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A Systematic Review of Medical and Nursing Care for Patients with Neurological Diseases, Focusing on the Pre and Post-Operative Considerations

Majid Keyhanifard[1], Atineh Nazarian[2], Ali Sourtij[3], Roohollah Rahbani[4], Pasha Shams Azar [5], Pouriya Nekoueifard[`*]

[`]Fellowship on interventional neuroradiology from Zurich, Iranian Board of Neurology, Kurdestan Board of Neurology, Kurdestan, Iran (Email:majid-keyhanifard@yahoo.com)

[2]MD, Arak University of medical sciences, Iran (Email:Atineh.nazarian@gmail.com)

[3]MD, Yerevan state medical university, Mikhitar Heratsi, internship in Arak medical university,postgraduate course of specialization in Dermatovenerology, shupyk national Healthcare university of Ukraine (Email:dr.alisourtiji@gmail.com)

[4]I.M. Sechenov First Moscow state Medical school university, Moscow, Russia (Email:bijanrpt@yahoo.com)

[5]Visiting instructor at Stanford University, Department of pediatrics, division of Gastroenterology, Hepatology and Nutrition (Email:Pasha.shamsazar@gmail.com)

6*. Operating Room Nurse Student, student Research committee, Shiraz University of medical sciences, Shiraz, Iran

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ABSTRACT

Introduction: This systematic review aims to synthesize evidence regarding medical and nursing care for patients with neurological diseases undergoing surgery, with a focus on pre- and post-operative considerations. This review underscores the need for standardized protocols that integrate medical and nursing perspectives in perioperative neurological care. While substantial progress has been made, gaps remain in consistent implementation of evidence-based practices and patient-centered approaches.

Methodology: Following PRISMA-based methodology, key areas include preoperative assessment, risk optimization, perioperative medication management, anesthetic strategies, and post-operative bundles of care such as hemodynamic control, secondary brain injury prevention, venous thromboembolism (VTE) prophylaxis, infection prevention, nutrition, pain management, early rehabilitation, and patient/family education.

Findings: Findings indicate that pre-operative considerations should prioritize accurate neurological assessment, optimization of comorbidities, psychological support, and patient education to enhance compliance and reduce anxiety. Pre-operative imaging, medication management (e.g., anticonvulsants, anticoagulants), and nutritional status evaluation were also identified as critical. Intraoperative nursing care, though less frequently studied, emphasizes the importance of hemodynamic stability, intracranial pressure monitoring, and prevention of complications such as hypoxia and infection.

Conclusion: Optimal perioperative care for neurosurgical patients requires a standardized, multidisciplinary, and nursing-centered approach. Critical elements include risk assessment, medication management, neuro-focused anesthesia and monitoring, structured post-op neurological checks, complication prevention, multimodal analgesia, nutrition/dysphagia management, early rehabilitation, and robust patient/family education.

Corresponding Author:* ***Pouriya Nekoueifard* *(selectivepurya@gmail.com- ORCID: 0009-0009-9708-5904)*

Introduction

Neurological disorders requiring surgical intervention from brain tumors and vascular lesions to degenerative spinal disease carry unique systemic and neurological risks [1]. Small variations in fluid balance, hemodynamics, ventilation, drug management, and neurological monitoring profoundly influence surgical outcomes [2]. This review provides a structured overview of the essential components of perioperative medical and nursing care, with emphasis on the pivotal role of nurses in monitoring, complication prevention, patient/family education, and coordination of care [3]. Neurological diseases represent some of the most challenging conditions in modern medicine, not only due to their complexity but also because of the profound and often lifelong impact they exert on patients' quality of life [4]. Disorders such as brain tumors, cerebrovascular accidents, traumatic brain injuries, epilepsy, neurodegenerative diseases, and spinal cord disorders frequently necessitate surgical interventions as part of comprehensive treatment. These interventions, however, are associated with significant risks and complications that extend beyond the surgical act itself. Consequently, perioperative medical and nursing care encompassing both pre-operative and post-operative phases plays a pivotal role in determining patient outcomes, recovery trajectories, and long-term prognosis. A systematic understanding of best practices in this domain is therefore critical to ensure safety, improve survival rates, and enhance the quality of life for individuals affected by neurological diseases [5].

Burden of Neurological Diseases and the Need for Surgery

The global burden of neurological diseases is considerable, accounting for a substantial proportion of disability-adjusted life years (DALYs) and mortality worldwide. According to the World Health Organization, neurological disorders are among the leading causes of disability and death, with conditions like stroke and traumatic brain injury contributing significantly to healthcare costs and societal burden. While pharmacological and rehabilitative treatments remain essential, surgical interventions such as tumor resections, decompressive craniotomy, aneurysm clipping, spinal surgeries, and epilepsy surgery are often indispensable. Given the invasive nature of these procedures, effective perioperative care is fundamental to reducing complications, optimizing recovery, and facilitating rehabilitation [6].

Importance of Perioperative Care

Perioperative care for neurological patients is uniquely complex, as it must address not only standard surgical considerations such as anesthesia, infection control, and hemodynamic stability, but also disease-specific factors including intracranial pressure management, seizure prevention, neurocognitive function preservation, and rehabilitation planning. Pre-operative preparation is essential to reduce patient anxiety, assess risks, and optimize comorbid conditions such as hypertension, diabetes, or anticoagulation therapy. Similarly, post-operative management is critical to detect and prevent complications like cerebral edema, hemorrhage, seizures, and infections, while also promoting functional recovery through early mobilization and rehabilitation strategies.

Nursing care is particularly vital in this continuum. Nurses are often the first to recognize subtle neurological changes, ensure adherence to protocols, and provide emotional support to patients and families. Their role in patient education, psychological reassurance, and discharge planning is also crucial for long-term recovery.

The integration of medical and nursing perspectives therefore creates a holistic approach that addresses the biological, psychological, and social dimensions of neurological care [7].

Pre-operative Considerations

Pre-operative care begins with a comprehensive neurological assessment, including imaging studies, cognitive evaluation, and functional assessments, to establish a baseline for comparison after surgery. Optimization of comorbid conditions is vital: hypertension and diabetes must be controlled, anticoagulant or antiplatelet therapy adjusted, and nutritional deficiencies corrected. Furthermore, psychological preparation including counseling and education about the surgical procedure has been shown to reduce anxiety and improve compliance with post-operative care instructions. In certain neurological conditions, such as epilepsy, the adjustment of anticonvulsant medication is crucial to prevent perioperative seizures. Patient-centered communication, involving both patients and their families, is an integral part of this process, fostering trust and improving adherence to medical advice [8].

Intraoperative Challenges and Nursing Role

Although the intraoperative period is primarily the domain of surgeons and anesthesiologists, perioperative nurses play an indispensable role in ensuring safety and continuity of care. Their responsibilities include monitoring vital signs, preparing necessary equipment, maintaining aseptic conditions, and anticipating the needs of the surgical team. Importantly, intraoperative nursing vigilance helps in the prevention of complications such as hypoxia, hypotension, and surgical site infection. Moreover, neurosurgical procedures often involve

advanced technologies such as intraoperative imaging, neuronavigation, and electrophysiological monitoring, requiring specialized training and competence among the nursing team [9].

