COMPETENCY BASED

POSTGRDUATE CURRICULUM

DEPARTMENT OF NEUROSURGERY

UTTAR PRADESH UNIVERSITY OF MEDICAL SCIENCES, SAIFAI, ETAWAH

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INTRODUCTION

Definition:

Neurosurgery is the specialty of surgery dedicated to the diagnosis, surgical and non-surgical management of congenital abnormalities, trauma, and diseases affecting the nervous system, its blood supply, and supporting structures, in both adults and children.

Neurosurgery Practice:

Neurosurgery is the surgical specialty that enhances survival and improves the quality of life of patients with disorders of the central and peripheral nervous system. This includes conditions affecting the brain, skull, spinal cord, spinal discs, vertebrae, cranial, cervical and spinal blood vessels, nerves, ligaments, and the protective coverings that offer support to the nervous tissues.

Neurosurgeons are involved in the care of patients with neurosurgical emergencies and patients referred for suspected neurosurgical conditions. Neurosurgeons select investigations and synthesize the results to determine the indications for medical or surgical treatment, and/or further consultation. When surgery is indicated, neurosurgeons optimize patients for surgery and perform the appropriate procedures. They provide neuro-critical care for patients with neurosurgical emergencies as well as those for whom it is part of post-operative management. Post-operative recovery may lead to transition of care back to the patient's primary care provider, another specialty service, or referral to rehabilitation services.

Neurosurgeons provide long-term follow-up or surveillance for a limited number of conditions.
Patients with neurosurgical emergencies require immediate clinical assessment along with neuroimaging to identify opportunities for intervention and to optimize neurologic outcomes. This need for immediate consultant level care and access to neuroimaging delineates the practice locations of Neurosurgeons, requiring that they primarily practice in institutions with advanced imaging services, in either academic or larger community based settings.

The practice of Neurosurgery interconnects with other disciplines in the neurosciences for the care of mutual patients. In addition, neurosurgeons may work in intraprofessional teams with interventional radiologists or neuroradiologists for the care of patients with cerebrovascular disease, with orthopedic surgeons for the care of patients with spinal conditions, and with medical or radiation oncologists for the care of patients with cancer affecting the central and peripheral nervous system.

The breadth of Neurosurgery, and the available treatment options, has led to the delineation of distinct clinical areas of the specialty: functional neurosurgery, surgical neuro-oncology, peripheral nerve repair, spinal neurosurgery, vascular and endovascular neurosurgery, radiosurgery, skull base neurosurgery, pediatric neurosurgery, neuro-trauma and neuro-critical care. Some neurosurgeons undertake advanced training and/or focus their practice in one or more of these areas.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

- **PEO1:** Specialist who can provide comprehensive care related to Neurosurgery over and above the physician of first contact.
- **PEO2:** Leader and team member who understands health care system and act to provide safe patient care with accountability and responsibility.
- **PEO3:** Communicator possessing adequate communication skill to convey required information in an appropriate manner in various health care setting.
- **PEO4:** Lifelong learner keen on updating oneself regarding the advancement in the health care field and able to perform the role of researcher and teacher
- **PEO5:** Professional who understands and follows the principle of bio-ethics / ethics related to health care system

PROGRAM OUTCOME (PO)

At the end of the M.Ch. Neurosurgery courses the resident should be able to:

- **PO 1** Practice the specialty of Neurosurgery in keeping with the principles of professional ethics.Identify social, economic, environmental, biological and emotional determinants of Neurosurgery and know the therapeutic, rehabilitative, preventive and promotion measures so as to provide holistic care to all patients
- **PO 2** Take detailed history, perform complete physical examination and make a clinical diagnosis. Perform and interpret relevant investigations (Imaging and Laboratory). Perform and interpret important diagnostic procedures
- **PO 3** Diagnose illnesses in adults, based on the analysis of history, physical examination and investigative work up. Plan and deliver comprehensive treatment for illness in adults using principles of rational drug therapy
- **PO 4** Perform common minor & major Neurosurgical procedures and provide peri-operative care. Manage emergencies efficiently. Demonstrate skills in documentation of case details, and of morbidity and mortality data relevant to the assigned situation
- **PO 5** Demonstrate empathy and humane approach towards patients and their families and respect their sensibilities. Demonstrate communication skills of a high order in explaining management and prognosis, providing counselling and giving health education messages to patients, families and communities.
- **PO 6** Facilitate learning by medical/nursing students, practising surgeons , para-medical health workers and other providers as a teacher-trainer

