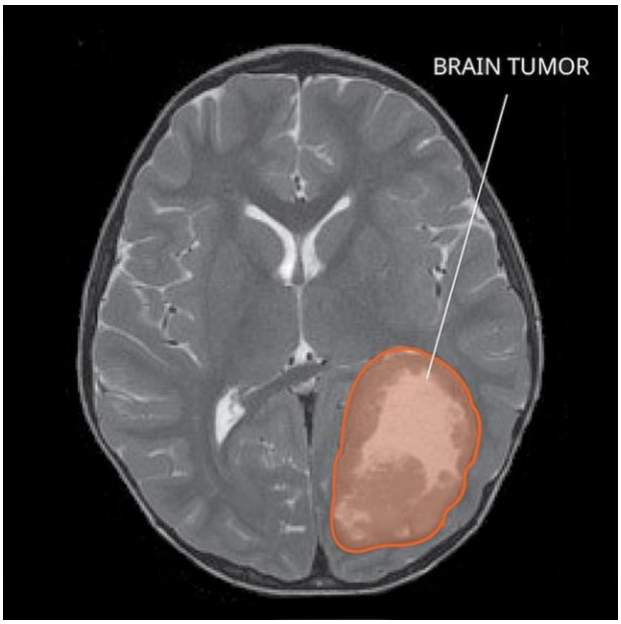


Figure 3.3. Magnetic resonance image of primitive neuroectodermal tumor of the central nervous system. From Wikimedia (2018). https://upload.wikimedia.org/wikipedia/commons/thumb/6/62/MRI_of_PNET.jpg/640px-MRI_of_PNET.jpg

A primary brain tumor is a tumor that has arisen within the brain tissue itself and can be either malignant or benign. A secondary brain tumor is one that has arisen elsewhere in the body and has spread to the brain. These tumors are also referred to as Metastatic tumors and can travel from other organs such as the breast, lung, kidney, skin, etc. A secondary brain is always malignant, as it has spread from somewhere else in the body (American Association of Neurosurgical Surgeons, 2023).

Surgical treatment options:

Craniotomy

This procedure involves the surgical opening of the skull and removal of a bone flap to provide access to the intracranial contents for the resection of the tumor (University of California, 2023). The bone flap may be reinserted at the end of the surgical procedure but may be preserved for replacement later. The duration and extent of the craniotomy procedure varies according to the location of the tumor.

Stereotactic Biopsy

During this procedure a small hole is made in the skull bone to insert a biopsy needle. The collected tissue specimen may be sent for permanent pathology or frozen section processing for an immediate diagnosis (University of California, 2023).

Intraoperative Nursing Interventions for Brain Tumor Procedures

The perioperative neurosurgical nurse must be aware of how to prepare the cranial stabilization frame. **Cranial stabilization equipment** will be explored in further detail in a subsequent module.

Patients may be positioned in the lateral, prone, or supine position for this type of procedure, depending on the location of the brain tumor. It is important to use appropriate positioning devices such as double mattresses, shoulder supports, safety straps, and other offloading supplies or devices to prevent skin breakdown, pressure injuries, and other patient safety concerns.

Special Considerations for Managing Intraoperative Intracranial Hemorrhage

With any craniotomy procedure, there is a risk of an intraoperative intracranial hemorrhage. The neurosurgical perioperative nurses need to be aware of the risk and how to manage this situation appropriately. Intracranial hemorrhage can have a rapid onset and high degree of harm (Su et al., 2022).

- Early recognition and identification of hemorrhage location intraoperatively is key to improve the rescue level of critical patients and achieving positive patient outcomes
- Intervention measures are urgent.
- The perioperative team will collaborate to maintain circulating blood volume, preventing cardiac arrest, and hemorrhagic shock.
- The neurosurgical circulating nurse should anticipate the ordering of blood products.
- The neurosurgical scrub nurse should remain attentive to the needs of the surgical team.

The success of brain resuscitation in patients with severe intraoperative intracranial hemorrhage is the key to successful management, increased survival rate, decreasing adverse events, and reduced mortality (Su et al., 2022).

CEREBRAL ANEURYSM/SUBARACHNOID HEMORRHAGE

Aneurysms are a secular outpouching of a cerebral artery and are classified by shape – berry (saccular shaped with a neck or stem) and fusiform (outpouching without a stem) (D'Souza, 2015; Johns Hopkins Medicine, 2023). Size classification is small (up to 15mm), large (15-20mm), giant (25-50mm) and super giant (>50mm). Rupture of a cerebral aneurysm usually results in a subarachnoid hemorrhage (SAH) (bleeding into the subarachnoid space) (D'Souza, 2015).

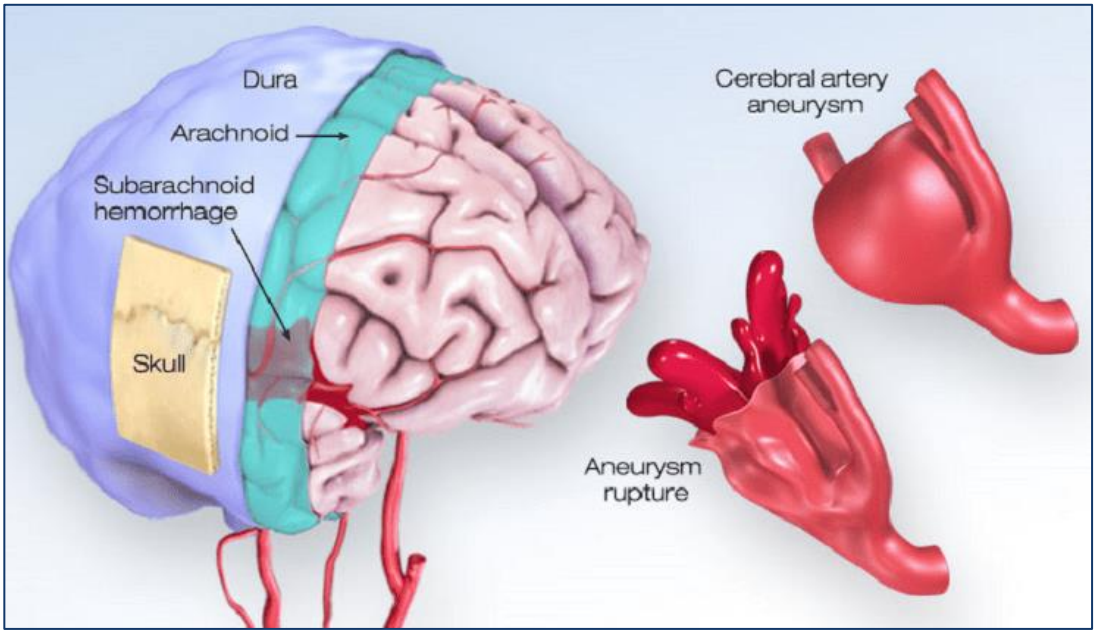


Figure 3.4 Cerebral aneurysm. From American Stroke Association (2023). https://www.stroke.org/en/about-stroke/types-of-stroke/hemorrhagic-strokes-bleeds/what-you-should-know-about-cerebral-aneurysms

Pathophysiology:

Both the location and type of aneurysm are important considerations in describing the risk of rupture (D'Souza, 2015). At the time of aneurysm rupture, blood under high pressure is forced into the subarachnoid space at the base of the brain (Circle of Willis) or less often into the parenchymal tissue, ventricles, or subdural space. Tissue pressure surrounding the aneurysm stops the bleeding,

and fibrin, platelets and fluid form a plug that seals off the site of bleeding. The resulting clot can occlude the area or interfere with cerebrospinal fluid (CSF) absorption. The blood released irritates the brain tissue, causing an inflammatory response resulting in cerebral edema. At the time of rupture, SAH occurs; raising intracranial pressure (ICP) and lowers mean cerebral perfusion pressure (CPP).

Cerebral Aneurysm Clipping

The surgical approach for this procedure is dependent on the location and characteristics of the aneurysm. An aneurysm with a stem or neck is usually managed with a surgical clip in the neck (D'Souza, 2015). Depending on the size and location of the aneurysm, more than one clip may be necessary to obliterate it. For aneurysms that are difficult to reach, the surgeon may have to modify a clip to accommodate the vessels and structures at the aneurysmal site. Before permanent clips are positioned, temporary clips are often applied medial or distal to the aneurysm and to ensure proper placement of the permanent clip. The temporary clips are removed after the aneurysmal neck has been securely clipped. Intraoperative angiography, cerebral blood flow (CBF) studies or intraoperative doppler studies may be conducted during surgery to verify the adequacy of circulation and the security of the clip (D'Souza, 2015).

Coil Embolization Treatment

This surgical procedure is typically done outside of the operating room, in interventional radiology. The procedure involves the insertion of a micro catheter that is navigated through a small puncture in the femoral artery up into the cerebral artery which harbors the aneurysm which is to be treated (D'Souza, 2015). The procedure is usually performed under general anesthesia. In rare circumstances, the coiling is unsuccessful, and it becomes an emergent situation which involves the

patient being rushed to the operating room for a clipping procedure (D'Souza, 2015; Johns Hopkins Medicine, 2023).

Intraoperative Nursing Interventions Cerebral Aneurysm and Subarachnoid Hemorrhage

The surgeon will select two clips, as shown in the photo below, to use in case the vessel ruptures, ensure these clips are properly loaded on the clip applier and ready to use in the event of bleeding (D'Souza, 2015; Johns Hopkins Medicine, 2023). It is critical that the scrub nurse have these clips always loaded and easily accessible (D'Souza, 2015). It is also critical to ensure that suction is connected and in good working order if significant bleeding occurs.

Figure 3.5 Image of neurosurgical Yasargil aneurysm clip and clip applier instrument. From Braun Medical (n.d.). https://www.bbraun.com/en/products-and-solutions/therapies/neurosurgery/yasargil-aneurysm-clips.html

Patients may be positioned in the lateral, prone, or supine position for this type of procedure, depending on the location of the aneurysm (D'Souza, 2015). It is important to use appropriate positioning devices such as double mattresses, shoulder supports, safety straps, and other offloading supplies or devices to prevent skin breakdown, pressure injuries, and other patient

CAROTID ENDARTERECTOMY

Carotid endarterectomy is the most frequently performed non cardiac vascular procedure. A buildup of plaque in the carotid artery can lead to atherosclerosis and stenosis of the artery.

The endarterectomy procedure is used to restore the cerebral blood flow in the carotid arteries which has been obstructed by atherosclerotic plaques (DaCosta et al., 2022).

Procedure: The surgeon will make an oblique cervical incision alongside the medial aspect of the sternocleidomastoid, to allow dissection of the carotid bifurcation (DaCosta et al., 2022). Following heparinization, the arteries of the bifurcation are cross clamped and an arteriotomy is performed. The plaque is dissected, and then primary closure performed, or a patch reconstruction is applied (DaCosta et al., 2022).

Intraoperative Nursing Interventions for Carotid Endarterectomy Procedures

Upon completion of the surgical procedure the scrub nurse should maintain the sterile setup until the patient is extubated and awake following the procedure (DaCosta et al.,2022). Since the surgical procedure occurs so close in proximity to the airway, this is an additional precaution to ensure there will be no airway issues following extubation.

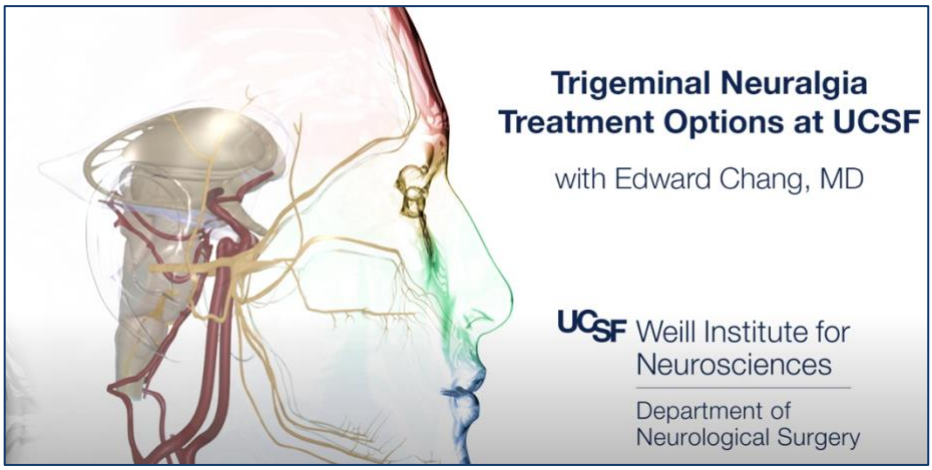
Patients are commonly positioned in the supine position for this type of procedure. The arm of the surgical side will be tucked at the patient's side, while the other arm will be left on an arm board. It is important to use appropriate positioning devices such as double mattresses, shoulder supports, safety straps, and other offloading supplies or devices to prevent skin breakdown, pressure injuries, and other patient safety concerns.

CRANIOTOMY FOR MICROVASULAR DECOMPRESSION

Trigeminal Neuralgia is characterized by intense, paroxysmal pain in one or more branches of cranial nerve V (Mayfield Brain & Spine, 2023a; Xiaochaun et al., 2013). The pain is abrupt in onset, unilateral and lasts for a few seconds. No motor or sensory deficits are found with trigeminal neuralgia. Symptoms may last several weeks or months with spontaneous remission. Length of remission is variable and often becomes shorter with aging (Mayfield Brain & Spine, 2023a).

Click on the link below to watch a video overviewing surgical treatment for trigeminal neuralgia.

https://www.youtube.com/watch?v=mXHbBPX6lm8&t=1s



Source. From “Trigeminal Neuralgia Treatment Options at UCSF” by UCFS Neurosurgery, https://www.youtube.com/watch?v=mXHbBPX6lm8&t=1s

Intraoperative Nursing Interventions for Microvascular Decompression Procedures

With any craniotomy procedure, there is a risk of hemorrhage (Mayfield Brain & Spine, 2023a). The neurosurgical perioperative nurses need to be aware of the risk and how to manage this situation appropriately. This will be discussed in depth in a later module about emergency situations.

Patients may be positioned in the lateral or supine position for this type of procedure, depending on the approach (Broggi et al., 2012). It is important to use appropriate positioning devices such as double mattresses, shoulder supports, safety straps, and other offloading supplies or devices to prevent skin breakdown, pressure injuries, and other patient safety concerns.