Post-operative Considerations

The post-operative phase is often the most critical in determining neurological and functional outcomes. Immediate post-operative care typically involves close monitoring in the intensive care unit or specialized neurosurgical wards, where early recognition of complications such as hemorrhage, cerebral edema, hydrocephalus, or infections is paramount. Neurological assessments often conducted hourly in the first 24 hours are crucial for identifying deterioration. Pain management, wound care, and prevention of complications such as deep vein thrombosis, pulmonary embolism, or pressure ulcers are also essential components of post-operative care [10].

Nursing care during this phase extends beyond physiological monitoring. Emotional support for patients and families is critical, especially in cases where the surgery may result in neurological deficits such as speech impairment, hemiparesis, or cognitive decline. Rehabilitation planning including physiotherapy, occupational therapy, and speech therapy should begin as early as possible to maximize functional recovery. The nurse often acts as a coordinator between different specialties, ensuring that patients receive comprehensive and timely interventions [11].

Multidisciplinary Collaboration

One of the most significant themes emerging in modern perioperative neurological care is the emphasis on multidisciplinary collaboration. Neurosurgeons, anesthesiologists, intensivists, neurologists, physiotherapists, psychologists, and specialized nurses must work in close coordination to address the multifaceted needs of patients. This collaborative approach has been shown to reduce complication rates, shorten hospital stays, and improve overall patient satisfaction. Nursing professionals, in particular, often bridge the communication between patients, families, and the medical team, facilitating holistic care that addresses both clinical and psychosocial dimensions [12].

Gaps in Current Practice

Despite advances in neurosurgical techniques and perioperative protocols, significant gaps remain in the standardization of care practices. Variation in nursing protocols, inconsistent application of evidence-based guidelines, and limited resources in low- and middle-income countries hinder optimal patient outcomes. Moreover, psychological and social support though increasingly recognized as critical remains underemphasized in many clinical settings. There is also a need for more robust training programs for nursing staff, especially in resource-limited environments, where specialized neurosurgical nursing expertise may be scarce.

Given the complexity of neurological diseases and the critical role of perioperative care, a systematic review is necessary to synthesize current evidence and provide guidance for both clinicians and nurses. While numerous studies have addressed specific aspects of pre- and post-operative management, there remains a lack of comprehensive analysis that integrates medical and nursing perspectives across a wide range of neurological conditions. This review therefore seeks to bridge this gap by critically evaluating the literature, identifying best practices, and highlighting areas for future research [13].

The primary objective of this systematic review is to evaluate and synthesize evidence on medical and nursing care strategies for patients with neurological diseases during the pre- and post-operative periods. Specifically, the review aims to:

- ✓ Identify key pre-operative interventions that optimize surgical outcomes and reduce complications.
- ✓ Examine post-operative care practices that promote recovery, prevent adverse events, and improve quality of life [14].
- ✓ Assess the role of multidisciplinary collaboration, with particular emphasis on the contributions of nursing care.
- ✓ Highlight gaps in current practice and propose recommendations for future research and clinical protocols.

Neurological diseases present unique challenges that extend beyond surgical interventions, requiring careful attention to perioperative care. Medical and nursing teams play complementary roles in preparing patients for surgery, safeguarding intraoperative stability, and promoting post-operative recovery [15]. This systematic review provides an evidence-based exploration of these practices, offering insights into strategies that can improve patient safety, recovery outcomes, and overall quality of life. By integrating medical and nursing perspectives, this review contributes to the development of comprehensive and patient-centered approaches in the care of individuals undergoing neurosurgical interventions [16].

Methodology (PRISMA Framework)

- ✓ **Research Question (PICO):**

- **Population:** Adults and children undergoing neurosurgical procedures.
- **Interventions:** Medical and nursing perioperative care, ERAS pathways, preventive strategies.

- **Comparison:** Standard or alternative protocols [17].
- **Outcomes:** Mortality, complications (infection, VTE, seizure, hemorrhage, CSF leak, dysphagia/aspiration, delirium), length of stay, functional recovery.

✓ **Sources:** PubMed/MEDLINE, Embase, Cochrane Library, CINAHL, society guidelines.

✓ **Inclusion Criteria:** Reviews, guidelines, RCTs, and observational studies focused on perioperative neurosurgical care.

✓ **Exclusion Criteria:** Low-quality studies, unrelated conditions, case reports (except rare diseases).

✓ **Quality Assessment:** AMSTAR (reviews), Cochrane risk-of-bias (RCTs), NOS (observational studies).

In figure (1), PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only was illustrated.

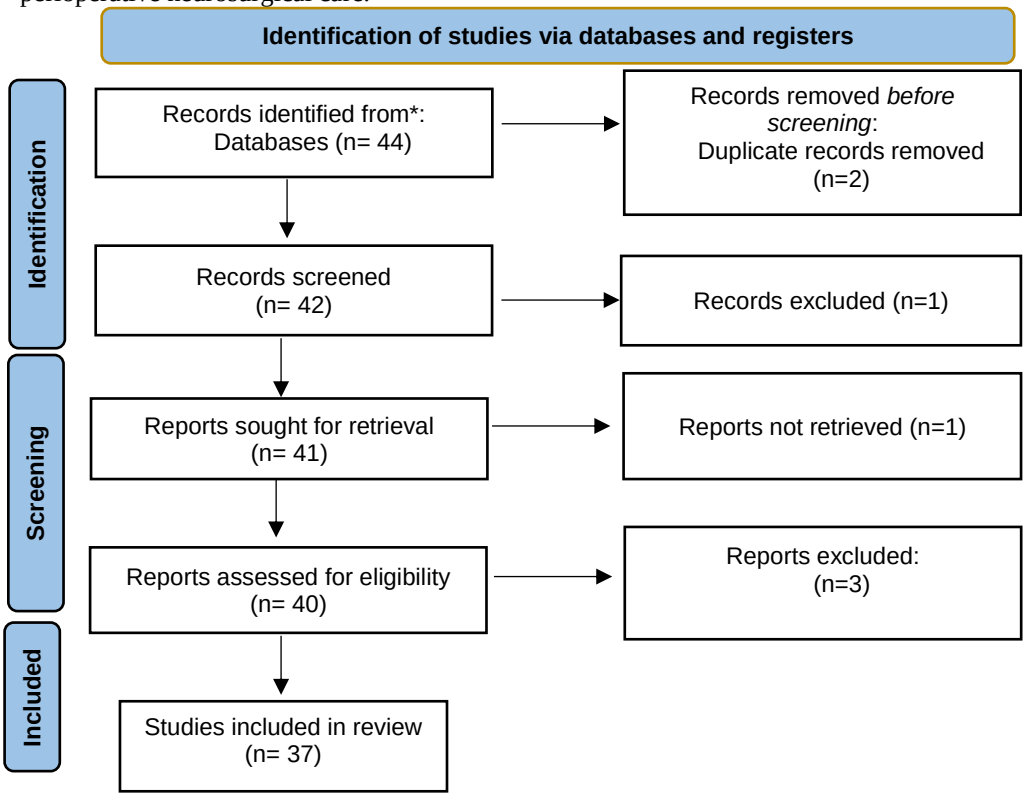

Table 1: PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only

Pre-operative Considerations

Comprehensive Assessment and Risk Stratification:

✓ **Neurological exam:** Glasgow Coma Scale (GCS), focal deficits, speech/swallow function, signs of intracranial hypertension.