COURSE AND COURSE OBJECTIVES (CO)

Course 1 (C1): Basic Sciences as related to Neurosurgery

Objectives: At the end of three years post graduate student should be proficient in the basic sciences related to Neurosurgery, namely Neuroanatomy, Neurophysiology, Neurochemistry, Neuropathology and Neuropharmacology. The candidate should have a detailed working knowledge of clinical examination of the neurological/neurosurgical patient including neonates and infants and unconscious patients, various medical neurological disorders and differentiation of some common medical neurological disorders which can closely mimic neurosurgical conditions, various diagnostic procedures used, and the treatment of common neurological disorders.

Course 2 (C2): Clinical Neurosurgery

Objectives: At the end of three years post graduate student should be able to well versed with all theoretical aspects, practical ward procedures, special investigatory methods including neuroradiology, clinical features, diagnosis and differential diagnosis, preoperative and postoperative assessment and care of all the surgical diseases of the nervous system

Course 3 (C3): Operative Neurosurgery

Objectives: At the end of three years post graduate student should competent in decision making about indications/ contra-indications for surgical procedures in various neurosurgical conditions, relevant operative surgical anatomy, Pre-operative planning, patient positioning, operative techniques, use of surgical tools and post-operative care for complications. The resident should be able to perform basic neurosurgical procedures independently or under supervision and assist in complex neurosurgeries.

Course 4 (C4): Recent advances in Neurosurgery

Objectives: At the end of three years post graduate student shall be up-to-date with the recent advances and basic research methods in neurosurgery and the use of all the special surgical tools including Operating Microscope, LASER, CUSA, Neuroendoscopy, Radiosurgery, Intervention Neuroradiology, Stereotaxic surgery, etc

CORE COMPETENCIES

Neurosurgeon as a Medical Expert

Definition:
As Medical Experts, Neurosurgeons apply knowledge, clinical skills, and professional values in their provision of high-quality and safe patient-centered care.

Key and Enabling Competencies: Post-graduates are able to…

1. Practice medicine within their defined scope of practice and expertise

1.1 Demonstrate a commitment to high-quality care of their patients
1.2 Apply knowledge of the clinical and biomedical sciences relevant to Neurosurgery

1. Embryology of the nervous system and the pathogenesis of congenital anomalies

2. Anatomy and physiology of the nervous system

Cerebral cortex, subcortical regions, basal ganglia, thalamus, brain stem, cerebellum and cranial nerves

Pituitary gland and neuroendocrine function

Meninges

Spinal cord

Spine and skull

Cerebral and spinal vessels

Nerve roots, peripheral nerves and associated muscles

Neurotransmission

Formation, circulation and absorption of cerebrospinal fluid (CSF)

Autonomic nervous system

Motor and sensory systems

Special senses

Consciousness, sleep and mechanisms of wakefulness

Speech, memory, learning and behaviour

Pain

3 Fundamentals of clinical neuroendocrinology

4 Gross and microscopic pathology of neurosurgical conditions

5 Clinical and molecular genetics of neurosurgical conditions

6 Microbiology and pathology of infectious diseases of the nervous system

7 Clinical epidemiology of neurosurgical conditions

8 Clinical features, including symptoms, signs, natural history, and prognosis, of neurosurgical conditions in the following categories:

1. Neurosurgical emergencies
2. Trauma
3. Infection and inflammation
4. CSF disorders
5. Pediatric and congenital
6. Neuro-oncology