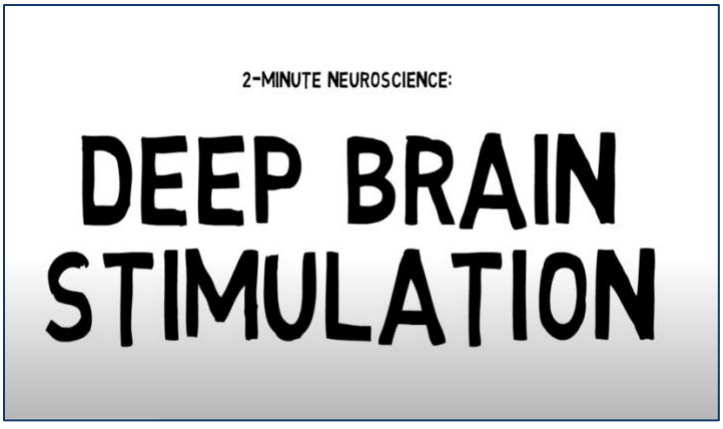
DEEP BRAIN STIMULATION (DBS)

This procedure involves a neurotransmitter being implanted to deliver electrical stimulation to a targeted area (American Association of Neurological Surgeons, 2023a; Lozano et al., 2019). Most DBS procedures are performed for movement disorders such as Parkinson's disease or to help control disabling neurological symptoms such as essential tremors (Lozano et al., 2019.

During the initial part of the procedure where the electrode is implanted the patient remains awake, under local anesthesia. The electrode is implanted into the targeted area of the brain through a small hole. After the electrode is implanted, the surgeon will conduct a test of the electrode and communicate with the patient to determine if the electrode is in the correct location. A series of questions may be asked of the patient to test how the stimulator is working. (American Association of Neurological Surgeons, 2023a; Lozano et al., 2019).

Click on the link to watch a video showing a brief overview of deep brain stimulation.

https://www.youtube.com/watch?v=tgKIbdTWq7o



Source. From “2-Minute Neuroscience: Deep Brain Stimulation” by Neuroscientifically Challenged, https://www.youtube.com/watch?v=tgKIbdTWq7o

Intraoperative Nursing Interventions for DBS procedures

With any surgical procedure where a device is being implanted, it is essential to take extra precaution to ensure aseptic technique with the device. The surgeon will commonly change their gloves before handling the device that is to be implanted. The neurosurgical scrub nurse should be careful not to drop or contaminate the implant.

Patients are commonly positioned in the supine position for this surgical procedure. Intraoperative verbal communication with the patient during the procedure is quintessential, therefore the patient may require pharmacological agents to remain comfortable while still conscious for the procedure (Chakrabarti et al., 2014). Since the patient is awake for the initial part of this procedure, it is important to ensure they are comfortable. They may require additional

EPILEPSY RELATED SURGICAL PROCEDURES

Common neurosurgical procedures for epilepsy include the placement of subdural electrodes for seizure monitoring or stereoencephalography (SEEG) and craniotomy for lobectomy or resection.

Subdural Electrodes

This procedure is commonly done to monitor patients for seizures (Kovac et al., 2017; Valentin et al., 2017). After the patient is asleep, a stereotactic frame is applied. Some surgeons prefer to do a CT scan to confirm the placement of the frame, while others will complete a spin with the O-Arm. Using the preoperative CT scan, the surgeon will map out the location for the electrodes to be placed. The coordinates will be input into the Stealth Station (Kovac et al., 2017). This piece of equipment will be described in detail in another module, but for this procedure it will enable the surgeon to place the electrodes in an accurate location for seizure monitoring.

The procedure is minimally invasive, a small trauma drill is used to make pinpoint holes in the skull. Each electrode is inserted individually through the small hole and secured with a post that is anchored in the skull. After each electrode is placed, the frame is recalibrated to the coordinates for the next electrode.

Craniotomy for Epilepsy

In cases where all other treatments to manage epileptic seizures have been unsuccessful, and the patient has undergone subdural electrode testing to determine the exact location of the seizures, the patient may be a candidate for a lobe resection to remove the portion of the brain that is responsible

for their seizures (Kaiboriboon et al., 2015). Craniotomy for this reason is comparable to all other craniotomy procedures for resection or tumors, treatment of hemorrhage, or management of brain injuries.

Interoperative Nursing Interventions for Epilepsy Related Procedures

During a craniotomy for lobectomy procedure, there is a risk of hemorrhage (Kaiboriboon et al., 2015). The neurosurgical perioperative nurses need to be aware of the risk and how to manage this situation appropriately. This will be discussed in depth in a later module about emergency situations.

Patients may be positioned in the supine, prone, or lateral position depending on the surgical approach and location of the resection. It is important to use appropriate positioning devices such as arm boards, pillows, safety straps, and other offloading supplies or devices to prevent skin breakdown, pressure injuries, and other patient safety issues. Specific positioning considerations may be reviewed **here**.

TRANSSPHENOIDAL SURGICAL APPROACHES

Transsphenoidal surgical approaches involve endoscopic surgery through the nose. This type of surgical approach is commonly used in neurosurgery for the resection of pituitary tumors (Garcia-Garrigos, 2015; Solari et al., 2014). Pituitary tumors can put tremendous pressure on the optic chiasm (resulting in visual disturbances) and cranial nerves (resulting in facial and visual symptoms).

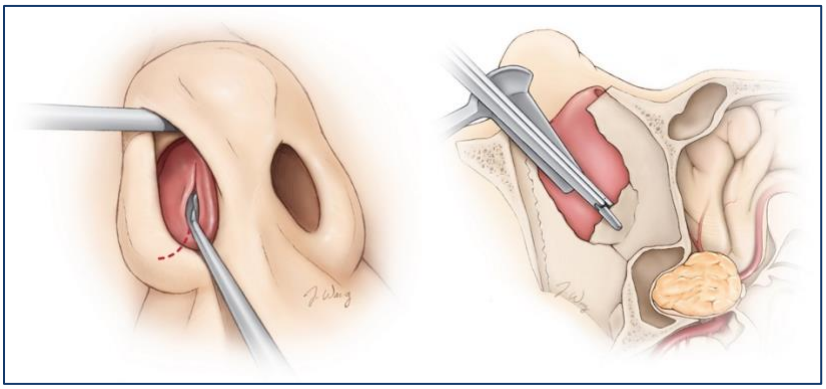
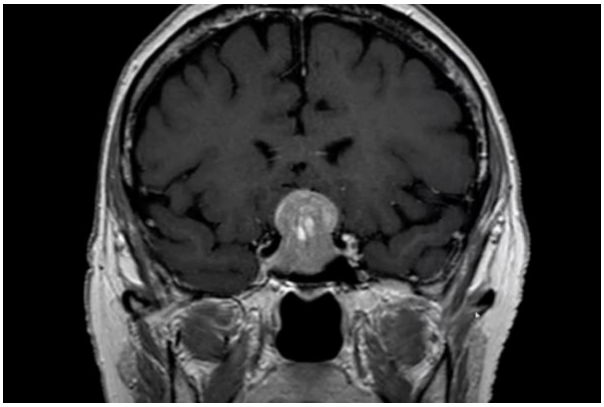


Figure 3.6 Image of transsphenoidal surgical approach. From American Cancer Society (2023). https://www.cancer.org/cancer/pituitary-tumors/treating/surgery.html

Click the link below to watch a video depicting an endoscopic transsphenoidal pituitary approach.

https://www.youtube.com/watch?v=Gu6yOp51Df0



Source. From “Endoscopic Transsphenoidal Approach for Pituitary Tumor Resection” by Mayo Clinic, https://www.youtube.com/watch?v=Gu6yOp51Df0

Interoperative Nursing Interventions for Transsphenoidal Surgeries

Patients are commonly positioned in the supine position for this surgical procedure. The drapes are placed to allow for access to the surgical site for the nose and thigh incase a fat graft is required (Garcia-Garrigos, 2015; Solari et al., 2014). It is important to use appropriate positioning devices such as arm boards, safety straps, pillows, and other offloading supplies or devices to prevent skin breakdown, pressure injuries, and other patient safety concerns. Specific positioning considerations may be reviewed here.

SPINAL SURGERY: DISCECTOMY/LAMINECTOMY/SPINAL FUSION

Patients with massive central herniations that compress the cauda equina or myelopathies resulting in sensory loss, paresis and loss of sphincter control; compression, resulting in quadriceps weakness or foot drop; severs and unrelenting pain or slow to resolve or recurrent sciatica that interferes with normal lifestyle and employment may require more immediate treatment (Reisener et al., 2020). Patients with radicular pain because of herniated discs and nerve root irritation are unlikely to lose neural function but may suffer pain and disability related to this pain.

Types of spinal surgical procedures:

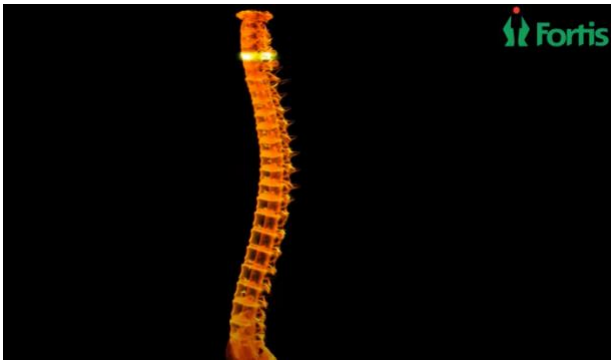
Discectomy removal of the nuclear disc material of an intervertebral disc, done with or without a laminectomy. In the lumbar region, a posterior approach is always used; the entire disc and cartilaginous plate are usually removed to prevent recurrent disc protrusion. In the cervical region, if a posterior discectomy is performed, only the extruded disc fragments are removed (Reisener et al., 2020). If an anterior discectomy is done, the total disc is usually removed. Some physicians now perform this procedure via a minimally invasive technique which usually allows the patient to go home the same day.

Laminectomy is the removal of the lamina, a part of the posterior arch of the vertebrae. This of often done with patients with patients who have spinal stenosis (Austevoll & Ebbs, 2022).

Spinal fusion Specific vertebrae are immobilized by insertion of a wedge-shaped piece of bone or bone chips between the vertebrae (Reisener et al., 2020). The bone graft is usually obtained from the iliac crest (autograft) or the bone bank (allograft). The purpose of the fusion is to immobilize and thus stabilize the vertebral column that is weakened because of degenerative disease or multilevel laminectomy (Austevoll & Ebbs, 2022). With spinal fusion, the patient must become accustomed to a permanent area of stiffness. Spinal fusion procedures may also involve the implantation of screws and rods (Reisener et al., 2020). There are different instrumentation sets that are used depending on the spinal level being fused. These instrument sets will be explored in greater detail in a later module.

Click the link below to watch a video overviewing spinal surgical procedure.

https://www.youtube.com/watch?v=7BTC43FogZc



Source. From “Lumbar Discectomy and Fusion” by Fortis Healthcare, https://www.youtube.com/watch?v=7BTC43FogZc

Interoperative Nursing Interventions for Spinal Surgery

Patients may be positioned in the supine or prone positions for these surgical procedures depending on the approach (Austevoll & Ebbs, 2022; Reisener et al., 2020). It is important to use appropriate positioning devices such as arm boards, safety straps, pillows, and other offloading supplies or devices to prevent skin breakdown, pressure injuries, and other patient safety concerns. **Positioning considerations** were explored in greater detail earlier in this module.

VENTRICULOPERITONEAL (VP) SHUNT PROCEDURES

A VP shunt is a device that is used to treat hydrocephalus; a condition in which excess CSF accumulates around the brain. The device is surgically implanted to provide drainage of excessive CSP to decrease and prevent increased ICP (Fowler, 2022).

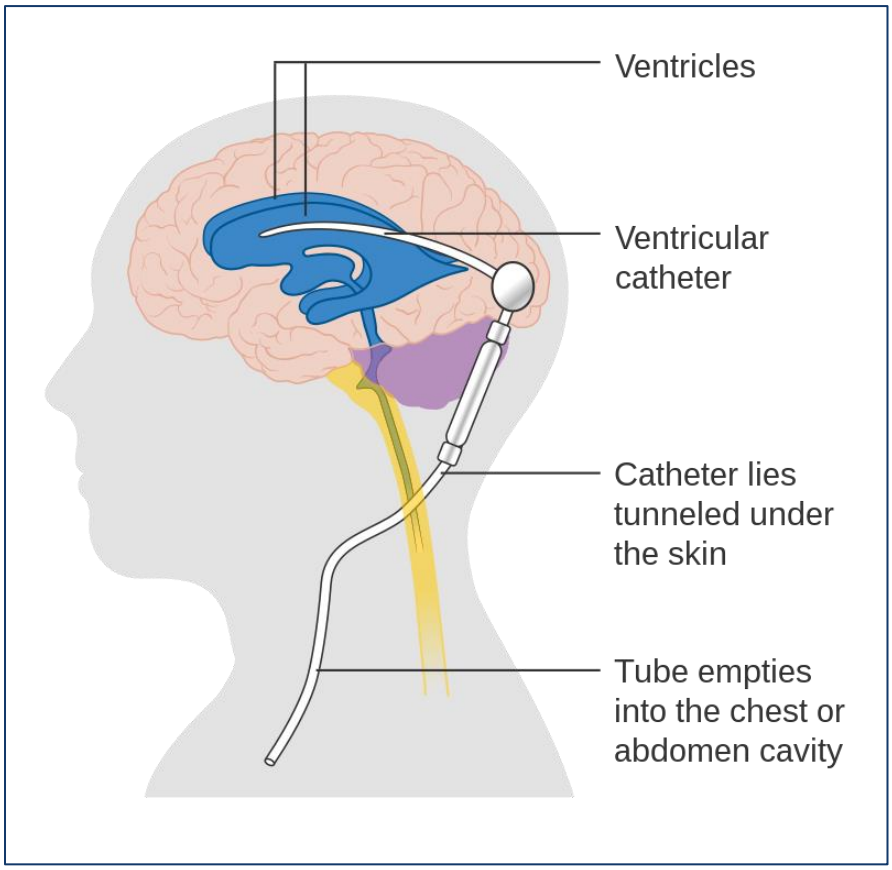


Figure 3.7 Cerebral or ventriculoperitoneal shunt. From Wikipedia (n.d.). https://en.wikipedia.org/wiki/Cerebral_shunt

During a shunt insertion procedure, a primary catheter is implanted into the lateral ventricle through a bur hole. An incision is made under the scalp and the catheter is pulled through so that the reservoir rests on the mastoid bone. CSF flows from the catheter to the reservoir, in which CSF collects. The one-way valve on the reservoir prevents CSF reflux. The terminal catheter is pulled under the skin to the terminal point which is usually in the peritoneum but can be in the subarachnoid space or vena cava. The terminal catheter is secured into position. The catheter is usually permanently left in place unless it becomes dislodged, plugged, or infected. In these situations, the shunt is removed and replaced (Fowler et al., 2022). Patients may also require VP shunt revision surgeries for complications that can occur.