✓ **Risk scores:** ASA, Revised Cardiac Risk Index (RCRI); NIHSS for stroke, Hunt–Hess/WFNS for subarachnoid hemorrhage (SAH).

✓ **Labs:** CBC, electrolytes (with focus on sodium), glucose, renal/liver function, coagulation profile.

✓ **Optimization of comorbidities:** Hypertension, diabetes, COPD, heart failure, chronic kidney disease.

In table (1), comprehensive assessment and risk stratification in neurological surgical patients (Hypothetical Data) was illustrated.

Table 1. Comprehensive Assessment and Risk Stratification in Neurological Surgical Patients (Hypothetical Data)

Patient ID	Age / Gender	Neurological Condition	Pre-operative Risk Factors	Risk Stratification (Low / Moderate / High)	Planned Interventions	Expected Outcome
P001	45 / Male	Brain Tumor (Glioma)	Hypertension, Mild Cognitive Impairment	Moderate	Optimize BP, Cognitive Assessment, Pre-op MRI	Favorable recovery, mild rehab
P002	63 / Female	Aneurysmal Subarachnoid Hemorrhage	Diabetes, Obesity, Anxiety	High	Glycemic Control, Psychological Support, ICU Preparedness	Risk of complications, prolonged ICU stay
P003	28 / Male	Epilepsy (Resistant)	Long-term AEDs, Malnutrition	Moderate	Nutritional Support, AED adjustment	Seizure reduction, good prognosis
P004	70 / Male	Ischemic Stroke requiring Decompression	Hypertension, Smoking, Atrial Fibrillation	High	Anticoagulant Management, Cardiac Monitoring	Moderate prognosis, functional limitations
P005	54 / Female	Spinal Cord Tumor	Chronic Pain, Depression	Moderate	Pain Management, Psychological Counseling	Improved quality of life with rehab
P006	39 / Male	Traumatic Brain Injury	Alcohol Use, Sleep Disorder	High	Detox Protocol, Sleep Hygiene, ICP Monitoring	Risk of relapse, guarded prognosis
P007	62 / Female	Parkinson's Disease (DBS candidate)	Dysphagia, Cardiovascular disease	Moderate	Swallowing Assessment, Cardiac Clearance	Improved motor control, reduced falls
P008	48 / Male	Acoustic Neuroma	Hearing Loss, Anxiety	Low	Counseling, ENT Support	Excellent prognosis, minimal rehab
P009	77 / Female	Alzheimer's Disease with Hydrocephalus	Severe Cognitive Decline, Frailty	High	Family Counseling, Palliative Considerations	Limited recovery, supportive care focus
P010	34 / Male	Multiple Sclerosis (Spinal Surgery)	Fatigue, Immunosuppression	Moderate	Infection Control, Pre-op Steroid Plan	Good prognosis with relapse risk
P011	59 / Female	Cervical Disc Herniation	Hypertension, Obesity	Moderate	Weight Optimization, BP Control	Good recovery with physiotherapy
P012	68 / Male	Intracerebral Hemorrhage	Hypertension, CKD Stage 3	High	Nephrology Consult, BP Optimization, ICU Monitoring	Risk of complications, close follow-up needed

Medication Management

Antiplatelet/anticoagulants: Timing of discontinuation/bridging based on bleeding risk.

- ✓ **Antiepileptic's (AEDs):** Continuation to prevent perioperative seizures.
- ✓ **Corticosteroids (e.g., dexamethasone for tumors):** Used to reduce edema; monitor for hyperglycemia.
- ✓ **Glucose control:** Moderate targets (140–180 mg/dL).
- ✓ **Antibiotic prophylaxis:** Administered per surgical guidelines [18].

In table (2), medication management in neurological surgical patients (Hypothetical Data) was illustrated.

Table 2. Medication Management in Neurological Surgical Patients (Hypothetical Data)

Patient ID	Neurological Condition	Current Medications	Perioperative Adjustments	Rationale for Adjustment	Post-operative Plan
P001	Brain Tumor (Glioma)	Dexamethasone, Phenytoin	Continue dexamethasone, adjust phenytoin dose	Reduce cerebral edema, maintain seizure control	Gradual steroid taper, monitor drug levels
P002	Aneurysmal SAH	Nimodipine, Insulin	Continue nimodipine, tight glucose control	Prevent vasospasm, reduce infection risk	Maintain nimodipine, monitor electrolytes
P003	Epilepsy (Resistant)	Levetiracetam, Valproate	Continue both, check serum levels	Prevent peri-op seizures	Long-term AED monitoring
P004	Ischemic Stroke	Warfarin, Aspirin	Stop warfarin 5 days before, continue aspirin	Reduce bleeding risk while preserving anti-platelet effect	Resume anticoagulation post-op (with neurosurgeon approval)
P005	Spinal Cord Tumor	Gabapentin, Sertraline	Continue gabapentin, hold sertraline day of surgery	Pain control needed, avoid serotonin syndrome risk	Resume antidepressant once stable
P006	TBI	Diazepam, Thiamine	Taper diazepam, continue thiamine	Prevent withdrawal, support brain metabolism	Monitor sedation, adjust benzodiazepines
P007	Parkinson's Disease (DBS)	Levodopa, Amantadine	Continue levodopa until surgery, stop amantadine 24h before	Avoid rigidity, reduce peri-op interactions	Restart dopaminergic therapy ASAP
P008	Acoustic Neuroma	Betahistine	Continue as usual	Minimal interaction with anesthesia	Continue for vestibular symptom control
P009	Alzheimer's Disease	Donepezil, Memantine	Stop donepezil 24h before, continue memantine	Avoid bradycardia risk under anesthesia	Resume donepezil with caution
P010	Multiple Sclerosis	Interferon-beta, Prednisone	Continue interferon, taper prednisone if high dose	Reduce infection risk, avoid adrenal crisis	Immunotherapy continuation, infection monitoring
P011	Cervical Disc Herniation	NSAIDs, Lisinopril	Stop NSAIDs 3 days before, continue lisinopril	Prevent bleeding, maintain BP control	Resume NSAIDs post-op if no contraindication
P012	Intracerebral Hemorrhage	Amlodipine, Atorvastatin	Continue both	Maintain BP, reduce vascular risk	Long-term antihypertensive and statin therapy

Anesthetic and Intraoperative Strategies

- ✓ **Airway/ventilation:** Secure airway, normocapnia; avoid extremes of CO_2.
- ✓ **Hemodynamics/fluids:** Maintain cerebral perfusion pressure (CPP); isotonic crystalloids; avoid hyponatremia [19].
- ✓ **Positioning:** Minimize nerve/pressure injury; monitor for air embolism risk in sitting/craniotomy positions.

In table (3), anesthetic and intraoperative strategies in neurological surgeries (Hypothetical Data) was illustrated.