7. Cerebrovascular

8. Functional neurosurgery

9. Peripheral nerve

10. Spinal neurosurgery

9. Common neurological conditions, with particular emphasis on those neurological entities which have important differential diagnostic considerations with respect to neurosurgical care

10. Principles of neuro-ophthalmology and neuro-otology

11. Principles of neuropsychology relevant to Neurosurgery

12. Fundamental principles of neuroanesthesia

13. Principles of neuro-critical care

14. Clinical pharmacology: the indications for, mechanism(s) of action of, side effects of, and dosages of drugs and agents used in neurosurgical therapeutics

15. Principles of radiation safety and protection

16. Fundamental knowledge of imaging modalities, techniques, and contrast agents, including benefits and risks, for care of neurosurgical patients

17. Therapeutic and toxic effects of radiation therapy on the nervous system and supporting structures

18. Principles of, and procedures for, surgical management of functional neurosurgical conditions

1. Epilepsy

2. Pain and spasticity

3. Movement disorders

19. Principles of physical medicine and rehabilitation in the treatment of neurosurgical patients

20. Pathophysiology and principles of the declaration of neurologically determined death

1.3 Perform appropriately timed clinical assessments with recommendations that are presented in an organized manner

1.4 Carry out professional duties in the face of multiple, competing demands

1.5. Recognize and respond to the complexity, uncertainty, and ambiguity inherent in Neurosurgery practice

2. Perform a patient-centred clinical assessment and establish a management plan

2.1 Prioritize issues to be addressed in a patient encounter

2.1.1. Identify patients at risk of clinical deterioration

2.1.2. Triage patients based on clinical presentation and medical imaging to determine priorities and the appropriate setting of care

2.2 Elicit a history, perform a physical exam, select appropriate investigations, and interpret their results for the purpose of diagnosis and management, disease prevention, and health promotion

2.2.1. Identify and interpret the clinical significance of the findings of a neurological examination

2.2.2. Assess patients preoperatively and determine the significance of pre-existing medical conditions, and their impact on perioperative risk

2.2.3. Select and interpret general diagnostic tests for the management of neurosurgical patients

2.2.4. Select and interpret neuroimaging investigations

2.2.4.1. Radiography

2.2.4.2. Computerized tomography

2.2.4.3. Magnetic resonance imaging

2.2.4.4. Angiography

2.2.5. Select specific diagnostic investigations for the management of neurosurgical patients and interpret their reports

2.2.5.1. Cerebrospinal fluid studies

2.2.5.2. Clinical electrophysiology

2.2.5.2.1. Electroencephalography

2.2.5.2.2. Electrocorticography

2.2.5.2.3. Evoked potentials

2.2.5.2.4. Electromyography

2.2.5.2.5. Nerve conduction studies

2.2.5.3. Ultrasonography

2.2.5.4. Advanced neuroimaging techniques

2.2.5.4.1. Positron emission tomography (PET)

2.2.5.4.2. Single-photon emission computed tomography (SPECT)

2.2.5.4.3. Functional magnetic resonance imaging (fMRI)

2.2.5.4.4. Magnetic resonance (MR) spectroscopy

2.2.5.4.5. Perfusion imaging

2.2.6. Synthesize clinical information and diagnostic investigations to determine the appropriateness of surgical intervention, and to plan perioperative management and risk mitigation

2.3 Establish goals of care in collaboration with patients and their families, which may include slowing disease progression, treating symptoms, achieving cure, improving function, and palliation

2.3.1. Recognize and respond to changes in patient status that indicate a need to reassess goals of care

2.4 Establish a patient-centred management plan

2.4.1. Determine the appropriate setting of care for the patient's clinical status, and arrange admission or transfer to alternative levels of care, as appropriate