Interoperative Nursing Interventions for VP Shunt Procedures

VP Shunts are known to have a higher rates of post operative infection, compared to other neurosurgical procedures (Fowler et al., 2022; Katiyar et al., 2021). Therefore, the scrub nurse must take extreme caution when handling the shunt implant devices. Some surgeons prefer that the shunt be soaked in an antibiotic solution prior to implantation, please refer to the surgeon's preference list that is generated when the case is booked.

Patients are commonly positioned in the supine position for this surgical procedure (Yamada et al., 2022). It is important to use appropriate positioning devices such as arm boards, safety straps, and other offloading supplies or devices to prevent skin breakdown, pressure injuries, and other patient safety concerns.

VENTRICULOSTOMY PROCEDURES

Endoscopic third ventriculostomy is a minimally invasive procedure is commonly performed to alleviate obstructive hydrocephalus by diverting the flow of CSF or removing the obstruction. If successful, this procedure can eliminate the need for a shunt (Farag et al., 2022).

During the procedure, a tiny burr hole is made in the skull. This allows for the endoscopic camera and instruments to be inserted into the ventricle to allow the surgeon to view the fluid and the obstruction. Since the most common site of blockage is the narrow pathway between the third and fourth ventricle, endoscopic instruments are used to remove the obstruction or create a hole in the membrane at the bottom of the ventricle to allow for CSF to flow around the obstruction and into the rest of the brain for reabsorption (Farag et al., 2022).

Interoperative Nursing Interventions for Ventriculostomy Procedures

Patients are commonly positioned in the supine position for this surgical procedure. It is important to use appropriate positioning devices such as arm boards, safety straps, and other offloading supplies or devices to prevent skin breakdown, pressure injuries, and other patient safety concerns.

Pause and Think: Reflection Activity 3.1

Source. From Microsoft Word Stock Images.

Think of the different neurosurgical procedures you have observed to date.

What factors were considered by the neurosurgical perioperative team when positioning the patient for a neurosurgical procedure?

What were the key nursing responsibilities you noticed during positioning?

What are some of the support devices that you have observed being used in practice?

Conclusion

Many neurosurgical procedures are offered at this healthcare institution, including but not limited to those presented in this module. This module provides an overview of some of the commonly performed neurosurgical procedures. Neurosurgical perioperative nurses play a critical role in the care of the neurosurgical patient. This module intended to provide a foundational understanding of the types of neurosurgical procedures. In the following modules you will learn more about the intricate details of the surgical procedures, potential complications and emergencies, and the coordination of care with the interdisciplinary perioperative team.

References

American Association of Neurological Surgeons. (2023). Brain tumors: Types of brain tumors. Neurosurgical conditions and treatments. https://www.aans.org/en/Patients/Neurosurgical-Conditions-and-Treatments/Brain-Tumors

American Association of Neurological Surgeons. (2023a). Deep brain stimulation. Neurosurgical conditions and treatments. https://www.aans.org/en/Patients/Neurosurgical-Conditions-and-Treatments/Deep-Brain-Stimulation

American Cancer Society. (2023). Surgery for pituitary tumors. https://www.cancer.org/cancer/pituitary-tumors/treating/surgery.html

American Stroke Association. (2023). What you should know about cerebral aneurysms. https://www.stroke.org/en/about-stroke/types-of-stroke/hemorrhagic-strokes-bleeds/what-you-should-know-about-cerebral-aneurysms

Arthur, A., Foley, K., & Hamm, C. W. (2018). Perioperative considerations and positioning for neurosurgical procedures. Memphis, TN: Springer. file:///C:/Users/lenihaal/Downloads/978-3-319-72679-3.pdf

Austevoll, I. M., & Ebbs, E. (2022). Fusion is not a safeguard to prevent revision surgery in lumbar spinal stenosis. Journal of the American Medical Association ,*5*(7). doi:10.1001/jamanetworkopen.2022.23812

BC Campus. (n.d.). Positioning patients in bed. Clinical procedures for safer patient care.

https://pressbooks.bccampus.ca/clinicalproceduresforsaferpatientcaretrubscn/chapter/3-9-positioning-patients-in-bed/

Braun Medical. (n.d.). Yasargil aneurysm clip system. https://www.bbraun.com/en/products/b0/yasargil-aneurysmclipsystem.html

Broggi, G., Broggi, M., Ferroli, P., & Franzini, A. (2012). Surgical technique for trigeminal microvascular decompression. *Acta Neurochirurgica,154*(6), 1089-1095. DOI: 10.1007/s00701-012-1324-2

Canadian Cancer Society. (2020). Anatomy and physiology of the nervous system. https://cancer.ca/en/cancer-information/cancer-types/neuroblastoma/what-is-neuroblastoma/the-nervous-system

Chakrabarti, R., Ghazanwy, M., & Tewari, A.. Anesthetic challenges for deep brain stimulation: a systematic approach. *North American Journal of Medical Sciences, 6*(8):359-69. doi: 10.4103/1947-2714.139281

CTE Skills.com. (2017, May 7). The nervous system in 9 minutes. [Video]. YouTube. https://www.youtube.com/watch?v=44B0ms3XPKU

D'Souza, S. (2015). Aneurysmal subarachnoid hemorrhage. *Journal of Neurosurgical Anesthesiology*. *27*(3), 222-240. doi: 10.1097/ANA.0000000000000130

DaCosta, M., Tadi, P., & Surowiec, S. M. (2022). Carotid Endarterectomy. National Library of Medicine. https://www.ncbi.nlm.nih.gov/books/NBK470582/

Elsevier. (2023). Nervous system anatomy and physiology.

https:/ /www.osmosis.org/learn/Nervous_system_anatomy_and_physiology

Farag, A. A., Asiri, F. A., Khoudir, M. A., Ismaeel, M., Hamouda, W., Alaghory, I. M., & Moshref, R. H. (2022). Endoscopic third ventriculostomy complications: Avoidance and management in a stepwise manner. *Egyptian Journal of Neurosurgery, 37*(1). https://doi.org/10.1186/s41984-022-00166-w

Fortis Healthcare. (2013, April 30). Lumbar discectomy and fusion (Spine Surgery). [Video]. YouTube. https://www.youtube.com/watch?v=7BTC43FogZc

Fowler, J. B., De Jesus, O., Mesfin, F. B. (2022). Ventriculoperitoneal shunt. https://www.ncbi.nlm.nih.gov/books/NBK459351/

Garcia-Garrigos, E., Arenas-Jimenez, J. J., Monjas-Canovas, I., Abarca-Olivas, J., Cortes-Vela, J. J., Hoz-Rosa, J., & Guirau-Rubio, M. D. (2015). Transsphenoidal approach in endoscopic endonasal surgery for skull base lesions: What radiologists and surgeons need to know. *Radio Graphics, 35*(4). https://doi.org/10.1148/rg.2015140105

Government of Alberta. (2022). Brain arteriovenous malformation repair: Before your surgery. My health Alberta. https://myhealth.alberta.ca/health/AfterCareInformation/pages/conditions.aspx?hwid=zc2758&

Incision. (2021, October 5). Patient positioning: How to safely position a patient in different positions on the surgical table. [Video]. YouTube. https://www.youtube.com/watch?v=SQRpKAB2fGA

Johns Hopkins Medicine. (2023). Brain anatomy and how the brain works. Health. https://www.hopkinsmedicine.org/health/conditions-and-diseases/anatomy-of-

the-brain

Johns Hopkins Medicine. (2023). Subarachnoid hemorrhage. Health. https://www.hopkinsmedicine.org/health/conditions-and-diseases/subarachnoid-hemorrhage

Kariboon, K., Malkhachroum, A. M., Zrik, A., Daif, A., Schiltz, N. M., Labiner, D. M., & Lhatoo, S. D. (2015). Epilepsy surgery in the United States: Analysis of data from the National Association of Epilepsy Centers. *Epilepsy Research, 116*(1), 105-109. https://doi.org/10.1016/j.eplepsyres.2015.07.007

Katiyar, V., Sharma, R., Tandon, V., Kanwalijeet, G., Narwal, P., Chandra, P. S., Suri, A., & Kale, S. S. (2021). Comparison of programmable and non-programmable shunts for normal pressure hydrocephalus: A meta-analysis and trail sequential analysis. *Neurosurgery India, 69*(8), 399-405. https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_scopus_primary_636770630

Kovac, S., Vakharia, V. N., Scott, C., & Diehl, B. (2017). Invasive epilepsy surgery evaluation. *Seizure, 44*(1), 125-136. https://doi.org/10.1016/j.seizure.2016.10.016

Kwee, M. M., Ho, Y. H., & Rozen, W.M. (2015). The prone position during surgery and its complications: A systematic review and evidence-based guidelines. *International Surgery, 100*(2), 292-303. doi: 10.9738/INTSURG-D-13-00256

Lozano, A. M., Lipsman, N., Bergman, H., Brown, P., Chabardes, S., Chang, J. W., Matthews, K.,

McIntyre, C. C., Schlapefer, T. E., Schulder, M., Temel, Y., Volkmann, J., & Krauss, J. K. (2019). Deep brain stimulation: Current challenges and future directions. *Nature Reviews Neurology, 15*(3), 148-160. doi: 10.1038/s41582-018-0128-2

Madden, L. K., Tham, P. K., & Shahalie, K. (2016). Management of patients undergoing neurosurgical procedures. https://nursekey.com/management-of-patients-undergoing-neurosurgical-procedures/

Mayfield Brain & Spine. (2023a). Microvascular decompression (MVD). https://mayfieldclinic.com/pe-mvd.htm

Mayfield Brain & Spine. (2023). Overview. Anatomy of the brain. https://mayfieldclinic.com/pe-anatbrain.htm

Mayo Foundation. (2023). Brain AVM (arteriovenous malformation). Diseases and conditions. https://www.mayoclinic.org/diseases-conditions/brain-avm/diagnosis-treatment/drc-20350265

Neuroscientifically Challenged. (2020, September 24). 2-minute neuroscience: Deep brain stimulation. [Video]. YouTube. https://www.youtube.com/watch?v=tgKIbdTWq7o

Nursing Management. (2006). Preventing intraoperative positioning injuries. *Nursing Management*, *37*(7), 9–10. https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_proquest_miscellaneous_764291962

Reisener, M. J., Pumberger, M., Shue, J., Girardi, F. P., & Hughes, A. P. Trends in

lumbar spinal fusion-a literature review. *Journal of Spine Surgery, 6*(4), 752-761. doi: 10.21037/jss-20-492

Rozet, I., & Vavilala, M. S. (2007). Risks and benefits of patient positioning during neurosurgical care. *Anesthesiology Clinics Journal, 25*(3), 631-53. doi: 10.1016/j.anclin.2007.05.009

Solari, D., Cavallo, L. M., & Cappabianca, P. (2014). Surgical approach to pituitary tumors. *Handbook of Clinical Neurology, 124*(1), 291-301. DOI: 10.1016/B978-0-444-59602-4.00019-8

Su, Z., Guo, W., Luo, Y., Wang, Y., & Du, Y. Observation on the nursing effect of the whole process in patients with severe intracranial hemorrhage. *Computational and Mathematical Methods in Medicine.* doi: 10.1155/2022/1546019

Thau, L., Reddy, V., Singh, P. (2022). Anatomy, Central nervous system. National Library of Medicine. http://www.ncbi.nlm.nih.gov/books/NBK542179/

UCSF Neurosurgery. (2018, December 5). Treatment for trigeminal neuralgia: UCSF Neurosurgery. [Video]. https://www.youtube.com/watch?v=mXHbBPX6lm8&t=1s

University of California. (2023). Brain tumor treatments. Conditions and treatments. https://www.ucsfhealth.org/conditions/brain-tumor/treatment

Valentin, A., Hernando-Quintana, N., Moles-Herbera, J., Jimenez, D., Mourente, S.,

Malik, I., Selway, R. P., & Alarcon, G. (2017). Depth versus subdural temporal electrodes revisited: Impact on surgical outcome after resective surgery for epilepsy. *Clinical Neurophysiology, 128*(3), 418-423. https://doi.org/10.1016/j.clinph.2016.12.018

Wikimedia Commons. (2018). Magnetic resonance imaging of primitive neuroectodermal tumor of the central nervous system. https://upload.wikimedia.org/wikipedia/commons/thumb/6/62/MRI_of_PNET.jpg/640px-MRI_of_PNET.jpg

Wikimedia Commons. (2021). Brain anatomy striatum. https://commons.wikimedia.org/wiki/File:Brain_Anatomy_Striatum.png

Wikipedia. (n.d.). Cerebral shunt. https://en.wikipedia.org/wiki/Cerebral_shunt

Winnipeg Regional Health Authority (2019). Patient positioning for surgical procedures. Evidence informed practice tools. https://professionals.wrha.mb.ca/old/extranet/eipt/files/EIPT-009-001.pdf

Xiaochuan, H., Xiaoyun, S., Junsheng, L., Ning, G., Wenshi, G., & Zhenxing, Z. (2013). Percutaneous micro balloon compression for trigeminal neuralgia using Dyna-CT. *Interventional Neuroradiology, 19*(3), 359-364. doi: 10.1177/159101991301900314

Yamada, S., Ishikawa, M., Nakajima, M., & Nozaki, K. (2022). Reconsidering ventriculoperitoneal shunt surgery and postoperative shunt valve pressure adjustment: Our approaches learned from past challenges and failures. *Frontiers in Neurology, 12*(1). https://doi.org/10.3389/fneur.2021.798488

Module Four

Common Instruments Used in Neurosurgery

Module Four

Common Instruments Used in Neurosurgery

This module will outline the instruments and supplies that are commonly used in neurosurgical procedures. The module will also provide instructions for how to assemble and care for delicate instruments, implant instrument sets, repair instructions, and general trouble shooting techniques. Hyperlinks to the sterile processing intranet system will be used to provide a visual representation of the instruments and supplies, along with a description of what procedures they may be required for, and where they are commonly stored. This module is designed to build upon basic perioperative instrument setups, as you learned in the NS Health Perioperative Nursing Program, to amend any gaps in competencies for neurosurgical perioperative nurses. This module will increase your understanding of neurosurgical instruments by providing an overview of the specific instrumentation and supplies used in neurosurgical procedures.

Learning Objectives:

1. Identify which instrument sets are commonly used for cranial or spinal neurosurgical procedures.
2. Understand how to assemble and care for delicate neurosurgical instruments.
3. Identify commonly used neurosurgical implant instrumentation sets.

Basic Neurosurgical Instruments

Basic neurosurgical instruments include any surgical instrument that is commonly used in cranial or spinal procedures. These instruments may be stored in sterilization container systems called Genesis pans, wrapped in sterile wrapping, or other storage containers. Perioperative neurosurgical nurses are expected to have the ability to recognize and recall surgical instruments (Clarke et al., 2021).