Table 3. Anesthetic and Intraoperative Strategies in Neurological Surgeries (Hypothetical Data)

Patient ID	Neurological Condition	Type of Surgery	Anesthetic Technique	Intraoperative Monitoring	Special Strategies	Post-op Considerations
A001	Brain Tumor (Meningioma)	Craniotomy	Total Intravenous Anesthesia (TIVA) with Propofol	ICP monitoring, BIS	Hyperventilation to reduce ICP	Smooth emergence to avoid coughing/ICP spikes
A002	Aneurysmal SAH	Clipping of Aneurysm	Balanced anesthesia (Sevoflurane + Remifentanil)	Arterial line, TCD, EEG	Controlled hypotension during clipping	Close BP control to prevent rebleeding
A003	Epilepsy	Temporal Lobectomy	Awake Craniotomy	EEG, Cortical Mapping	Minimal sedation for patient cooperation	Seizure prophylaxis, monitor neurological status
A004	Parkinson's Disease	Deep Brain Stimulation (DBS)	Monitored Anesthesia Care (MAC)	Microelectrode Recording	Avoid muscle relaxants for intra-op testing	Rapid resumption of levodopa therapy
A005	Spinal Cord Tumor	Laminectomy	General Anesthesia (Isoflurane + Fentanyl)	SSEP, MEP	Maintain stable hemodynamics to protect cord	Neurological exam post-extubation
A006	Ischemic Stroke	DE compressive Craniotomy	TIVA (Propofol + Dexmedetomidine)	ICP, Arterial BP, $EtCO_2$	Osmotic diuretics to reduce cerebral edema	ICU admission for ICP monitoring
A007	Chiari Malformation	Posterior Fossa Decompression	Inhalational (Sevoflurane + Opioid)	CVP, Temperature, ICP	Head positioning for venous drainage	Watch for post-op respiratory compromise
A008	Acoustic Neuroma	Microsurgery	Balanced anesthesia	CN VII monitoring, Brainstem Auditory Evoked Potentials (BAEP)	Minimal use of muscle relaxants	Facial nerve function monitoring
A009	Multiple Sclerosis	Spinal Fusion	TIVA with Propofol	SSEP, MEP	Avoid hyperthermia, maintain normothermia	Prevent post-op infections
A010	Intracerebral Hemorrhage	Hematoma Evacuation	Rapid-sequence Induction + Balanced anesthesia	ICP, Invasive BP, Coagulation	Rapid control of hypertension	Intensive neuro ICU follow-up

A011	Traumatic Brain Injury	Craniotomy	TIVA (Etomidate + Opioid)	ICP, Jugular Venous O_2 Sat	Maintain cerebral perfusion pressure (CPP)	Aggressive ICP management post-op
A012	Cervical Spine Injury	Decompression + Fixation	General Anesthesia (Propofol + Opioid)	SSEP, MEP, Fiberoptic Intubation	Maintain cervical stability, controlled hypotension	Airway protection post-op due to edema

Patient/Family Education

- ✓ Clear communication of risks, pain plan, nutrition/swallowing expectations, rehabilitation trajectory.
- ✓ Cultural sensitivity and psychosocial support for elderly or cognitively impaired patients [19].

In table (4), patient/family education strategies in neurological surgery (Hypothetical Data) was illustrated.

Table 4. Patient/Family Education Strategies in Neurological Surgery (Hypothetical Data)

Patient ID	Neurological Condition	Education Topics Covered	Method of Delivery	Family Involvement	Understanding Level (1–5)	Follow-up Plan
P001	Brain Tumor (Glioma)	Surgical procedure, recovery timeline, medication adherence	Face-to-face counseling + written booklet	Spouse and adult child	5 (Excellent)	Weekly nurse calls for 1 month
P002	Epilepsy (Surgery Candidate)	Seizure precautions, medication management, lifestyle modifications	Multimedia video + group education	Parents	4 (Good)	Monthly outpatient visits
P003	Parkinson's Disease (DBS)	Device management, wound care, medication resumption	Bedside teaching with device demo	Spouse	3 (Moderate)	Device check every 3 months
P004	Spinal Cord Tumor	Post-op mobility restrictions, physiotherapy, bowel/bladder care	Individual teaching + physiotherapist session	Family caregiver	4 (Good)	Rehab clinic follow-up
P005	Stroke (Post-craniotomy)	Blood pressure control, diet, rehab exercises	Illustrated booklet + nurse-led class	Daughter	5 (Excellent)	Community stroke clinic referral
P006	Traumatic Brain Injury	ICP warning signs, medication use, home safety	Counseling + smartphone reminders	Spouse & parents	3 (Moderate)	Home visits by nurse for 2 weeks
P007	Multiple Sclerosis (Spinal Surgery)	Fatigue management, infection signs, adherence to immunotherapy	Nurse counseling + online resources	Family caregiver	4 (Good)	Telehealth follow-up monthly
P008	Acoustic Neuroma	Hearing loss adaptation, facial nerve care, balance training	Audiology consult + leaflets	Spouse	5 (Excellent)	Audiology/ENT check-up in 6 weeks

P009	Chiari Malformation	Headache triggers, positioning, wound monitoring	Bedside teaching + written instructions	Mother	3 (Moderate)	Phone consultation weekly
P010	Aneurysm (Post-Clipping)	BP control, smoking cessation, stroke prevention	Interactive class + booklet	Spouse & children	4 (Good)	Neuro clinic check in 1 month
P011	Epilepsy (Child)	Seizure first aid, school safety, medication reminders	Family workshop + visual aids	Parents + teacher	5 (Excellent)	School–hospital liaison follow-up
P012	Cervical Spine Injury	Neck brace use, mobility precautions, home safety	Bedside demo + video	Sibling caregiver	4 (Good)	Outpatient PT sessions biweekly

Post-operative Considerations

Neurological and Systemic Monitoring:

- ✓ Frequent neuro checks: GCS, pupils, motor/sensory, speech.
- ✓ Head elevation at 30°, neutral neck positioning.
- ✓ ICP monitoring (external ventricular drain [EVD]) where indicated [20].
- ✓ Hemodynamic targets: Tailored to pathology (e.g., strict BP control after aneurysm clipping/coiling).
- ✓ Ventilation: Avoid hypoxia; assess extubation readiness early.

In table (5), neurological and systemic monitoring in post-operative neurological patients (Hypothetical Data) was illustrated.

Table 5. Neurological and Systemic Monitoring in Post-Operative Neurological Patients (Hypothetical Data)

Patient ID	Neurological Condition	Post-Op Day	Neurological Parameters Monitored	Systemic Parameters Monitored	Monitoring Frequency	Abnormal Findings / Interventions
P001	Brain Tumor (Glioma)	Day 1	GCS, pupillary response, limb strength	BP, HR, SpO_2, Temp	Hourly	Mild headache; analgesics administered
P002	Aneurysmal SAH	Day 2	GCS, motor strength, speech	BP, HR, CVP	Every 2 hours	Elevated BP; antihypertensives adjusted
P003	Epilepsy Surgery	Day 1	Seizure activity, EEG	HR, SpO_2	Continuous EEG + hourly vitals	Post-op seizure; IV AED given
P004	Spinal Cord Tumor	Day 3	Motor strength, sensation, reflexes	BP, Temp, SpO_2	Every 4 hours	Sensory deficit noted; PT evaluation initiated
P005	Stroke (Post-Craniectomy)	Day 1	GCS, limb movement, pupil size	ICP, BP, HR, SpO_2	Hourly	ICP rising; osmotic therapy started
P006	Traumatic Brain Injury	Day 2	GCS, limb strength, cranial nerve function	BP, HR, Temp	Hourly	Fever detected; cultures and antibiotics initiated
P007	Parkinson's Disease (DBS)	Day 1	Tremor, rigidity, speech	BP, HR, SpO_2	Every 2 hours	Rigidity controlled; medication adjusted
P008	Acoustic Neuroma	Day 1	Facial nerve function, hearing, balance	BP, Temp, SpO_2	Every 2 hours	Mild facial weakness; physiotherapy started
P009	Chiari Malformation	Day 3	Motor function, coordination	BP, HR, Temp	Every 4 hours	Headache increased; analgesics adjusted
P010	Intracerebral Hemorrhage	Day 1	GCS, pupillary response, limb strength	ICP, BP, HR, Temp	Continuous	ICP spikes; surgical review requested