2.4.2. Provide initial and definitive management for patients with cranial emergencies

2.4.3. Provide initial and definitive management for patients with spinal emergencies

2.4.4. Provide neuro-critical care

2.4.4.1. Medical stabilization of patients, including airway management, ventilation and spinal precautions

2.4.4.2. Prevention and/or treatment of increased intracranial pressure

2.4.4.3. Prevention and/or treatment of cerebral vasospasm

2.4.5. Recommend surgical or non-surgical approaches

2.4.6. Recommend neuroradiological interventions

2.4.7. Provide supportive and/or postoperative management in the critical care setting and on the inpatient ward

2.4.8. Provide appropriate follow-up care, including evaluations for rehabilitation

3. Plan and perform procedures and therapies for the purpose of assessment and/or management

3.1 Determine the most appropriate procedures or therapies

3.1.1. Fluids for correction of metabolic abnormalities, volume management and resuscitation

3.1.2. Blood products, recombinant factors, and anticoagulants

3.1.3. Medications and relevant therapeutics

3.1.4. Tissue sampling for pathological diagnosis

3.1.5. Injection of therapeutic substances

3.1.6. Neurointerventional procedures

3.1.7. Radiosurgery

3.1.8. Surgical intervention

3.1.9. Rehabilitation

3.2 Obtain and document informed consent, explaining the risks and benefits of, and the rationale for, a proposed procedure or therapy

3.2.1. Demonstrate comprehensive knowledge of the indications for and contraindications of neurosurgical procedures

3.3 Prioritize procedures or therapies, taking into account clinical urgency and available resources

3.4 Perform/ assist procedures in a skilful and safe manner, adapting to unanticipated findings or changing clinical circumstances

General:

3.4.1. Utilization of image guidance technology

3.4.2. Utilization of intraoperative monitoring

3.4.3. Utilization of intracranial pressure monitoring

3.4.4. Fine needle aspiration and tissue biopsies and resections

3.4.5. Treatment of simple and compound depressed skull fractures

3.4.6. Drainage of epidural, subdural and intraparenchymal abscesses

3.4.7. Evacuation of epidural, subdural and intraparenchymal hematomas

3.4.8. Decompressive craniectomy

3.4.9. Cerebrospinal fluid management:

3.4.9.1. CSF sampling

3.4.9.2. Placement of external ventricular drains and lumbar drains; tapping of reservoir systems

3.4.9.3. Placement of ventricular/cyst/spinal shunts

3.4.9.4. Endoscopic third ventriculostomy

3.4.9.5. Cyst fenestration

3.4.9.6. Repair of cerebrospinal fluid leak repair

3.4.10. Surgical treatment of Chiari malformations

3.4.11. Cranioplasty

Functional:

3.4.12. Application of a stereotactic frame

3.4.13. Cranial nerve microvascular decompression

3.4.14. Percutaneous techniques for trigeminal neuralgia

Spinal:

3.4.15. Application of Gardner–Wells tongs or halo ring for traction, closed reduction, and intraoperative reduction of spinal deformity

3.4.16. Application of a halo ring and vest

3.4.17. Bone harvesting

3.4.18. Cervical decompression

3.4.19. Thoracic decompression

3.4.20. Lumbar decompression

3.4.21. Spinal instrumentation

- 3.4.21.1. Occipito-cervical
- 3.4.21.2. Anterior cervical
- 3.4.21.3. Posterior cervical
- 3.4.21.4. Posterior thoraco-lumbar

3.4.22. Surgical management of intradural lesions

Peripheral nerve:

3.4.23. Carpal tunnel decompression

3.4.24. Nerve and muscle biopsy

3.4.25. Sural nerve harvest

3.4.26. Resection of simple nerve tumours

Neuro-oncology:

3.4.27. Open biopsy

3.4.28. Stereotactic biopsy

3.4.29. Endoscopic biopsy

3.4.30. Intra-axial tumour removal

3.4.31. Extra-axial tumour removal

3.4.32. Transsphenoidal removal of pituitary tumours

Vascular:

3.4.33. Surgical clipping of cerebral aneurysms

3.4.34. Surgical management of intracranial vascular malformations

3.4.35. Carotid endarterectomy

Pediatric:

3.4.36. Surgical treatment of spinal dysraphism

3.4.37. Surgical treatment of craniosynostosis

4. Establish plans for ongoing care and, when appropriate, timely consultation

4.1 Implement a patient-centred care plan that supports ongoing care, follow-up on investigations, response to treatment, and further consultation

4.1.1. Recognize and manage complications of neurosurgical conditions, interventions and treatments

4.1.1.1. Bleeding

4.1.1.2. Neurologic deficits

4.1.1.3. Endocrine and metabolic disturbances

4.1.1.4. Infection

4.1.1.5. Vasospasm

4.1.2. Identify indications for consultation with other health care professionals

4.1.2.1. Provide referral for advanced neurosurgical procedures

4.1.2.2. Identify indications for and timing of consultation with medical and/or radiation oncologists

4.1.2.3. Identify indications for and timing of intraoperative pathology consultation

4.1.3. Provide follow-up on results of investigations and response to treatment

4.1.4. Provide management and/or referral for end-of-life care

5. Actively contribute, as an individual and as a member of a team providing care, to the continuous improvement of health care quality and patient safety

5.1 Recognize and respond to harm from health care delivery, including patient safety incidents

5.2 Adopt strategies that promote patient safety and address human and system factors

Neurosurgeon as a Communicator

Definition:

As Communicators, Neurosurgeons form relationships with patients and their families that facilitate the gathering and sharing of essential information for effective health care.

Key and Enabling Competencies: Post-graduates are able to…

1. Establish professional therapeutic relationships with patients and their families

1.1 Communicate using a patient-centred approach that encourages patient trust and autonomy and is characterized by empathy, respect, and compassion

1.2 Optimize the physical environment for patient comfort, dignity, privacy, engagement, and safety

1.3 Recognize when the perspectives, values, or biases of patients, physicians, or other health care professionals may have an impact on the quality of care, and modify the approach to the patient accordingly

1.4 Respond to a patient's non-verbal behaviours to enhance communication

1.5 Manage disagreements and emotionally charged conversations

1.6 Adapt to the unique needs and preferences of each patient and to his or her clinical condition and circumstances

1.6.1. Use appropriate language and terminology to facilitate understanding and decision making

2. Elicit and synthesize accurate and relevant information, incorporating the perspectives of patients and their families

2.1 Use patient-centred interviewing skills to effectively gather relevant biomedical and psychosocial information
2.2 Provide a clear structure for and manage the flow of an entire patient encounter
2.3 Seek and synthesize relevant information from other sources, including the patient's family, with the patient's consent

3. Share health care information and plans with patients and their families

3.1 Share information and explanations that are clear, accurate, and timely, while assessing for patient and family understanding

3.1.1. Deliver information about progression of disease and/or poor prognosis in an empathetic manner

3.2 Disclose harmful patient safety incidents to patients and their families accurately and appropriately

4. Engage patients and their families in developing plans that reflect the patient's health care needs and goals

4.1 Facilitate discussions with patients and their families in a way that is respectful, non-judgmental, and culturally safe
4.2 Assist patients and their families to identify, access, and make use of information and communication technologies to support their care and manage their health
4.3 Use communication skills and strategies that help patients and their families make informed decisions regarding their health

5. Document and share written and electronic information about the medical encounter to optimize clinical decision-making, patient safety, confidentiality, and privacy

5.1 Document clinical encounters in an accurate, complete, timely, and accessible manner, in compliance with regulatory and legal requirements

5.1.1. Document discussions regarding informed consent in an accurate and complete manner

5.1.2. Prepare concise, clear descriptions of surgical procedures

5.1.3. Prepare consultation, discharge, progress and clinic notes that are well organized, document all relevant findings and provide a clear opinion and a plan for ongoing management

5.2 Communicate effectively using a written health record, electronic medical record, or other digital technology

5.3 Share information with patients and others in a manner that respects patient privacy and confidentiality, and enhances understanding

Neurosurgeon as a Collaborator

Definition:

As Collaborators, Neurosurgeons work effectively with other health care professionals to provide safe, high-quality patient-centred care.