Source. From Microsoft Word Stock Images

The major neurosurgical instruments are divided into three instrument pans:

Neuro Basic A – This instrument set is commonly used for any neurosurgical procedure and contains standard surgical instrument such as forceps, Penfield dissectors, clamps, pituitary rongeurs, scissors, needle drivers, curettes, suctions, and more.

An itemized content list of this instrument pan can be viewed at the following link:

SET: NEURO BASIC A

Neuro Basic B – This instrument set is commonly used in combination with the Neuro Basic B set for any *back* or spinal neurosurgical procedure and contains spinal instruments such as curettes, retractors, Kerrison's, cobb elevators, dollar dissectors, bone rongeurs and more.

An itemized content list of this instrument pan can be viewed at the following link:

SET: NEURO BASIC B

Neuro Basic C – This instrument set is commonly used in combination with the Neuro Basic A set for any *cranial* neurosurgical procedure and includes cranial instruments such as the Hudson brace, brain retractors, osteotomes, curettes, fine scissors, clip appliers, and more.

An itemized content list of this instrument pan can be viewed at the following link:

SET: NEURO BASIC C

Other common instruments used for both cranial and spinal surgeries include:

Neurosurgical Micro-instruments

Neurosurgery requires delicate surgical technique to preserve and protect the function of nearby structures. Micro instruments are extremely thin and fine tip instruments that allow for increased precision and accuracy in surgical procedures.

The micro instruments set includes bayonet fine tip forceps, micro scissors with curved tips, micro scissors with straight tips, fine nerve hook, and fine dissectors (Aylmore et al., 2022).

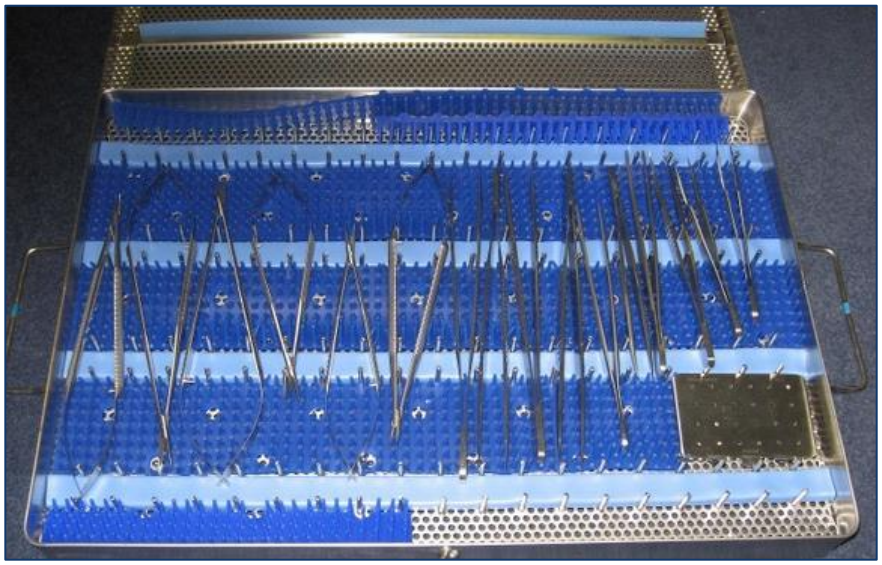


Figure 4.1. Neurosurgical Micro Instrument Set. By Whittemore Enterprises Medical Equipment Center (2018). http://www.wemed1.com/neuro-micro-instrument-set

Micro instruments are extremely delicate and require proper care and maintenance. Instruments should be wiped with saline during the procedure to remove any debris. When the procedure is complete, the items should be placed in their designated storage container for sterile processing (Aylmore et al., 2022).

Rhoton Micro Dissectors

These are specialized micro dissectors that are commonly used to manipulate tissue and provide an atraumatic approach to sever cranial or spinal structures including vessels, abnormal parenchyma, tumors, and soft tissues. The set provides a range of profiles including disc-shaped tips, spatula shaped tips, angled tips, and sharp-edged tips.

Figure 4.2 Photo of rhoton micro dissectors.

Fukushima Suction Cannulas

These suction cannulas provide malleable adaption of suction using the tear drop shaped suction interrupter. This allows the surgeon to adapt the control of the suction to the anatomical conditions. The suction cannula is made of malleable material, allowing the surgeon to bend and manipulate the canula to accommodate the anatomical conditions. The suction cannulas come in three lengths (small, medium, and long) and three diameters (5-French, 7-French, and 9-French).

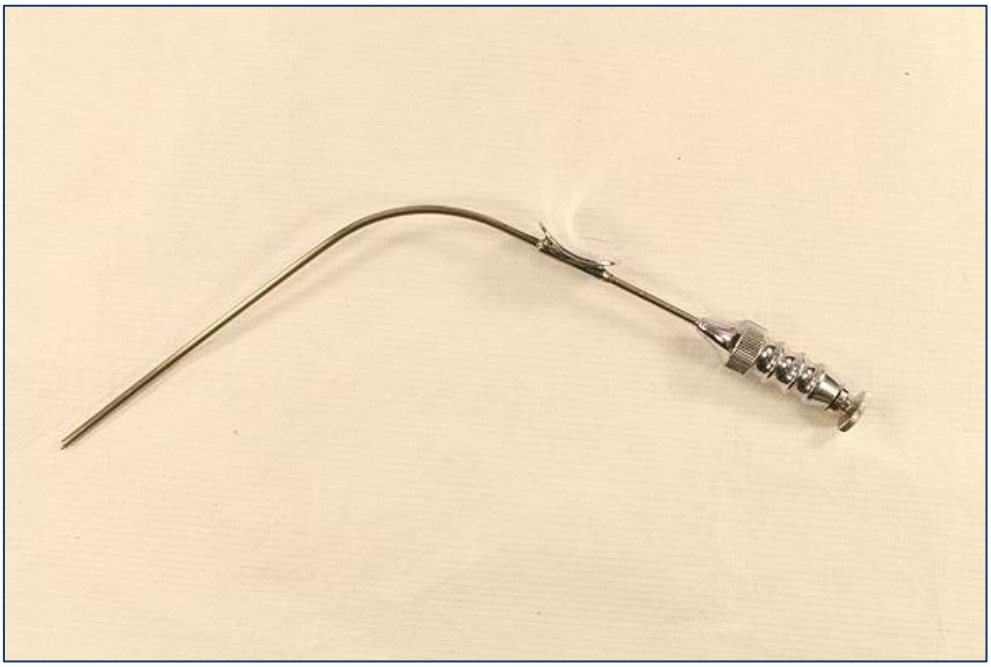
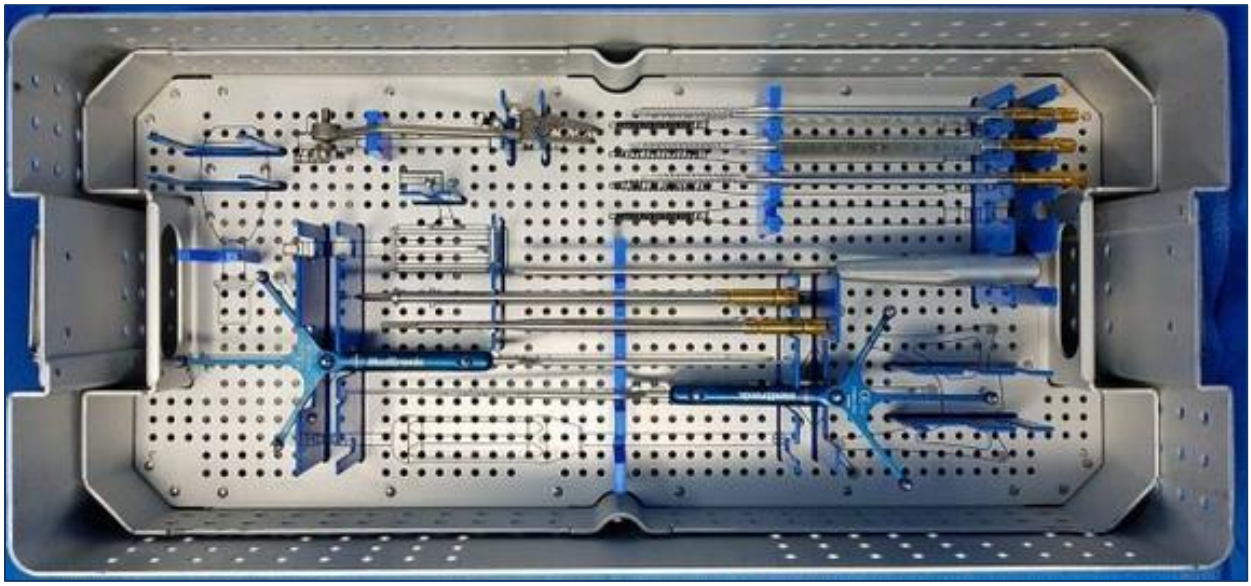


Figure 4.2. Fukushima suction canula. By Wikimedia Commons (n.d.). https://commons.wikimedia.org/wiki/File:Aiguille_de_stomatologie_02.JPG

Navigation Instruments

Navigation instruments are used in combination with surgical navigation technology to allow surgeons to precisely track instrument positions during the surgical procedure. Instruments are tracked using infrared tracking (Medtronic, 2023a). The navigation instrument sets require the use of disposable

marking spheres that are reflective. Spheres are placed on the posts of the surgical navigation instruments prior to the start of the procedure then removed and disposed of following the surgical procedure. The spheres must be kept clean and dry throughout the procedure to ensure the surgical navigation technology is able to detect the surgical instrument (Medtronic, 2023a).

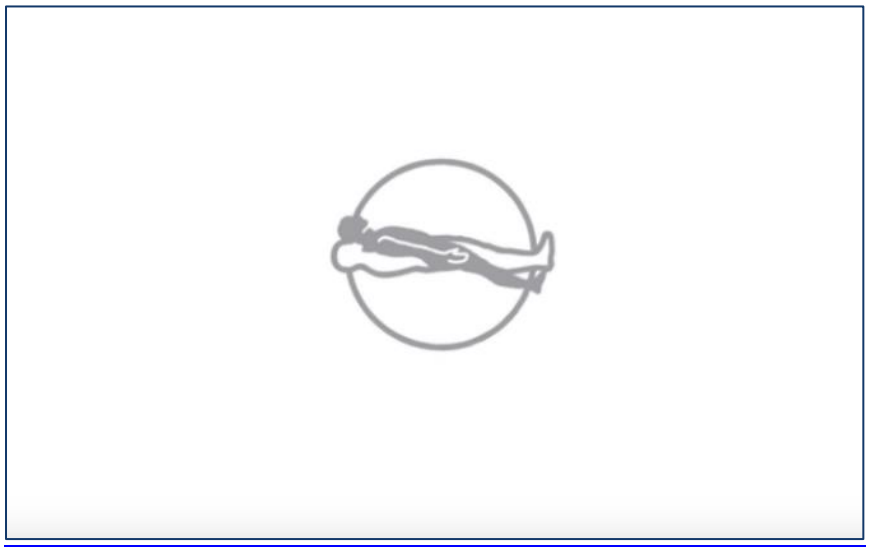


\Figure 4.3. Neurosurgical cranial navigation instruments. By Medtronic (2023). https://www.medtronic.com/us-en/healthcare-professionals/products/neurological/surgical-navigation-systems/stealthstation/cranial-neurosurgery-navigation.html

Two navigation instrument sets are commonly used in neurosurgery:

- Cranial navigation instruments
- Spinal navigation instruments

Click on the following link to watch a video of the surgical navigation system used for the placement of a VP shunt: **https://www.youtube.com/watch?v=y9_QVuE-vnU**



Source. From “Demonstration of Shunt Placement Using StealthStation EM Navigation” by Medtronic Neurosurgery, https://www.youtube.com/watch?v=y9_QVuE-vnU

Specialized Instruments for Cranial Neurosurgical Procedures

Cranial neurosurgical instruments are often intricate and delicate. One of the most intricate instruments for cranial neurosurgery is the Leksell Stereotactic System. This system uses stereotactic techniques to explore the intricate structures that are involved in neurosurgical treatments.

Source. From Microsoft Word Stock Images

Leksell Stereotactic System

The Leksell Stereotactic System is commonly used for minimally invasive, functional cranial neurosurgical procedures. The system can be used for both therapeutic or diagnostic procedures and supports a large range of applications (Elekta Health Management, 2023). The Leksell Stereotactic System provides versatility and accuracy for cranial biopsies, epilepsy monitoring procedures, and deep brain stimulation procedures. The system uses a three-dimensional (3D) coordinate system combined with a preoperative image such as computed tomography (CT) scanning or magnetic resonance imaging (MRI), to precisely locate targets deep within the brain.

Components of the system include:

- The Leksell Multipurpose Stereotactic Arc
- The Leksell Coordinate Frame

- **Figure 4.5**. Leksell frame and arc. From Elekta Health Management (2023). https://healthmanagement.org/products/view/stereotactic-frame-leksell-stereotactic-system-r-elekta

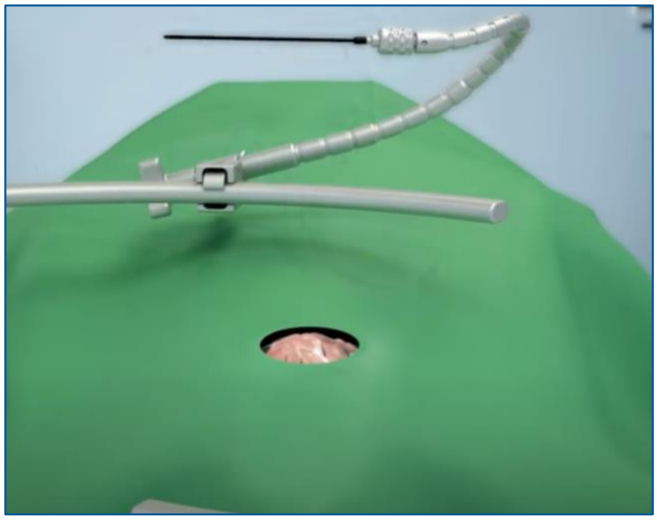
At the beginning of the procedure, the frame is attached to the patient's head using local anesthetic to numb the scale. An indicator box may be attached to the headframe to allow for diagnostic imaging to confirm the positioning of the frame. The frame provides superior imagine as well as high platform rigidity to ensure the utmost accuracy is maintained during the surgical procedure.

Together, the arc and frame utilize x, y, and z cartesian coordinates to stereotactically determine any point in 3D space (Washington University School of Medicine, 2023; Elekta Health Management, 2023). This allows for full access to the intracranial areas by encompassing a surgical target within the 3D space using a center-of-arc principle and therefore, provides limitless entry points and trajectories.