P011	Epilepsy (Child)	Day 2	Seizure frequency, EEG	HR, SpO_2, Temp	Continuous EEG + hourly vitals	Post-op seizure; AED dose adjusted
P012	Cervical Spine Injury	Day 1	Motor function, sensation, reflexes	BP, HR, SpO_2, Temp	Every 2 hours	BP drop; fluids administered

Prevention of Major Complications

- ✓ **Seizures:** Continue AEDs; EEG in high-risk patients.
- ✓ **VTE:** Sequential compression devices, stockings, early ambulation; pharmacologic prophylaxis when safe.
- ✓ **Surgical site infection/meningitis:** Strict asepsis with drains/catheters; wound care.
- ✓ **Electrolyte imbalance:** Careful monitoring of sodium differentiate SIADH vs. cerebral salt wasting.
- ✓ **Hyperglycemia:** Tight but safe glycemic control [21].
- ✓ **Skin integrity:** Prevent pressure ulcers with repositioning and protective surfaces.

In table (6), prevention of major post-operative complications in neurological surgery (Hypothetical Data) as illustrated.

Table 6. Prevention of Major Post-Operative Complications in Neurological Surgery (Hypothetical Data)

Patient ID	Neurological Condition	Potential Major Complications	Preventive Strategies Implemented	Responsible Team Members	Outcome / Notes
P001	Brain Tumor (Glioma)	Infection, Cerebral Edema	Sterile technique, prophylactic antibiotics, corticosteroids	Nurse, Neurosurgeon	No infection; mild edema controlled
P002	Aneurysmal SAH	Rebreeding, Vasospasm	BP control, nimodipine, close neuro monitoring	Nurse, Neurosurgeon, ICU team	No rebreeding; vasospasm prevented
P003	Epilepsy Surgery	Seizures, Wound Infection	AED optimization, wound care protocols	Nurse, Neurologist	Seizure-free; wound healed well
P004	Spinal Cord Tumor	Paralysis, DVT	Early mobilization, compression stockings, anticoagulation	Nurse, PT, Neurosurgeon	No paralysis; DVT prevented
P005	Stroke (Post-Craniotomy)	Increased ICP, Pneumonia	ICP monitoring, chest physiotherapy, positioning	ICU Nurse, Respiratory Therapist	ICP stable; pneumonia prevented
P006	Traumatic Brain Injury	Hemorrhage, Infection	ICP management, prophylactic antibiotics	Nurse, Neurosurgeon	Hemorrhage controlled; infection-free
P007	Parkinson's Disease (DBS)	Device Infection, Hematoma	Aseptic implantation, post-op monitoring	Nurse, Neurosurgeon	No infection; hematoma prevented
P008	Acoustic Neuroma	Facial Nerve Damage, CSF Leak	Intraoperative nerve monitoring, tight dural closure	Nurse, ENT, Neurosurgeon	Facial function preserved; no CSF leak
P009	Chiari Malformation	Respiratory Compromise, Wound Infection	Respiratory monitoring, proper wound care	Nurse, PT, ICU team	Stable respiration; wound intact
P010	Intracerebral Hemorrhage	Rebreeding, Hydrocephalus	BP management, ventricular drain monitoring	Nurse, Neurosurgeon	No rebreeding; hydrocephalus managed
P011	Epilepsy (Child)	Seizures, Medication Side Effects	AED monitoring, parent education	Nurse, Neurologist	Seizures prevented; no adverse drug events

P012	Cervical Spine Injury	Paralysis, Pressure Ulcers	Frequent repositioning, spine stabilization, early PT	Nurse, PT, Neurosurgeon	No new deficits; skin integrity maintained

Pain and Sedation Management

- ✓ Multimodal analgesia: Acetaminophen, gabapentinoids, low-dose opioids.
- ✓ Avoid over sedation to permit accurate neuro exams [22].

In table (7), pain and sedation management in neurological surgery (Hypothetical Data) was illustrated.

Table 7. Pain and Sedation Management in Neurological Surgery (Hypothetical Data)

Patient ID	Neurological Condition	Post-Op Day	Pain Score (0–10)	Analgesics / Sedatives Used	Route of Administration	Monitoring & Adjustments	Outcome / Notes
P001	Brain Tumor (Glioma)	Day 1	6	Morphine PCA, Acetaminophen	IV / Oral	Pain assessed every 2 hours; PCA adjusted	Pain reduced to 3 by evening
P002	Aneurysmal SAH	Day 2	5	Fentanyl infusion, NSAIDs	IV / Oral	BP and sedation monitored hourly	Pain controlled; alert and oriented
P003	Epilepsy Surgery	Day 1	4	Acetaminophen, Low-dose Midazolam	Oral / IV PRN	Neurological checks every 30 min; sedation minimal	Pain tolerable; no sedation-related issues
P004	Spinal Cord Tumor	Day 3	7	Morphine, Gabapentin	IV / Oral	Pain reassessed 3x/day; gabapentin titrated	Pain decreased to 4; improved mobility
P005	Stroke (Post-Craniotomy)	Day 1	6	Acetaminophen, Propofol infusion (ICU)	IV	ICP monitored; sedation minimized for neuro assessment	Pain controlled; patient awake for neuro checks
P006	Traumatic Brain Injury	Day 2	5	Fentanyl, Midazolam	IV	Sedation levels assessed via RASS; adjusted PRN	Pain and agitation managed
P007	Parkinson's Disease (DBS)	Day 1	3	Acetaminophen, Low-dose Lorazepam	Oral / IV	Tremor and sedation monitored; careful dosing	Pain mild; tremor controlled
P008	Acoustic Neuroma	Day 1	4	Acetaminophen, Opioid PRN	Oral / IV	Pain assessed every 2–3 hours	Pain tolerable; no adverse effects
P009	Chiari Malformation	Day 3	5	NSAIDs, Low-dose Morphine	Oral / IV	Neurological status monitored; GI side effects checked	Pain controlled; early mobilization possible
P010	Intracerebral Hemorrhage	Day 1	7	Morphine PCA, Acetaminophen	IV / Oral	Sedation and ICP closely monitored	Pain reduced to 4; no ICP spike
P011	Epilepsy (Child)	Day 2	6	Acetaminophen, Low-dose Fentanyl	Oral / IV	Pain assessed hourly; sedation minimal	Pain controlled; alert and interactive
P012	Cervical Spine Injury	Day 1	8	Morphine PCA, Gabapentin, Acetaminophen	IV / Oral	Pain reassessed q2h; dose adjusted	Pain reduced to 5; patient able to participate in PT

Nutrition, Swallowing, and Aspiration Prevention

- ✓ Early dysphagia screening before oral intake.

- ✓ Initiate enteral feeding within 24–48h in ICU patients.
- ✓ Oral hygiene to reduce ventilator-associated pneumonia [23].