Greenberg Retractor

The Greenberg retractor system is indicated for self-retaining retraction, support of the surgeon's hands, and support of surgical instruments in cranial neurosurgery. The system consists of primary, secondary, floating secondary clamps, and short couplers to provide a modular approach to retraction (Symmetry Surgical, 2020). All Greenberg components should be disassembled from one another prior to cleaning.

Click on the link below to watch a video demonstrating the application of the Greenberg retractor system. **https://www.youtube.com/watch?v=kIHrC5Amc4U**



Source. Doro Luna Brain Retractor System. From: PMI Doro Luna. https://www.youtube.com/watch?v=kIHrC5Amc4U

Specialized Instruments for Spinal Neurosurgical Procedures

Implantation instruments are required for **spinal fusions**. Spinal fusion limits the movement at the surgical site and is commonly used to reshape, stabilize, or strengthen the spine. Fusions of the cervical spine may be performed using an anterior or posterior approach, while fusions of the thoracic and lumbar spine are more commonly performed using a posterior approach. Implant instrumentation sets that are commonly used in neurosurgical spinal procedures include the **CD Horizon™ Solera™ Spinal System** and the **Infinity System**.

CD Horizon™ Solera™ Spinal System

The CD Horizon™ Solera™ Spinal System facilitates flexibility across patient types and allows the surgeon to select the best system for treating multiple spinal pathologies in the thoracic and lumbar spine (Medtronic, 2014). This system is intended for posterior fixation for the following indications: degenerative disc disease, spondylolisthesis, spinal tumor or trauma, spinal stenosis, curvatures, pseudarthrosis, and failed previous spinal fusion.

The system offers two sizes of implants:

- CD Horizon™ Solera™ 4.75 Spinal System
- CD Horizon™ Solera™ Solera 5.5/6.0 Spinal System

Figure 4.4. CD Horizon™ Solera™ spine instrument set. By Medtronic (2014). https://www.orthoracle.com/content/uploads/2019/11/ST.Solera-Spine.pdf

Components of the system: The Solera Spinal System consists of rods, hooks, and screws for implantation. The system also includes the surgical instruments required to implant the system. Multiple rod diameters and screw sizes allow the surgeon to select the appropriate size for the anatomical conditions. The system is also compatible with various enabling technologies that are complimentary to the therapeutic treatment, including: the surgical navigation system and the powered drill equipment (Medtronic, 2023).

Infinity System

The Medtronic Infinity occipitocervical upper thoracic spinal system is a complete system including instruments and implants designed to simplify cervical and thoracic spinal surgical procedures.

The system intends to provide immobilization and stabilization of spinal segments as an adjunct to fusion for acute and chronic instabilities of the craniometrical junction, cervical spine, and the upper thoracic spine (Medtronic, 2023b). This system may be indicated for traumatic spinal fractures or

dislocations, failed previous fusions, spinal tumors involving the cervical spine, degenerative disease including radiculopathies and myelopathies of the neck.

Components of the system: Multiple screwdriver options, taps, rod reducers, rod benders, multi-axial screws, full spectrum rods, refined navigated instruments for optional use with the surgical navigation equipment. This system is also compatible with the powered drill equipment.

Please visit the following website for more information on this spinal implant system and instrumentation set**. Medtronic Healthcare Professionals – Infinity OCT System Overview** (Medtronic, 2023b).

Pause and Think: Reflection Activity 4.1

Source. From Microsoft Word Stock Images.

Reflect on the neurosurgical procedures you have observed to date.

What have you noticed about how the perioperative neurosurgical team handles the surgical instruments before, during, and after the procedure?

Conclusion

This module provided an overview of the instrument sets that are commonly used in neurosurgical procedures. Unlike other surgical instruments, neurosurgical instruments are extremely fine and delicate. Prolonging the life of neurosurgical instruments requires care and attention from perioperative neurosurgical nurses. Neurosurgical instruments should only be used for their intended purposes and always handled with caution and care. The perioperative neurosurgical nurse plays a key role in the maintenance of neurosurgical instruments. Identifying when instruments are damaged or dull is essential to patient safety. Following the surgical procedure, the perioperative neurosurgical scrub nurse is ultimately responsible for the removal of blades and sharps, disassembling surgical instruments, and placing them on the case cart for decontamination and sterile processing.

References

Aylmore, H., Dimitrakakis, E., Carmichael, J., Khan, D. Z., Stoyanov, D., Dorward, N. L., & Hani, J. M. (2022). Specialized surgical instruments for endoscopic and endoscope-assisted neurosurgery: A systematic review of safety, efficacy, and usability. *Cancers, 14*(12). https://doi.org/10.3390/cancers14122931

Clarke, D. B., Gaililee, A. I., Kureshi, N., Hong, M., Fenerty, L., & D'Arcy, R. C. N. (2021). Knowledge transfer and retention of simulation-based learning for neurosurgical instruments: a randomised trial of perioperative nurses. *BMJ Simulation & Technology Enhanced Learning*, *7*(3), 146–153. https://doi.org/doi:10.1136/bmjstel-2019-000576

Elekta Health Management. (2023). Leksell Stereotactic System Elekta. https://healthmanagement.org/products/view/stereotactic-frame-leksell-stereotactic-system-r-elekta

Medtronic (2014). CD Horizon Solera Spinal System: Surgical Technique. https://www.orthoracle.com/content/uploads/2019/11/ST.Solera-Spine.pdf

Medtronic. (2023). Midas Rex. Healthcare professionals. https://www.medtronic.com/ca-en/healthcare-professionals/products/neurological/powered-surgical-instruments/midas-rex-mr7-high-speed-pneumatic-drills.html

Medtronic. (2023a). Neurosurgery navigation. https://www.medtronic.com/ca-en/healthcare-professionals/products/neurological/surgical-navigation-systems/stealthstation/cranial-neurosurgery-navigation.html

Medtronic. (2023b). Healthcare professionals: Infinity OCT System. https://www.medtronic.com/us-en/healthcare-professionals/products/spinal-orthopaedic/posterior-occipitocervical-upper-thoracic-reconstruction-systems/infinity-oct.html

Medtronic Neurosurgery. (2014, June 5). *Demonstration of shunt placement using StealthStation EM navigation* [Video]. YouTube. https://www.youtube.com/watch?v=y9_QVuE-vnU

PMI Doro Luna. (2016, March 9). *Doro Luna brain retractor system.* [Video]. YouTube. https://www.youtube.com/watch?v=kIHrC5Amc4U

Symmetry Surgical. (2020). The Greenberg Retractor. https://shop.symmetrysurgical.com/en/Image/GetDocument/233

Washington University School of Medicine. (2023). Stereotactic Neurosurgical Procedures. Department of Neurosurgery. https://neurosurgery.wustl.edu/items/stereotactic-neurosurgical-procedures/

Whittemore Enterprises Medical Equipment Center. (2018). Neurosurgical micro instrument set. http://www.wemed1.com/neuro-micro-instrument-set

Wikimedia Commons. (n.d.). Fukushima suction canula. By Wikimedia (n.d.). https://commons.wikimedia.org/wiki/File:Aiguille_de_stomatologie_02.JPG

Module Five

Common Equipment Used in Neurosurgery

Module Five

Common Equipment Used in Neurosurgery

Neurosurgery requires the use of equipment that is very specific and intricate. Module four will follow a similar format to the previous model by outlining the equipment used in neurosurgical procedures. This module is intended to increase your knowledge and understanding of the types of equipment used in neurosurgical procedures. Module four will include an overview of the neurosurgical equipment including quick start references, how to maintain equipment, and where equipment is stored.

Learning Objectives:

1. Identify the equipment that is commonly used for neurosurgical procedures.
2. Identify the proper maintenance and quick start strategies for use of equipment.
3. Identify the types of diagnostic equipment used in neurosurgery.
4. Identify the types of surgical tables and which is appropriate for which surgical procedure.

Neurosurgical Equipment for Overview

This section will provide an overview of some of the commonly used neurosurgical equipment including the StealthStation, Cavitron Ultrasonic Surgical Aspirator (CUSA) System, Midas Rex drill, neurosurgical microscopes and endoscopes, bipolar electrocautery, diagnostic imaging equipment, types of surgical tables, and OR bed attachments.

Source. From Microsoft Word Stock Images

Medtronic StealthStation Surgical Navigation System

This piece of equipment is commonly used in cranial and spinal procedures including biopsies, tumor resections, deep brain stimulation, catheter placements, spinal decompression or fusion, spinal fixation procedures, and treatment of spinal traumas. Through a combination of hardware, software, tracking algorithms, image data merging, and specialized instruments, the machine allows the surgeon to precisely track the location of surgical instruments in real time throughout the procedure. Surgeons will upload a preoperative diagnostic image and use the software to create a translational map between all points in the images and the corresponding points on the patient anatomy (Medtronic, 2022). After establishing this map, when the operator touches a point on the patient using a special tracked instrument, the StealthStation will identify the corresponding point on the images. This process is called *navigation* and allows for the identification of digital landmarks that can be used to guide the surgeon during the procedure.

Figure 5.1 Photo of the Medtronic StealthStation Equipment

Indications for Use

The StealthStation is intended to be used as an aid for precisely locating anatomical structures in open and percutaneous neurosurgical procedures. The StealthStation is also commonly used for any medical condition in which the use of stereotactic surgery may be appropriate (Medtronic, 2022).

Components of the System:

1. Staff cart and monitor –Serves as the base for the camera and contains the contains the computer system and control unit.
2. Camera – receives infrared light signals from each device or instrument and continuously communicates the location of each to the system.
3. Surgeon cart – placed near the surgical field, this enables the surgeon to have optimal visibility of the navigation screen.
4. Optical markers and instruments – specific instruments are designed for use with the StealthStation (Spinal and cranial navigation probes, patient reference frames, and instrument trackers).
5. Navigation field – the surgical site.

Quick Start for the StealthStation

- While it is ultimately the responsibility of the surgeon to prepare the StealthStation for use during the surgical procedure, it can be beneficial for neurosurgical perioperative nurses to understand the setup (Medtronic, 2022).
- The camera must be aimed and positioned toward the devices and instruments so to ensure effective navigation (Medtronic, 2022).

- The surgeon may ask the nurse to select the instrument option on the staff cart. When the instrument is selected, it must be registered to the system by placing the tip of the instrument into a metal divot on the reference frame and pushing the foot switch. The camera will confirm the instrument matches what has been selected and provide an image of the instrument in the bottom right corner of the screen (Medtronic, 2022).

Perioperative neurosurgical nurses can assist with the following setup steps:

- ✓ **Separate the carts**
- ✓ **Connect and start the system with the connection cable**
- ✓ **Press and hold the power switch located on the Staff Cart**
- ✓ **Dock the camera near the surgical field**

Maintenance and Storage

- Clean camera lenses using lens cleaner – DO NOT USE CHEMICALS on the camera lenses (Medtronic, 2022).
- When the procedure is complete, attach the staff and surgeon carts, turn off the system.
- The monitor folds down into a stowed position on the staff cart for ease of storage. The staff cart and surgeon cart may be docked and stored together.
- Typically, the StealthStation systems are stored in the neurosurgical operating room (OR-13) or in the equipment bay outside of OR-9.

Cavitron Ultrasonic Surgical Aspirator (CUSA) System

This technology provides the power and precision to debulk fibrous tissue quickly and safely to maximize surgical performance and patient outcomes. There are two ultrasonic surgical aspirator systems used in the neurosurgical ORs.

- CUSA Clarity (Integra, 2019a).
- CUSA Excel (Integra, 2019b).

Both models are comparable in the features that they offer, however the CUSA Clarity is the newest model.

Figure 5.2 CUSA console and foot pedal. By Integra (2019). https://www.integralife.com/file/general/1551373888.pdf

The CUSA systems utilize technology for ultrasonic tissue ablation to provide safe debulking of fibrous tissue for more efficient tissue removal. The CUSA delivers radio frequency energy to the tip of the handpiece which allows for the fragmentation of pathological tissue while providing suction and irrigation to aspirate the fragments (Integra, 2019). The CUSA can distinguish pathologic tissue from normal tissue, thus preventing damage to healthy tissues. These features result in minimal cranial or spinal cord disruption, reduced surgical time, and improved patient outcomes (Integra, 2019).

Components of the System

- CUSA console and footswitch (unsterile equipment console)
- CUSA handpiece (sterile surgical instrument piece)
- Disposable items (CUSA quick connect cartridge and tubing set, CUSA wrench, CUSA handpiece tips)

Click on the link to watch a video overviewing the components and function of the CUSA.

https://www.youtube.com/watch?v=6urVMa74rR0

Source. From “Cavitron Ultrasonic Surgical Aspirator – CUSA” by Entoscope, (2020) https://www.youtube.com/watch?v=6urVMa74rR0

Quick Start for the CUSA

- During the first surgical safety check list time out, the surgeon will confirm if the CUSA is to be used for the procedure. The circulating nurse will then confirm with the surgeon which handpiece tip will be used for this procedure. It is the responsibility of the neurosurgical perioperative circulating nurse to prepare the CUSA equipment, and the neurosurgical perioperative scrub nurse to prepare the CUSA handpiece (Integra, 2019).

- The circulating nurse should open the CUSA handpiece, quick connect cartridge and tubing set, wrench and tip using aseptic technique for the scrub nurse. The circulating nurse will also ensure the console is prepared with a 1L bag of normal saline, and a filtered suction cannister. The circulating nurse should position the console so that the tubing can be connected and arrange the footswitch within the surgeons reach (Integra, 2019).

- The scrub nurse will prepare the handpiece by connecting the tubing set and securing the tip. The scrub nurse will pass off the tubing to be connected to the console when the procedure begins, using aseptic technique (Integra, 2019).

Maintenance and Storage

After the surgical procedure, the circulating nurse should inquire if the surgeon wishes for the aspirated contents of the CUSA to be sent for pathology testing. Any disposable items such as the cartridge and tubing set, CUSA wrench, and CUSA handpiece tip may be disposed of. The handpiece should be sent for appropriate medical device reprocessing (Integra, 2019). The console and footswitch can be wiped down for storage within the inner core of the OR, outside of OR-13.

Midas Rex Drill

The Midas Rex is a high-speed drill system used for cranial and spinal neurosurgical procedures to precisely incise or cut bone. The Midas Rex drill can integrate high speed drilling with the StealthStation for cranial and spinal surgical procedures. This piece of equipment is used in almost all neurosurgical procedures and may be used with or without irrigation (Medtronic, 2023a).

Figure 5.3 Photo of Midas Rex Drill power console and handpiece with attachments

Components of the System

The drill consists of two main components (Medtronic, 2023a):

1. The integrated power console (IPC) – typically stored on an IV pole to mobilize the unit.

2. MR8 handpiece – requires attachments as selected by the surgeon.
3. MR8 navigated handpiece – used with the surgical navigation system for some spinal procedures.

Quick Start for the Midas Rex Drill

- The surgeon will select the required attachment prior to the first surgical safety checklist. There are a variety of attachments and drill bits used for spinal procedures. The most common attachments used for cranial surgery include the perforator and the craniotome (Medtronic, 2023).
- The scrub nurse will hand off the handpiece cable to the circulating nurse using aseptic technique.
- The circulating nurse will ensure the IPC is near but not touching the sterile field. The circulating nurse will connect the handpiece to the IPC. A helpful tip – ensure the connection aligns properly on the handpiece and IPC to avoid damaging the handpiece (Medtronic, 2023).
- If using irrigation, the circulating nurse will connect and prime the irrigation tubing (Medtronic, 2023).

Maintenance and Storage

The integrated power console can be wiped down and stored in the operating room. The handpiece may be sent on the case cart for medical device reprocessing along with the rest of the instruments used during the procedure (Medtronic, 2023a).

Neurosurgical Microscopes and Endoscopes

In neurosurgery, microscopes are commonly used to support surgeons in performing complex microsurgical applications. The microscopes provide optimal and reliable visualization of the surgical field and the fine anatomical details of the cranial and spinal structures. The microscope may be connected to the StealthStation for navigation to enable the surgeon to perform the procedure with high precision (Ma & Fei, 2021; Zeiss, n.d.).

Figure 5.4 Photo of the Neurosurgical Microscope

Components of the System

Two neurosurgical microscopes are used within NS Health:

1. Zeiss OPMI Pentero 900 (Zeiss, n.d.).
2. Zeiss OPMI Pentero 800 (Zeiss, n.d.).

Applications of neurosurgical microscopes may include the following procedures: Brain aneurysm repair, cranial or spinal tumor resections, AVM repair or treatment, epilepsy surgery or, spinal procedures.

Quick Start for Microscopes

- Preparation of the microscope is required before it may be used for surgery. When powering the microscope on, select the user for the surgical procedure. Each user profile is set up with the settings that the surgeon prefers (Zeiss, n.d.).
- The surgeon or resident delegate will complete the Auto Balance to ensure the microscope is balanced appropriately (Zeiss, n.d.).
- The scrub nurse must drape the microscope with a sterile drape. The circulating nurse will press the Auto Drape button to facilitate a quick and easy draping process. When the surgeon requests, the circulating nurse will position the microscope over the sterile field and apply the brake. The cable may be connected to auxiliary monitors so the rest of the perioperative team can view the surgical procedure (Zeiss, n.d.).

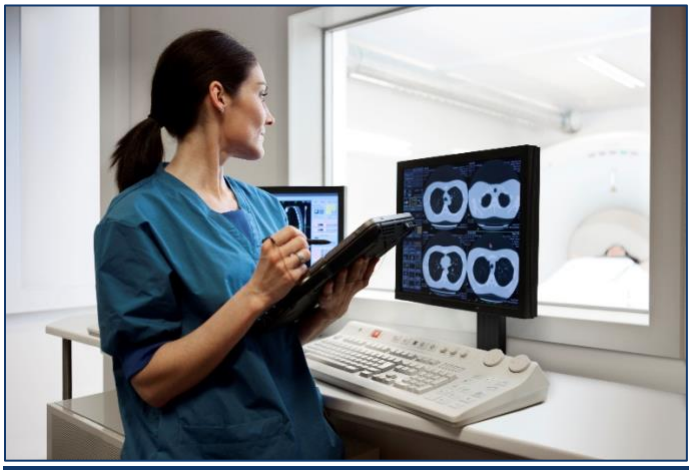
Maintenance and Storage

The microscope should be returned to a neutral position by aligning the marks on the microscope. The microscopes are stored in each neurosurgical operating theatre. The microscopes should be unplugged from the power outlet for storage between uses (Zeiss, n.d.).

Diagnostic Imaging Equipment

Both the C-arm (GE HealthCare, 2023) and O-arm (Medtronic, 2023b) systems can be used intraoperatively for diagnostic imaging during spinal and cranial surgeries. The C-arm provides the flexibility to acquire precise x-ray images intraoperatively. This equipment transitions quickly and easily to provide greater efficiency and versatility for may be used for a wide range of clinical applications (GE HealthCare, 2023).

The O-arm system is a mobile x-ray system and is compatible with image guided surgical systems including the StealthStation. Along with the StealthStation navigation, the O-arm system provides enhanced visibility and surgical feedback (Medtronic, 2023b).



Source. From Microsoft Word Stock Images

Pause and Think: Reflection Activity 5.1

Source. From Microsoft Word Stock Images.

Think about the neurosurgical procedures you have observed to date.

What types of neurosurgical equipment have you encountered in your practice?

How does the functional control of equipment correlate with patient care?

What can happen when problems arise related to the neurosurgical equipment?

Surgical Tables

The neurosurgical operating rooms use a variety of surgical tables depending on the type of surgical procedure being performed.

Skytron Surgical Tables

These surgical tables include various features including rotational, top slide, and low-profile bases that promote patient safety and provide better access for surgeons during procedures. Maximum weight limits range from 600-1200lbs depending on the model of the bed. The beds offer surgical positioning flexibility and are easily rotatable to allow for intraoperative diagnostic imaging (Skytron, 2023). The Mayfield clamp attaches to this bed. Common surgical procedures performed on this type of surgical table include cranial, neurovascular, and neck procedures (Skytron, 2023).

Figure 5.5 Photo of the Skytron surgical table.

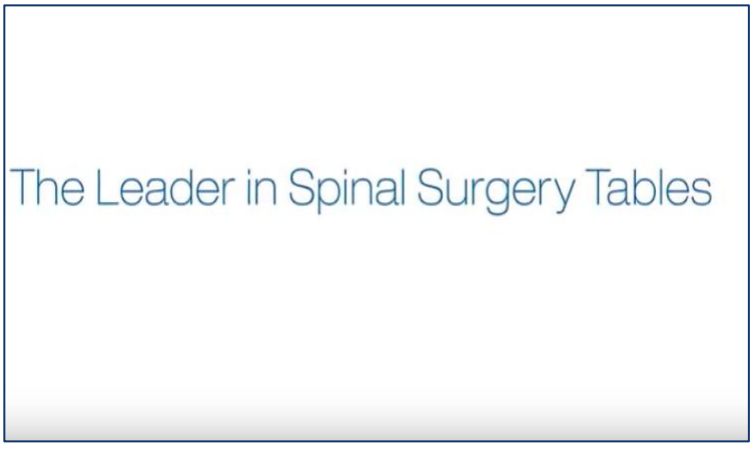
Jackson Surgical Table Systems

This surgical table features a unique tabletop mounting interface that keeps the tabletop in the locked position. The Jackson surgical table systems offer enhanced patient positioning for spinal procedures, diagnostic imaging, and other trauma procedures. Positioning capabilities and enhanced safety measures allow patients to be positioned in the prone, supine, or lateral positions. The carbon fiber construction of the frame allows for complete radiolucency, allowing unrestricted diagnostic imaging using the C-Arm or O-Arm (Mizuho, n.d.).

Common procedures performed on this type of surgical table include spinal procedures including laminectomies, decompressions, osteotomies, anterior/posterior fusions, surgical correction of deformities, and kyphoplasty procedures; or cranial procedures requiring the patient to be in the prone position (Mizuho, n.d.).

Click on the link below to watch a video overviewing the Jackson surgical table system.

https://www.youtube.com/watch?v=o9q7mzn4WzM



Source. From “Trios Promotional Video Product Highlights” by Mizuho OSI, https://www.youtube.com/watch?v=o9q7mzn4WzM

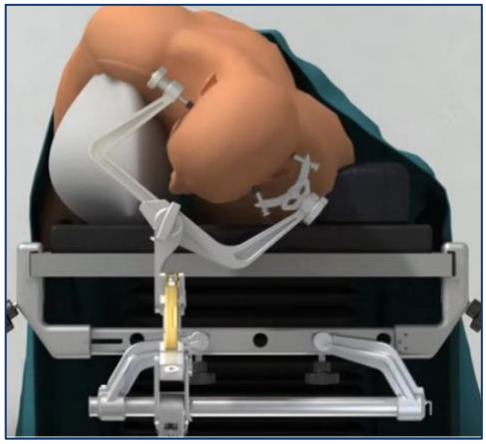
OR Bed Attachments

There are two types of cranial skull clamps that are commonly used during cranial procedures to provide fixation and cranial stabilization during the neurosurgical procedure. The Mayfield head clamp or Sugita head frame may be selected based on the surgeon's preference or surgical approach (Integra, n.d.; Surgicalone, 2023).

Mayfield Head Clamp

Please refer to the section on patient positioning to review safety and positioning considerations for the Mayfield Head Clamp.

Click on the link below to watch a video overview of the care and application of the Mayfield cranial clamp. **https://www.youtube.com/watch?v=2BCGqx5Av1U**



Source. From Integra Mayfield 360 by Nozhamedical, https://www.youtube.com/watch?v=2BCGqx5Av1U

The Mayfield Skull Clamp provides rigid 3-point skeletal fixation with pins for craniotomies, laminectomies, and most neurosurgical procedures (Integra, n.d.; Rozet & Vavilala, 2007).

- Infinity support bar system – attaches to bed to secure the clamp (Integra, n.d.).
- Swivel adaptor – provides flexibility for positioning (Integra, n.d.).
- Horseshoe headrest - provides cranial support for patients in supine positions (Integra, n.d.).
- General purpose headrest - provides cranial support in either supine or semi-sitting procedures (Integra, n.d.).

Sugita Head Frame

The Sugita head frame provides a 6-point rigid fixation system to achieve firm cranial stabilization and comfort to both the patient and the operating surgeon (Koyama et al., 2002; Surgicalone, 2023).

Figure 5.6. Sugita head frame clamp and attachments. By Surgicalone (2023). https://surgicalone.com/item/mizuho-sugita-surgical-head-frames/

Components of the frame include the table attachment bar, u-shaped head holder with 6 pin positions, basal frame with semi-circular frame, metal snake arm retractors, titanium scalp hooks, slide adjustor, and brain spatula retractors (Surgicalone, 2023).

Conclusion

This module provides and overview of the intricate equipment that is unique to neurosurgery. Although the neurosurgical perioperative nurse does not necessarily operate all the equipment described in this module, it is beneficial to understand the equipment and how it is used in practice. The perioperative neurosurgical circulating nurse is responsible for arranging the setup of the operating room and preparing the equipment for use during the surgical procedure. The perioperative neurosurgical nurse may also be responsible for troubleshooting the equipment if any issues are encountered during the surgical procedure. Becoming familiar with the types of surgical tables and equipment used in neurosurgery will increase perioperative neurosurgical nursing confidence and competence in clinical practice.

References

Entoscope. (2020, April 25). *Cavitron Ultrasonic Surgical Aspirator – CUSA* [Video]. YouTube. https://www.youtube.com/watch?v=6urVMa74rR0

GE Healthcare. (2023). 3D imaging every day. Surgical imaging. https://www.gehealthcare.ca/en-ca/products/surgical-imaging/oec-3d

Integra. (2019a). CUSA Clarity Ultrasonic Tissue Ablation System. https://www.integralife.com/ca/cusa-clarity/category/cusa-tissue-ablation-cusa-clarity

Integra. (2019b). CUSA Excel Ultrasonic Tissue Ablation System. https://www.integralife.com/cusa-excel/category/cusa-tissue-ablation-cusa-excel

Integra. (n.d.). Mayfield cranial stabilization and fixation systems. https://www.integralife.com/file/general/1453799331.pdf

Koyama, J., Hongo, K., Okudera, H., Nitta, J., Kusano, Y., & Kobayashi, S. (2002). Modified, Multipurpose, Radiolucent Sugita head frame for intraoperative cerebral angiography. *Neurosurgery, 51* (4), 989-992. http://ovidsp.ovid.com.qe2a-proxy.mun.ca/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&AN=00006123-200210000-00025&D=ovft

Ma, L. & Fei, B. (2021). Comprehensive review of surgical microscopes: technology development and medical applications. *Journal of Biomedical Optics, 26*(1). doi: 10.1117/1.JBO.26.1.010901

Medtronic. (2022). Stealth station surgical navigation system. Neurosurgery and spine

procedures. https://www.medtronic.com/ca-en/healthcare-professionals/products/neurological/surgical-navigation-systems/stealthstation.html

Medtronic. (2023a). Midas Rex. Healthcare professionals. https://www.medtronic.com/ca-en/healthcare-professionals/products/neurological/powered-surgical-instruments/midas-rex-mr7-high-speed-pneumatic-drills.html

Medtronic. (2023b). Healthcare professionals O-arm surgical imaging system. Surgical imaging systems. https://www.medtronic.com/ca-en/healthcare-professionals/products/neurological/surgical-imaging-systems/o-arm.html

Mizuho OSI. (2022, April 13). *Trios promotional video product highlights*. YouTube. https://www.youtube.com/watch?v=o9q7mzn4WzM

Mizuho OSI. (n.d.). Trios surgical table system. Surgical tables. https://www.mizuhosi.com/product/trios/

Rozet, I., & Vavilala, M. S. (2007). Risks and benefits of patient positioning during neurosurgical care. *Anesthesiology Clinics Journal, 25*(3), 631-53. doi: 10.1016/j.anclin.2007.05.009

Skytron. (2023). Skytron 6702 Hercules. Surgical Tables. https://www.skytron.com/wp-content/uploads/documentation/6702-Hercules-Brochure-Web.pdf

Surgicalone. (2023). Mizuho Sugita head frames. https://surgicalone.com/item/mizuho-sugita-surgical-head-frames/

Zeiss. (n.d.). Opmi Pentero 900 for healthcare professionals.

https://www.zeiss.com/meditec/us/products/neurosurgery/surgical-microscopes/opmi-pentero-900.html

Module Six

Interprofessional Considerations

Module Six

Interprofessional Considerations

This module will provide an overview of interprofessional considerations related to neurosurgery including: an overview of all neurosurgical team members, coordination of care, shared decision making, and teamwork/communication strategies. Teamwork is an essential part of perioperative nursing practice. The perioperative team consists of different professional working groups including anesthesia, surgical residents, surgeons, nursing, and support staff. Members of each professional group frequently work and learn together to improve the care of the neurosurgical patient. This module will provide an understanding and reinforce the importance of perioperative teamwork for neurosurgical patients.