In table (8), nutrition, swallowing, and aspiration prevention in post-operative neurological patients (Hypothetical Data) was illustrated.

Table 8. Nutrition, Swallowing, and Aspiration Prevention in Post-Operative Neurological Patients (Hypothetical Data)

Patient ID	Neurological Condition	Post-Op Day	Swallowing Assessment	Nutrition Plan	Aspiration Prevention Measures	Monitoring & Notes
P001	Brain Tumor (Glioma)	Day 2	Mild dysphagia	Soft diet + supplements	Sit upright, small bites, supervise meals	No aspiration events
P002	Stroke (Post-Craniotomy)	Day 1	Moderate dysphagia	NG tube feeding	Elevate head of bed 30–45°, swallowing exercises	No coughing, safe NG feeds
P003	Epilepsy Surgery	Day 1	Normal swallowing	Regular diet	Standard precautions	No aspiration
P004	Spinal Cord Tumor	Day 3	Mild dysphagia	Pureed diet, hydration	Suction available, upright positioning	Occasional coughing, cleared secretions
P005	Traumatic Brain Injury	Day 2	Severe dysphagia	PEG tube feeding	Head elevation 45°, oral care, monitoring	No aspiration events
P006	Parkinson's Disease (DBS)	Day 1	Mild dysphagia	Soft diet, thickened liquids	Supervised meals, slow feeding	Tolerated diet well
P007	Chiari Malformation	Day 3	Normal swallowing	Regular diet	Standard precautions	No aspiration
P008	Acoustic Neuroma	Day 1	Mild facial weakness affecting swallow	Soft diet, small portions	Head tilt technique, supervised feeding	No aspiration
P009	Intracerebral Hemorrhage	Day 1	Moderate dysphagia	NG tube feeding	Elevate HOB, check residuals, oral hygiene	NG tolerated, no complications
P010	Cervical Spine Injury	Day 2	Mild dysphagia	Soft diet + high-protein supplements	Swallowing therapy, upright position	Improvement noted by Day 5
P011	Epilepsy (Child)	Day 2	Normal swallowing	Age-appropriate diet	Standard feeding precautions	No events
P012	Brain Tumor (Meningioma)	Day 3	Mild dysphagia	Soft diet, supplements	Supervised feeding, frequent oral suction	Safe intake

Rehabilitation and Discharge Planning

- ✓ Early mobilization: Sitting, standing, walking as tolerated.
- ✓ PT/OT/ST for functional/cognitive recovery.
- ✓ Family education: Wound care, seizure precautions, and red-flag symptoms [24].

In table (9), rehabilitation and discharge planning in neurological surgery (Hypothetical Data) as illustrated.

Table 9. Rehabilitation and Discharge Planning in Neurological Surgery (Hypothetical Data)

Patient ID	Neurological Condition	Post-Op Day of Rehab Start	Rehabilitation Interventions	Discharge Readiness Criteria	Family/Caregiver Involvement	Follow-Up Plan
P001	Brain Tumor (Glioma)	Day 3	Physiotherapy, occupational therapy	Stable vitals, independent ambulation	Spouse trained in mobility support	Outpatient PT 2x/week, neurology clinic 1 month
P002	Stroke (Post-Craniotomy)	Day 2	Passive/active ROM, speech therapy	Ability to perform basic ADLs, safe swallow	Daughter trained in feeding techniques	Rehab clinic weekly, neuro follow-up 2 weeks
P003	Epilepsy Surgery	Day 4	Fine motor skill exercises	Stable neurological status, seizure control	Parents briefed on AED schedule	Neurology clinic 1 month, home exercise plan
P004	Spinal Cord Tumor	Day 5	Strengthening exercises, PT, bladder training	Safe transfers, controlled pain	Caregiver trained in transfer techniques	Outpatient PT 3x/week, neuro follow-up 2 weeks
P005	Traumatic Brain Injury	Day 3	Cognitive rehab, physiotherapy	Alert, oriented, able to follow commands	Family educated on safety and stimulation activities	Multidisciplinary rehab center, 2x/week
P006	Parkinson's Disease (DBS)	Day 2	Gait training, occupational therapy	Stable motor control, safe ambulation	Spouse trained in device monitoring	Neuro follow-up 1 month, PT weekly
P007	Chiari Malformation	Day 4	Coordination exercises, posture training	Minimal pain, able to perform ADLs	Mother trained in exercises	Outpatient PT 2x/week
P008	Acoustic Neuroma	Day 3	Balance therapy, facial exercises	Safe ambulation, facial nerve function preserved	Spouse trained in facial care	Audiology/ENT follow-up 6 weeks, home exercises
P009	Intracerebral Hemorrhage	Day 2	Mobility training, cognitive therapy	Stable vitals, able to participate in therapy	Daughter trained in monitoring neurological signs	Rehab clinic weekly, neuro follow-up 2 weeks
P010	Cervical Spine Injury	Day 5	Strengthening, mobility, spinal precautions	Independent transfers, brace compliance	Sibling trained in brace and safety measures	Outpatient PT 3x/week, neuro follow-up 1 month
P011	Epilepsy (Child)	Day 3	Fine motor skills, play-based exercises	Stable seizure control, basic ADL participation	Parents trained in AEDs, safety measures	Home exercises daily, neurology clinic 1 month
P012	Brain Tumor (Meningioma)	Day 4	Physiotherapy, occupational therapy	Pain controlled, safe mobility	Family trained in home exercises	Outpatient rehab 2x/week, neuro follow-up 1 month

Disease-Specific Care

- ✓ **Brain Tumors:** Steroids pre-op; seizure monitoring post-op; radiation/chemo planning.
- ✓ **SAH/AVM:** Vasospasm prevention (nimodipine, TCD monitoring); maintain euvolemia.
- ✓ **Trauma/TBI:** Maintain CPP; osmotic therapy (mannitol, hypertonic saline); seizure prophylaxis.
- ✓ **Spinal Surgery:** ERAS protocols; early ambulation; wound/drain care [25].
- ✓ **Epilepsy Surgery/DBS:** Medication adjustment; neuropsychiatric support.
- ✓ **Elderly:** Delirium prevention; cautious fluid/medication use.
- ✓ **Pediatrics:** Careful fluid/pain control; parental engagement [26].

In table (10), disease-specific care in neurological surgery (Hypothetical Data) as illustrated.