Learning Objectives:

1. Identify members of the neurosurgical perioperative team and understand their roles.
2. Identify strategies to maintain effective communication and teamwork within interprofessional teams in the neurosurgical perioperative environment.
3. Provide examples of how the neurosurgical team collaborates to promote patient safety.

Neurosurgical Team Members

Perioperative patient care for neurosurgical patients involves the integrated multidisciplinary care of patients from the moment the surgical procedure is contemplated through to the complete recovery of the patient. During the perioperative phases, professionals from different specialties and healthcare sectors collaborate to support the patient along their journey. Working as an interdisciplinary team is the foundation of neurosurgical perioperative patient care. Delivering quality healthcare requires different professional groups to come together as a team, share information, and collaborate to meet expected patient outcomes.

Source. From Microsoft Word Stock Images

Coordination of Care and Shared Decision Making

Interprofessional collaboration of the neurosurgical perioperative team is necessary to maintain coordination of care and improve patient safety. Having a clear understanding of the roles and responsibilities of other team members can be essential for preventing adverse events in the perioperative environment. Given that the neurosurgical perioperative environment is a dynamic

setting in which patients are known to be vulnerable, teamwork and interdisciplinary collaboration is especially important to minimize the risk of adverse events (Jayasuriya-Illesinghe et al., 2016).

The interdisciplinary neurosurgical perioperative team works collaboratively to make decisions and share resources and responsibilities to promote patient safety and wellbeing (Nova Scotia, 2013). Shared decision-making in the neurosurgical perioperative setting blends individual team members making decisions within their own scope of practice with the ideal of all team members sharing in the decision-making process (Nancarrow et al., 2013). Shared decision-making relies on the competencies and knowledge of all team members and requires shared power and leadership to achieve optimal patient outcomes. The neurosurgical perioperative team believes that patients are entitled to safe, evidence-informed, humanistic care (Nova Scotia Health, 2022).

Teamwork and Communication

The neurosurgical perioperative team values technical competence, preparation, and strong communication skills to ensure efficiency and optimal patient outcomes. Miscommunication and poor coordination among perioperative teams are known causes of preventable patient safety events, operating room inefficiencies and inhibitions of surgical training (Ber et al., 2021, Osborne-Smith & Hodgen, 2017). Effective communication in the neurosurgical perioperative environment is a requirement for the delivery of safe patient care and a crucial element of teamwork.

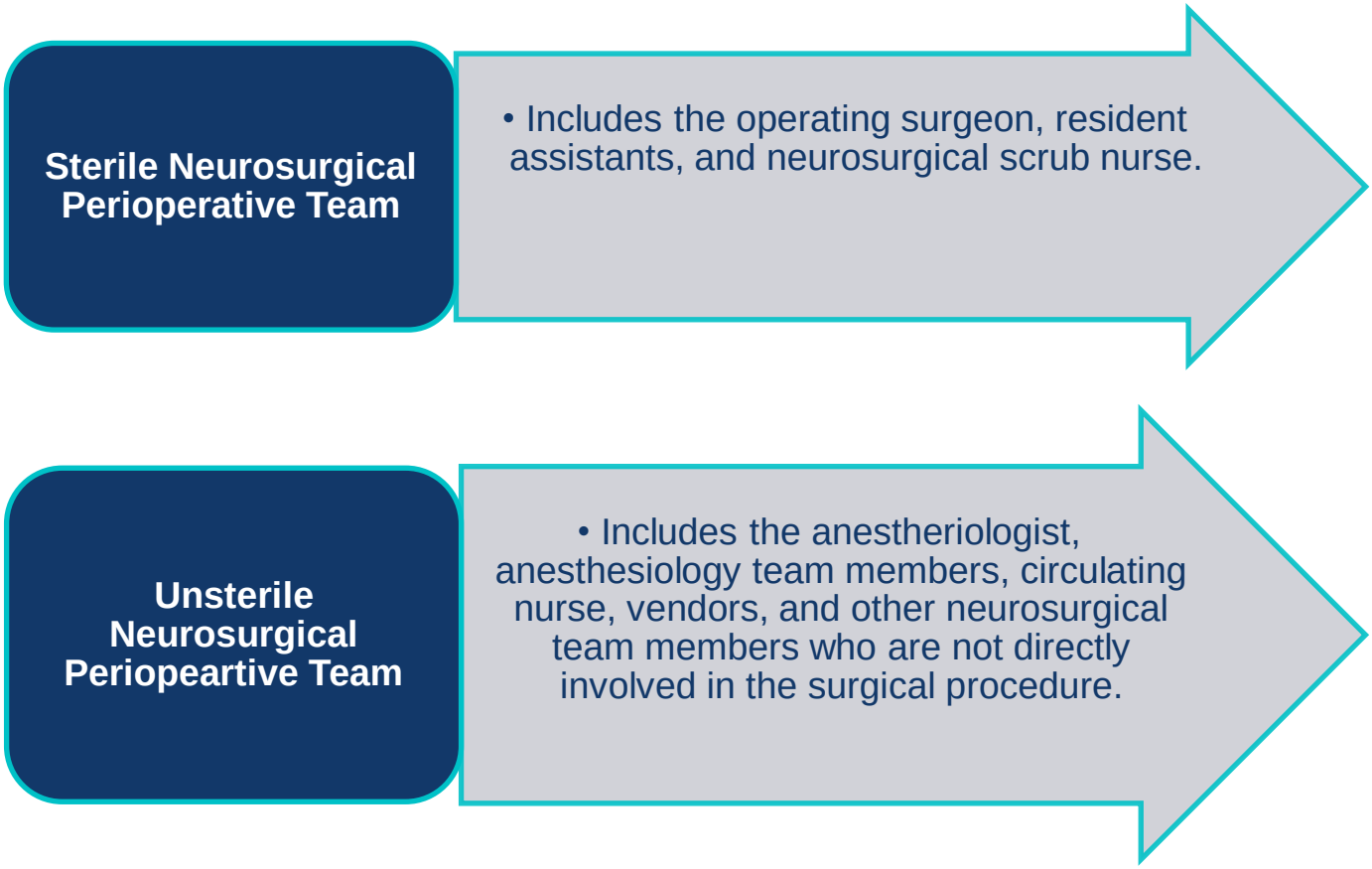
Classification of the Neurosurgical Perioperative Team

The neurosurgical perioperative team is ultimately responsible for the safety and well-being of a patient throughout the surgical procedure. Maintaining patient's privacy, dignity, and promoting patient safety measures requires a collaborative approach from all members of the neurosurgical perioperative team.

The neurosurgical perioperative team shares a responsibility to create an environment that supports and respects the patient's interests, values, and dignity (Blomberg et al., 2018; Oliveira, 2020). An integrated, comprehensive, and collaborative approach to perioperative patient care is encouraged to improve and sustain patient safety (Falcone et al., 2021; Fearon, 2018; Leach et al., 2011).

The neurosurgical perioperative environment has sterile and non-sterile areas, as well as sterile and non-sterile personnel (BC Campus, n.d.). The team can be divided into two groups according to the function of their roles. Figure 6.1 outlines the classification of the perioperative team members into sterile and unsterile team groups.

Figure 6.1 Classification of the Neurosurgical Perioperative Team



Sterile Neurosurgical Perioperative Team

Members of the sterile neurosurgical perioperative team perform hand hygiene, don sterile gowns and gloves, enter and maintain the sterile field, continue to practice surgical conscious and aseptic techniques (BC Campus, n.d.).

Perioperative Neurosurgical Scrub Nurse

The neurosurgical scrub nurse is an important part of the sterile team. Click here to review the **Neurosurgical Scrub Nursing Roles and Responsibilities** outlined in **Module One**.

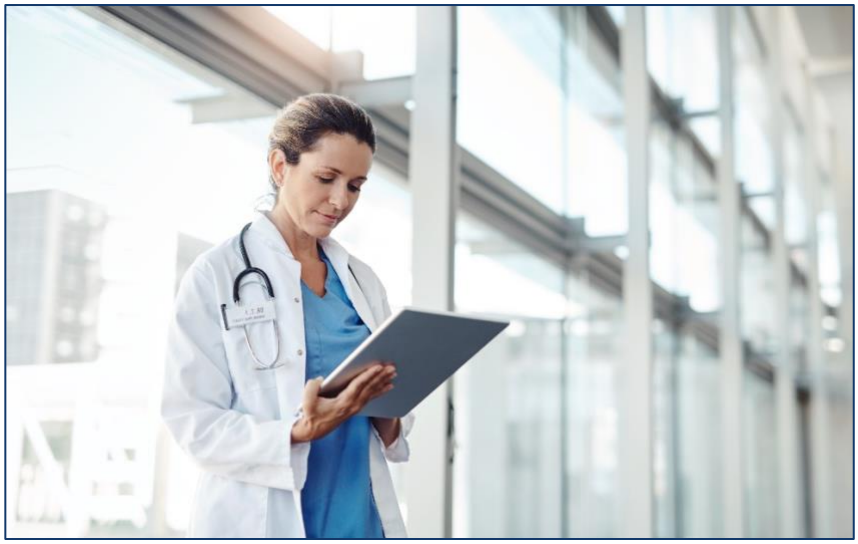
Source. From Microsoft Word Stock Images

Neurosurgical Staff Surgeons and Residents

The staff surgeon is ultimately responsible for the direction of the perioperative care provided in the operating room. Surgeons direct and manage all staff in the operating room and are ultimately responsible for the outcome of the patient. The surgeon is responsible for the preoperative diagnosis, ensuring all preoperative images are accessible, designing the surgical plan, performing the

operation, and providing the patient with postoperative care and treatments (American College of Surgeons, 2023).

The resident will assist the surgeon during the procedure by helping to maintain visibility during the procedure, helping to control bleeding, closing the surgical incision, handling instruments and tissues as necessary (American College of Surgeons, 2023a; Dalhousie University, 2023).



Source. From Microsoft Word Stock Images

Key responsibilities of the neurosurgeon or resident delegate relating to patient safety include but are not limited to:

- Developing the surgical plan of care in coordination with the perioperative team (American College of Surgeons, 2023a; Dalhousie University, 2023; Holzer et al., 2019).
- Marking of the surgical site according to the organizational policy.

  Please review the following NS Health policy:

  Marking of the Surgical Site – Policy SS-SR-001 (Nova Scotia Health, 2019).

- Ensuring the necessary preoperative images are on display in the neurosurgical operating theatre (Holzer et al., 2019).
- Coordinating the positioning of the patient for neurosurgery (American College of Surgeons, 2023; Holzer et al., 2019).
- Leading Phase 2 of the Surgical Safety Checklist as per the policy.

  Please review the following NS Health policy.

  Operating Room Team Surgical Safety Checklist – Policy #SS-OR-001 (Nova Scotia Health, 2017).

Unsterile Neurosurgical Perioperative Team

Members of the unsterile neurosurgical perioperative team work outside of the sterile field to support the perioperative patient. Still maintaining their surgical conscious, the members of this team handle unsterile supplies and equipment, support the sterile team by passing sterile supplies, providing direct to the neurosurgical patient, attending to any needs of the sterile surgical team.

Perioperative Neurosurgical Circulating Nurse

The neurosurgical circulating nurse is an important part of the sterile team. Click here to review the Neurosurgical Circulating Nursing Roles and Responsibilities outlined in Module One.

Source. From Microsoft Word Stock Images

Anesthesiology Team

The anesthesiology team is often composed of a staff anesthesiologist, resident, and an anesthesia technologist or assistant. Anesthesiologists are responsible for monitoring and evaluating the wellbeing of the patient before, during, and after surgery (Canadian Anesthesiologists Society, 2023).

Source. From Microsoft Word Stock Images

The key responsibilities of the neurosurgical anesthesia team to include but are not limited to:

- Collaborating with the neurosurgeon to select appropriate anesthetic agents (Canadian Anesthesiologists Society, 2023).
- Administration of anesthesia throughout the surgical procedure (Canadian Anesthesiologists Society, 2023).
- Monitoring of physiologic function during the surgical procedure (Canadian Anesthesiologists Society, 2023).
- Deliver anesthesia services through up-to-date clinical care that is based on current research and education (Canadian Anesthesiologists Society, 2023).

Industry Representative Personnel

Industry representative personnel may be present to support the surgeon during some surgical procedures. Vendors are subject matter experts and often guide surgeons in the optimal use of instruments and implants (Plonien & Williams, 2019). Vendors may access the operating room upon the formal request of the attending surgeon or nurses. A formal request must be submitted to the Perioperative Product Coordinator before an industry representative personnel may enter the neurosurgical perioperative environment. The role of the vendor or industry representative personnel is generally to support the use of an existing product, device, or piece of equipment, or to introduce and trial new products, devices, or equipment (Plonien & Williams, 2019). The industry representative personnel must follow all current Nova Scotia Health protocols and screening practices pertaining to COVID-19.

Within Nova Scotia Health, it is the expectation that the industry representative personnel will function only as a resource to the surgeon or nursing staff regarding their perspective product, device, or equipment.

- Vendors may not scrub in or participate in the setup of the surgical procedure (Plonien & Williams, 2019).
- Vendors may visually and audibly verify an item with the surgeon. However, they may not open any item and place it on the sterile field or assist with other duties of the circulating nurse (Plonien & Williams, 2019).

Neurosurgical Technical Coordinator

The technical coordinator of the neurosurgical perioperative team provides basic technical support services to assist with the care that the neurosurgical perioperative team provides. The technical coordinator supports all members of the perioperative team with the goal of providing optimal patient care. The technical coordinator may also oversee any intraoperative electrophysiologic monitoring to assess the function of the brain, brainstem, spinal cord, cranial nerves, and peripheral nerves during the neurosurgical procedure. (Ghatol & Widrich, 2022; Simon, 2019).

The neurosurgical team is supported by other members of the perioperative team including but not limited to:

- Patient attendants – responsible for supporting perioperative patient care activities including assisting in the movement and transportation of patients, cleaning of equipment and work areas, maintaining equipment and handling of sterile items.
- Housekeeping – designated personnel assigned to clean the operating theatres and surrounding clinical and nonclinical areas.
- Medical device reprocessing staff – perform technical duties related to the decontamination, sterilization, reassembly, functional testing, and distribution of medical and surgical supplies for the ORs.
- Management and leadership roles – including the perioperative unit manager and clinical supervisors.
- Neurosurgical patients also play an active role in the perioperative interdisciplinary team.

Pause and Think: Reflection Activity 6.1

Source. From Microsoft Word Stock Images.

Think about your personal perioperative nursing practice experiences.

What have you noticed about interdisciplinary communication within the perioperative neurosurgical team?

What was the impact of communication?

How does communication between professions impact patient care in the neurosurgical OR?

How does communication between professions impact relationships?