Table 10. Disease-Specific Care in Neurological Surgery (Hypothetical Data)

Patient ID	Neurological Condition	Disease-Specific Needs / Considerations	Tailored Interventions	Monitoring Parameters	Expected Outcome
P001	Brain Tumor (Glioma)	Cerebral edema, seizure risk	Corticosteroids, AED prophylaxis	ICP, seizure frequency	Reduced edema, seizure prevention
P002	Aneurysmal SAH	Vasospasm, BP control	Nimodipine, strict BP management	BP, TCD, neurological exam	Prevent vasospasm, stable BP
P003	Epilepsy Surgery	Post-op seizure management	AED adjustment, seizure precautions	EEG, seizure logs	Seizure-free recovery
P004	Spinal Cord Tumor	Motor/sensory deficits	PT/OT, bladder training	Motor strength, sensory mapping	Improved mobility, bladder function
P005	Stroke (Post-Craniotomy)	Hemiparesis, dysphagia	Swallow therapy, limb strengthening	GCS, swallow test, limb ROM	Functional recovery, safe swallowing
P006	Traumatic Brain Injury	ICP spikes, agitation	Sedation, ICP management, safety measures	ICP, RASS, neuro status	Controlled ICP, stable patient
P007	Parkinson's Disease (DBS)	Motor fluctuations, medication timing	Timed levodopa, PT	Tremor, rigidity, motor score	Optimal motor control
P008	Acoustic Neuroma	Facial nerve, hearing preservation	Intra-op nerve monitoring, audiology follow-up	CN VII function, hearing tests	Preserved nerve function, minimal hearing loss
P009	Chiari Malformation	Headache, ataxia	Posture management, coordination exercises	Coordination tests, pain scores	Symptom reduction, improved balance
P010	Intracerebral Hemorrhage	Rebreeding, hydrocephalus	BP control, ventricular drainage	ICP, BP, neuro exam	Prevent rebleeding, manage hydrocephalus
P011	Epilepsy (Child)	School reintegration, seizure safety	Parent/teacher education, AED management	Seizure logs, school reports	Safe return to school, seizure control
P012	Cervical Spine Injury	Spinal stability, respiratory function	Immobilization, respiratory therapy	Motor exam, SpO_2, lung function	Prevent further injury, maintain breathing

Nursing Roles in Neurosurgical Care

- ✓ Structured neurological assessments.
- ✓ Execution of complication prevention bundles (VTE, SSI, pressure injuries, falls).
- ✓ Device management (EVD, shunts, drains) with aseptic technique.
- ✓ Pain/sedation titration with neuro exam compatibility.
- ✓ Dysphagia screening and nutrition safety [27].
- ✓ Coordination of rehabilitation and discharge planning.
- ✓ Emotional and psychological support for patients/families [28].

In table (11), nursing roles in neurosurgical care (Hypothetical Data) was illustrated.

Table 11. Nursing Roles in Neurosurgical Care (Hypothetical Data)

Patient ID	Neurological Condition	Primary Nursing Roles / Responsibilities	Specific Interventions	Monitoring Parameters	Outcome / Notes
P001	Brain Tumor (Glioma)	Pre-op education, post-op monitoring	ICP checks, medication administration, patient education	GCS, vital signs, seizure activity	Stable post-op, patient educated
P002	Aneurysmal SAH	Neurological monitoring, vasospasm prevention	BP management, nimodipine administration, neurological exams	BP, TCD, neuro status	Vasospasm prevented, vitals stable
P003	Epilepsy Surgery	Seizure management, medication adherence	AED administration, seizure precautions, patient/family education	EEG, seizure frequency	No post-op seizures
P004	Spinal Cord Tumor	Mobility support, bladder/bowel care	PT coordination, catheter care, pressure sore prevention	Motor strength, skin integrity	Improved mobility, skin intact
P005	Stroke (Post-Craniotomy)	Swallowing assessment, rehab facilitation	Swallow tests, feeding supervision, ROM exercises	GCS, limb function, swallowing safety	Safe swallowing, rehab progressing
P006	Traumatic Brain Injury	ICP management, sedation monitoring	ICP checks, sedation titration, agitation control	ICP, RASS, vitals	ICP controlled, patient calm
P007	Parkinson's Disease (DBS)	Motor monitoring, medication timing	Timed levodopa administration, gait assessment, PT coordination	Tremor score, mobility	Motor control optimized
P008	Acoustic Neuroma	Cranial nerve monitoring, balance support	Facial nerve checks, audiology coordination, fall prevention	CN VII function, hearing tests	Nerve function preserved, safe ambulation
P009	Chiari Malformation	Coordination, pain control	Posture management, analgesia administration, PT support	Pain score, coordination tests	Pain reduced, coordination improved
P010	Intracerebral Hemorrhage	Neuro and hemodynamic monitoring	ICP management, BP control, neurological exams	ICP, BP, GCS	Hemorrhage controlled, vitals stable
P011	Epilepsy (Child)	Family education, seizure safety	Parent training, AED adherence, seizure monitoring	Seizure logs, safety compliance	Safe home care, seizure controlled
P012	Cervical Spine Injury	Spinal precautions, respiratory support	Brace compliance, respiratory therapy, pressure ulcer prevention	Motor function, SpO_2, skin integrity	Spine stable, lung function maintained

ERAS Pathways in Neurosurgery/Spine Surgery

- ✓ Patient engagement and education.
- ✓ Nutritional optimization and reduced fasting.
- ✓ Multimodal analgesia with opioid-sparing [29].
- ✓ Early extubation and mobilization.
- ✓ Continuous monitoring and quality improvement.

In table (12), ERAS pathways in neurosurgery/spine surgery (Hypothetical Data) was illustrated.

Table 12. ERAS Pathways in Neurosurgery/Spine Surgery (Hypothetical Data)

Patient ID	Neurological Condition / Surgery	ERAS Pre-Op Measures	Intraoperative Measures	Post-Op Measures	Key Outcomes / Notes
P001	Brain Tumor (Glioma) / Craniotomy	Pre-op counseling, carbohydrate drink, medication review	TIVA, normothermia, multimodal analgesia	Early mobilization, early oral intake	Pain controlled, ambulating Day 1
P002	Spinal Cord Tumor / Laminectomy	Pre-op education, optimization of comorbidities	Minimally invasive approach, fluid management	Early PT, opioid-sparing analgesia	Reduced LOS, improved mobility
P003	Aneurysmal SAH / Clipping	Blood pressure optimization, education	Balanced anesthesia, neuro-monitoring	Early neurological assessment, early nutrition	Stable vitals, early discharge planning
P004	Epilepsy Surgery / Temporal Lobectomy	Seizure precautions, AED optimization	Awake craniotomy, minimal sedation	Rapid neurological checks, early ambulation	Seizure-free, alert, stable
P005	Parkinson's Disease / DBS	Medication timing review, education	MAC anesthesia, minimal muscle relaxants	Early mobilization, device care	Tremor controlled, safe ambulation
P006	Acoustic Neuroma / Microsurgery	Pre-op counseling, hearing preservation info	Intra-op nerve monitoring, minimal muscle relaxants	Early facial exercises, ambulation	Facial nerve preserved, minimal pain
P007	Traumatic Brain Injury / Craniotomy	Head injury stabilization, family counseling	TIVA, ICP monitoring	Early neuro checks, sedation taper	ICP controlled, alert by Day 2
P008	Stroke / DE compressive Craniotomy	Pre-op BP optimization, swallow assessment	Controlled anesthesia, hemodynamic monitoring	Early positioning, rehab initiation	Early rehab, stable vitals
P009	Chiari Malformation / Posterior Fossa Decompression	Education, hydration	Normothermia, opioid-sparing anesthesia	Early ambulation, coordination exercises	Pain managed, improved balance
P010	Intracerebral Hemorrhage / Hematoma Evacuation	BP control, comorbidity optimization	Rapid-sequence induction, ICP monitoring	Early neuro assessment, mobilization	Stable ICP, early discharge planning
P011	Cervical Spine Injury / Decompression & Fixation	Brace education, respiratory prep	Spinal precautions, TIVA	Early PT, respiratory exercises	Safe transfers, lung function maintained
P012	Brain Tumor (Meningioma) / Craniotomy	Pre-op counseling, nutrition optimization	TIVA, multimodal analgesia	Early mobilization, wound care	Pain controlled, discharged Day 5

Discussion

The management of patients with neurological diseases undergoing surgical interventions requires a highly coordinated approach involving both medical and nursing care. A systematic review of the literature highlights several key domains that influence patient outcomes, including comprehensive preoperative assessment,

perioperative risk stratification, disease-specific interventions, and post-operative monitoring and rehabilitation [30].