Conclusion

After completing this module, you should have a better understanding of the roles of the interdisciplinary neurosurgical perioperative team. This foundational understanding will allow you to function as a member of the neurosurgical perioperative team with an emphasis on providing collaborative efforts that are conducive to achieving positive patient outcomes. Effective communication and establishing an efficient working environment are effective strategies for promoting interdisciplinary teamwork within the neurosurgical perioperative setting.

References

American College of Surgeons. (2023). Job description. Online guide for medical professionals. https://www.facs.org/for-medical-professionals/education/online-guide-to-choosing-a-surgical-residency/guide-to-choosing-a-surgical-residency-for-medical-students/faqs/job-description/

American College of Surgeons. (2023a). What is a surgical resident? https://www.facs.org/media/0kph3p0n/what_is_a_surgical_resident.pdf

BC Campus. (n.d.). Clinical procedure for safer patient care. Chapter 1: Infection control. https://opentextbc.ca/clinicalskills/chapter/sterile-gloving/

Ber, R., London, D., Senan, S., Youssefi, Y., Harter, D., Golfinos, J. G., & Pacione, D. (2021). Perioperative team communication through a mobile app for improving coordination and education in neurosurgery cases. *Journal of Neurosurgery, 136*(4), 1157-1163, doi: 10.3171/2021.4.JNS21485

Blomberg, A., Bisholt, B., & Lindwall, L. (2018). Responsibility for patient care in perioperative practice. *Nursing Open, 5*(3), 414-421. doi: 10.1002/nop2.153

Canadian Anesthesiologists Society. (2023). Job description. https://www.cas.ca/en/practice-resources/career-centre/explore-a-career-in-anesthesiology

Dalhousie University. (2023). The Atlantic Canadian neurosurgery residency program.

Division of neurosurgery. https://medicine.dal.ca/departments/department-sites/surgery/divisions/neurosurgery/education/residency-training.html

Falcone, R. A., Simmons, J., Carver, A. M., Mullett, B., Kotagal, M., Lin, E., Muething, S., & Von Allmen, D. (2021). Perioperative safety: Engage, integrate, empower, sustain to eliminate patient safety events. *Pediatric Quality & Safety, 6*(6). doi: 10.1097/pq9.0000000000000495

Fearon, M. C. (2018). Knowledge, Accuracy, Precision: Requirements for the perioperative neurosurgical nurse. *AORN Journal, 108*(2), 124-125. https://doi.org/10.1002/aorn.12321

Ghatol, D., & Widrich, J. (2022). Intraoperative neurophysiological monitoring. https://www.ncbi.nlm.nih.gov/books/NBK563203/

Holzer, E., Tschan, F., Kottwitz, M.U., Guido, B., Businger, A. P., & Semmer, N. K. (2019). The workday of hospital surgeons: what they do, what makes them satisfied, and the role of core tasks and administrative tasks; a diary study. *BMC Surgery, 19*(1). https://doi.org/10.1186/s12893-019-0570-0

Leach, L. S., Myrtle, R. C., & Weaver F, A. (2011). Surgical teams: role perspectives and role dynamics in the operating room. *Health Services Management Research*, *24*(2), 81-90. doi: 10.1258/hsmr.2010.010018

Nancarrow, S. A., Booth, A., Ariss, S., Smith, T., Enderby, P., & Roots, A. (2013). Ten principles of good interdisciplinary teamwork. *Human Resources for Health, 11*(19),

https://human-resources-health.biomedcentral.com/articles/10.1186/1478-4491-11-19

Nova Scotia. (2013). Collaborative care guidelines for perioperative nurses. https://novascotia.ca/dhw/mocins/docs/Collaborative_Care_Guidelines_for_Perioperative_Nurses_in_Nova_Scotia.pdf

Nova Scotia Health. (2017). Perioperative policy and procedure: Operating room team surgical safety checklist. https://policy.nshealth.ca/Site_Published/NSHA/document_render.aspx?documentRender.IdType=6&documentRender.GenericField=&documentRender.Id=69177

Nova Scotia Health. (2019). Perioperative policy and procedure: Marking of the surgical site. https://policy.nshealth.ca/Site_Published/nsha/document_render.aspx?documentRender.IdType=6&documentRender.GenericField=&documentRender.Id=89700

Nova Scotia Health. (2022). NSHA Central Zone – Anesthesia Department. http://www.cdha.nshealth.ca/node/19615

Oliveria, C. R. (2018). Dignity in perioperative practice. *Anesthesia, Pain & Intensive Care, 24*(5), 473-475. **DOI**: https://doi.org/10.35975/apic.v24i5.1350

Osborne-Smith, L., & Hodgen, R. K. (2017). Communication in the operating room setting. *Annual Review of Nursing Research, 35*(1), 55-59, DOI: 10.1891/0739-6686.35.55

Plonien, C., & Williams, M. (2019). Vendor presence in the OR: Perioperative

leadership. *AORN, 100* (1), 81-86. https://mun.primo.exlibrisgroup.com/permalink/01MUN_INST/12c0frt/cdi_proquest_miscellaneous_1634739373

Simon, M. V. (2019). Tests in the operating room. In B. Barry (2nd ed), *Intraoperative neurophysiology: A comprehensive guide to monitoring and mapping* (pp. 1-52) Springer Publishing Company. https://books.google.ca/books?hl=en&lr=&id=WlplDwAAQBAJ&oi=fnd&pg=PP1&dq=neurophysiologist+role+in+surgery&ots=ih7kDQr5OB&sig=0qzdDIrlGL8R6X0itlkUdWkbMJg#v=onepage&q=neurophysiologist%20role%20in%20surgery&f=false

Appendix A: Post-test

The following questions are designed to test your acquired knowledge on the topic of neurosurgical perioperative nursing. These questions are repeated from the pre-test at the beginning of the orientation resource so that you can measure how much you have learned. Answers to the questions can be found in **Appendix B**.

1. Name the two roles that neurosurgical perioperative nurses may assume.

2. _____ is the key responsibility of the scrub nurse during a neurosurgical procedure.

3. List four responsibilities of the neurosurgical circulating nurse.

4. Define surgical conscious and aseptic technique as used in neurosurgery.

5. List three subjects that should be documented in the neurosurgical perioperative chart.

6. List four key strategies for promoting patient safety in the neurosurgical operating room (OR).

7. What would a surgical wound that encounters the sinus be classified as?

8. Identify a significant intraoperative complication of the craniotomy procedure that nurses should be prepared for, and appropriate actions for the neurosurgical perioperative nurse.

9. Define arteriovenous malformation.

10. Explain why the neurosurgical scrub nurse must remain sterile and maintain their sterile set up until the patient is extubated following a carotid endarterectomy.

11. What is the common positioning for patients undergoing a microvascular decompression?

12. In which neurosurgical procedure do patients often receive local anesthesia, such as lidocaine, during the first part of the surgery?

13. _____ provides a 6-point fixation system for firm cranial stabilization during cranial neurosurgical procedures.

14. True or False: During any surgical procedure, it is critical that both the circulating nurse and scrub nurse must remain attentive to the evolving events of the surgery.

15. The _____ was developed with the intent to decrease surgical errors and adverse events, and increase teamwork and communication in surgery.

16. Explain the meaning of the phrase “time is brain”.

17. True or False: The circulating nurse is a member of the sterile neurosurgical team.

18. True or False: The anesthesia technologist is a member of the unsterile neurosurgical team.

19. True or False: A formal request for an industry representative personnel must be submitted prior to them attending the surgical procedure.

The answers for the pre-test can be found in Appendix B.

Appendix B: Pre-test and Post-test Answers

1. Scrub nurse and circulating nurse.
2. Maintaining sterility, using aseptic technique.
3. Patient assessment, communication with the perioperative team, ensure equipment is working, open sterile instruments and supplies, documentation, surgical counts, catheterization, patient safety practices, monitoring for break in sterile technique.
4. Surgical Conscious is a 360-degree awareness of everything within the nurse's sterile and unsterile environment. Asepsis is how this awareness is incorporated into their daily activities of care (Chambers, 2013).
5. Consent, surgical site, surgical counts, event times, procedures, medications, positioning, specimens, equipment.
6. Technical excellence, optimizing communication between team members, improving team dynamics, streamlining OR processes.
7. Class III.
8. With any craniotomy procedure, there is a risk of an intraoperative intracranial hemorrhage. The neurosurgical perioperative nurses need to be aware of the risk and how to manage this situation appropriately. Intracranial hemorrhage can have a rapid onset and high degree of harm (Su et al., 2022).
    - The perioperative team will collaborate to maintain circulating blood volume, preventing cardiac arrest, and hemorrhagic shock.
    - The neurosurgical circulating nurse should anticipate the ordering of blood products.

- The neurosurgical scrub nurse should remain attentive to the needs of the surgical team.

9. Arteriovenous malformation – tangle of abnormal and poorly formed arteries and veins.
10. High risk of bleeding from the operative site upon extubation.
11. Supine or lateral.
12. Deep brain stimulation.
13. Sugita head frame.
14. True.
15. Surgical safety checklist.
16. Human nervous tissue is rapidly and irretrievably lost as time progresses. Early surgical intervention is essential to preserve neurological functioning.
17. False.
18. True.
19. True.

Appendix C: Case Study Answer Key

Answers are provided below for the case studies that were presented in **Module 1** and **Module 2**.

Case Study 1.1: Perioperative Nursing Care Answer Key

1. **What are the circulating nursing roles and responsibilities for providing neurosurgical perioperative patient care?**

   The circulating nurse should ensure the patient is comfortable upon arriving to the operating room. The circulating nurse must manage and provide perioperative care that encourages a safe and comfortable environment for the patient. The circulating nurse can increase patient's comfort by offering a warm blanket and talking to the patient to let them know what is going to happen.

2. **What are some notable concerns that should be addressed in this scenario?**

   The neurosurgical perioperative team did not introduce themselves to the patient. The team did not engage patient in developing the perioperative plan of care, and there was no surgical safety checklist conducted before the patient went to sleep.

Case Study 2.1: Emergency Neurosurgical OR Case Answer Key

1. **What initial interventions should the circulating nurse prioritize at this moment?**

   Discuss and establish roles with the neurosurgical perioperative team. Obtain the emergency neurosurgical case cart. Assist the scrub nurse in setting up the surgical field by opening any sterile equipment or supplies required. Discuss the plan of care with the perioperative neurosurgical team.

2. **What initial interventions should the scrub nurse prioritize in this moment?**

   Discuss and establish roles with the neurosurgical perioperative team. Obtain the emergency neurosurgical case cart. The scrub nurse should immediately begin a surgical scrub and don sterile surgical attire. The scrub nurse should prioritize setting up the sterile instruments and field for the procedure.

3. **What are the priority instruments required to begin this procedure?**

   The priority instruments required would include the Midas Rex Drill with the perforator and craniotome attachments, bipolar electro cautery, suction, irrigation, and a scalpel.

4. **What perioperative interventions can the circulating nurse anticipate?**

   The circulating nurse should anticipate the requirement for a blood transfusion given the patient's diagnosis and the risk for intraoperative bleeding. These risks should be

discussed with the attending surgeon and anesthesiologist during the first phase of the surgical safety checklist.

Appendix D: Glossary

An alphabetized list of key terms and words used throughout the resource.

Acute epidural hematoma – a collection of blood that forms between the skull and the dura matter, typically the result of an arterial bleed.

Acute hydrocephalus – an abnormal accumulation of cerebrospinal fluid in the ventricles.

Acute intracerebral hematoma or hemorrhage – acute bleeding within the brain tissue (hemorrhage) or pooling of clotted blood (hematoma).

Acute subdural hematoma with shift – an acute collection of blood that develops between the surface of the brain and the dura matter, resulting in the displacement of brain tissue across the center line of the brain.

AVM – an abnormal tangle of blood vessels, which disrupts normal blood circulation, within the brain.

Brain abscess/empyema – a pocket of purulent fluid that develops within the brain.

Brain tumors with altered level of consciousness – tumors centered in, infiltrating, or causing pressure on areas of the brain that are responsible for alertness will result in altered level of consciousness.

Cauda equina syndrome – occurs when there is dysfunction of multiple lumbar and sacral nerve roots of the nerve roots in the lumbar and sacral region.

Cerebral aneurysm – a weakening or thinning of the wall of an arterial structure in the brain causing the pooling of blood.

Cerebrospinal fluid leak – cerebrospinal fluid escapes through a small tear or hole in the dura (the outermost layer surrounding the brain).

Cervical dislocations – vertebrae in the cervical spine move out of place often as the result of overstretched ligaments.

Chronic subdural hematoma – an older clot of blood remains on the surface, but below the dural layer of the brain.

Cranial conditions – abscess, empyema, aneurysms, AVMs, pituitary apoplexies, hydrocephalus.

Craniotomy – a surgical operation in which a small hole is made in the skull or a piece of the skull bone is removed to expose part of the brain.

Decompressive craniotomy – a cranial neurosurgical procedure to relieve compression on the brain caused by traumatic brain injuries, stroke, or acute subdural hematoma.

Intracranial injuries – including subdural or epidural hematomas, subarachnoid hemorrhages, and ruptured aneurysms.

Intraoperative trauma or unintended structural damage – unintended damage to surrounding structures, tissues, or vessels intraoperatively.

Lumbar discs with intractable pain – the intervertebral disc in the lumbar spine become damaged, bulged, or herniated.

Myelopathy with acute progression – an acute injury to the spinal cord caused my severe compression.

Polytrauma injuries – including unstable neurological patients with multi-system injuries.

Skull fractures – including fractures to the skull base, linear skull vault, and depressed skull fractures. Note that skull fractures are often indicative of an intracranial hemorrhage.

Spinal conditions – spinal epidural abscess or empyema, cauda equina syndrome, cervical myelopathy, spinal epidural hematoma, vertebral tumors, extramedullary spinal tumors.

Spinal cord compression – caused by a condition that puts pressure on the spinal cord. Often results in symptoms such as numbness, pain, or weakness.

Spinal cord injury (incomplete) – compression or injury to the spinal cord resulting in partial damage to the spinal cord.

Spinal cord injury (complete) – complete severance of the spinal cord produces a total loss of all motor and sensory function below the level of injury.

Stable spinal fractures – the spinal fracture does not cause any spinal deformity or nerve problems.

Unstable spinal fractures – a type of spinal fracture in which the vertebrae are moved out of the usual alignment.

Uncontrolled bleeding – bleeding that does not stop or slow with pressure or other hemostasis techniques.

Ventriculoperitoneal shunt revision – a neurosurgical procedure to treat excess cerebrospinal fluid in the ventricles of the brain.

Wound infections - a localized defect or excavation of the skin or underlying soft tissues in which pathological organisms have invaded. The surgical wound may have purulent drainage, reddened tissue, and be warm or painful.