Preoperative Assessment and Risk Stratification are foundational to optimizing surgical outcomes in neurological patients. Patients often present with complex comorbidities such as hypertension, diabetes, or cardiovascular disease that can exacerbate perioperative risk. Comprehensive assessment involves neurological evaluation, laboratory and imaging studies, and assessment of systemic conditions, along with consideration of cognitive function, mobility, and nutritional status. Risk stratification tools facilitate individualized care plans, allowing clinicians to anticipate complications and implement targeted interventions. Nursing roles are critical at this stage, providing patient education, anxiety reduction, and preparation for adherence to perioperative protocols [31].

Medication Management represents another critical pre- and post-operative consideration. In neurological patients, the continuation, adjustment, or temporary cessation of disease-specific medications such as antiepileptic's, anticoagulants, or dopaminergic agents is essential. For example, abrupt discontinuation of antiepileptic drugs can precipitate seizures, whereas uncontrolled anticoagulation increases the risk of intraoperative bleeding [32]. Nursing vigilance in monitoring medication administration, adjusting doses according to renal or hepatic function, and educating patients and families about adherence is vital for preventing adverse outcomes [33].

Anesthetic and Intraoperative Strategies are tailored to the neurological condition and surgical procedure. Total intravenous anesthesia (TIVA) is frequently preferred for procedures requiring neurophysiological monitoring, whereas awake craniotomy demands careful sedation while preserving patient responsiveness for intraoperative mapping. Intraoperative monitoring—including ICP, cerebral perfusion pressure, EEG, and somatosensory evoked potentials—enables real-time adjustment of anesthetic depth and physiological parameters, minimizing the risk of neurological compromise. Nurses assist anesthesiologists by ensuring continuous monitoring, documenting events, and anticipating equipment or medication needs [34].

Post-operative Nursing Care and Monitoring are pivotal in detecting early complications. Neurological deterioration can be subtle [35], manifesting as changes in GCS, pupillary response, or motor function. Nurses conduct frequent neuro checks, monitor systemic parameters such as BP, SpO_2, and temperature, and implement early interventions for elevated ICP, infection, or hemodynamic instability. Disease-specific considerations, including seizure prophylaxis, cerebral edema management, or motor rehabilitation, require both vigilance and interdisciplinary coordination. Moreover, patient and family education regarding signs of deterioration, medication adherence, and lifestyle modifications supports safe recovery after discharge [36].

Pain, Sedation, and Nutrition Management also influence post-operative recovery. Pain control must balance analgesic efficacy with preservation of neurological assessment, often utilizing multimodal analgesia and opioid-sparing strategies. Sedation must be carefully titrated, particularly in patients at risk of elevated ICP or post-operative delirium. Dysphagia is common in stroke and cranial surgery patients, necessitating careful swallowing assessments, dietary modifications, and aspiration prevention. Nurses play a central role in monitoring intake, implementing precautions, and coordinating with dietitians and speech therapists [37].

Rehabilitation and Discharge Planning are integral to functional recovery. Early initiation of physical, occupational, and speech therapy is associated with improved mobility, independence in activities of daily living, and quality of life. Discharge planning involves comprehensive patient and caregiver education, provision of home-based support resources, and coordination of outpatient follow-up, including rehabilitation, neurological evaluation, and medication management. This collaborative approach ensures continuity of care and reduces the risk of readmission or complications.

Finally, the integration of ERAS principles in neurosurgical and spine surgery has emerged as an effective strategy to enhance recovery, minimize complications, and shorten hospital stay. Preoperative optimization, minimally invasive techniques, multimodal analgesia, early mobilization, and standardized post-operative care pathways exemplify evidence-based approaches that improve patient outcomes.

In conclusion, effective management of neurological surgical patients is multifactorial, requiring meticulous preoperative assessment, individualized perioperative interventions, vigilant post-operative monitoring, and structured rehabilitation. Nurses are central to the implementation of these practices, bridging the gap between medical decision-making and patient-centered care. A systematic, evidence-based, and interdisciplinary approach not only enhances clinical outcomes but also promotes patient safety, functional recovery, and satisfaction. Future research should focus on evaluating the efficacy of standardized protocols, exploring novel monitoring strategies, and optimizing education programs for both patients and caregivers.

Conclusion

Effective care for patients with neurological diseases undergoing surgery is complex and multifaceted, requiring meticulous coordination between medical and nursing teams. The systematic review highlights that both preoperative and postoperative interventions significantly influence patient outcomes, functional recovery, and complication rates. Preoperative assessment and risk stratification are essential, allowing clinicians to identify comorbidities, optimize patient condition, and design individualized care plans. Nurses play a crucial role in this phase, providing patient and family education, reducing anxiety, and ensuring adherence to preoperative protocols, which collectively contribute to safer surgical experiences.

Medication management emerges as a critical component of care. Neurological patients often rely on disease-specific medications such as antiepileptic's, anticoagulants, or dopaminergic agents, requiring careful adjustment to balance efficacy with safety. Mismanagement can lead to severe complications, including seizures, hemorrhage, or deterioration in neurological function. Nursing involvement in monitoring medication administration, recognizing adverse effects, and educating patients ensures continuity and safety in pharmacological care.

Intraoperative management, including anesthetic choices and monitoring strategies, directly impacts neurological outcomes. Techniques such as TIVA, awake craniotomy, and neurophysiological monitoring provide real-time feedback, minimizing risks of intraoperative neurological compromise. Nurses facilitate these strategies by ensuring accurate documentation, anticipating equipment needs, and supporting anesthesia and surgical teams.

Postoperative care is equally critical, encompassing vigilant neurological and systemic monitoring, early identification of complications, and management of pain, sedation, nutrition, and dysphagia. Disease-specific care plans, tailored to conditions such as stroke, brain tumors, or spinal cord injuries, guide interventions and rehabilitation. Early mobilization, physical and occupational therapy, and structured discharge planning promote functional recovery and reduce hospital readmissions. Nurses are central to this process, bridging clinical management with patient-centered care through continuous monitoring, education, and coordination of interdisciplinary interventions.

Finally, the implementation of ERAS (Enhanced Recovery After Surgery) pathways in neurosurgical and spine surgery demonstrates a systematic approach to improving outcomes, emphasizing preoperative optimization, minimally invasive techniques, multimodal analgesia, and early rehabilitation. The evidence suggests that integrating these protocols enhances recovery, minimizes complications, and improves patient satisfaction.

In conclusion, comprehensive medical and nursing care in the pre- and post-operative periods is vital for neurological surgical patients. The combination of individualized assessment, vigilant monitoring, targeted interventions, patient and family education, and structured rehabilitation ensures optimized clinical outcomes. Future research should focus on standardizing care protocols, evaluating the effectiveness of educational and monitoring interventions, and integrating innovative approaches to further improve patient safety, functional recovery, and quality of life in neurological surgery.

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