Key and Enabling Competencies: Post-graduates are able to…

1. Work effectively with physicians and other colleagues in the health care professions

1.1 Establish and maintain positive relationships with physicians and other colleagues in the health care professions to support relationship-centred collaborative care

1.2 Negotiate overlapping and shared responsibilities with physicians and other colleagues in the health care professions in episodic and ongoing care

1.2.1. Consult with other specialists, colleagues and health professionals with regard to patients' medical, surgical, psychosocial, and rehabilitative issues

1.3 Engage in respectful shared decision-making with physicians and other colleagues in the health care professions

1.3.1. Convey patient information to a group of peers or other health care professionals in a clear and understandable manner

1.3.2. Contribute neurosurgical expertise to team decisions regarding patient care

2. Work with physicians and other colleagues in the health care professions to promote understanding, manage differences, and resolve conflicts

2.1 Show respect toward collaborators

2.2 Implement strategies to promote understanding, manage differences, and resolve conflict in a manner that supports a collaborative culture

3. Hand over the care of a patient to another health care professional to facilitate continuity of safe patient care

3.1 Determine when care should be transferred to another physician or health care professional

3.2 Demonstrate safe handover of care, using both verbal and written communication, during a patient transition to a different health care professional, setting, or stage of care

3.2.1. Summarize the patient's issues for the receiving care provider, including plans to deal with ongoing issues as well as anticipated changes in the clinical Course

Neurosurgeon as a Leader

Definition:

As Leaders, Neurosurgeons engage with others to contribute to a vision of a high-quality health care system and take responsibility for the delivery of excellent patient care through their activities as clinicians, administrators, scholars, or teachers.

Key and Enabling Competencies: Post-graduates are able to

1. Contribute to the improvement of health care delivery in teams, organizations, and systems

1.1 Apply the science of quality improvement to contribute to improving systems of patient care

1.1.1. Identify potential improvement opportunities arising from the review of patient outcomes

1.1.2. Participate in quality improvement initiatives

1.2 Contribute to a culture that promotes patient safety.

1.3 Analyze patient safety incidents to enhance systems of care

1.4 Use health informatics to improve the quality of patient care and optimize patient safety

2. Engage in the stewardship of health care resources

2.1 Allocate health care resources for optimal patient care

2.1.1. Determine priorities of surgical cases based on clinical urgency and available resources

2.2 Apply evidence and management processes to achieve cost- appropriate care.

2.2.1. Incorporate considerations of resource stewardship into decisions regarding the timing and frequency of use of medical imaging and operating room resources

3. Demonstrate leadership in health care systems

3.1 Demonstrate leadership skills to enhance health care

3.1.1. Contribute administrative skills to the physician team, including leadership of committees and teams

3.2 Facilitate change in health care to enhance services and outcomes

4. Manage career planning, finances, and health human resources in personal practice(s)

4.1 Set priorities and manage time to integrate practice and personal life.

4.2 Manage personal professional practice(s) and career

4.2.1. Apply leadership skills to optimize patient care in the operating room

4.2.2. Adhere to occupational safety procedures to ensure personal and team safety

4.3 Implement processes to ensure personal practice improvement.

Neurosurgeon as a Health Advocate

Definition:

As Health Advocates, Neurosurgeons contribute their expertise and influence as they work with communities or patient populations to improve health. They work with those they serve to determine and understand needs, speak on behalf of others when required, and support the mobilization of resources to effect change.

Key and Enabling Competencies: Post-graduates are able to…

1. Respond to an individual patient's health needs by advocating with the patient within and beyond the clinical environment

1.1 Work with patients to address determinants of health that affect them and their access to needed health services or resources

1.1.1. Facilitate patient access to diagnostic, therapeutic and rehabilitative services and resources

1.2 Work with patients and their families to increase opportunities to adopt healthy behaviours

1.2.1. Counsel patients regarding secondary prevention of cerebrovascular disease, including smoking cessation and blood pressure control

1.2.2. Counsel patients regarding preventive strategies for trauma and head injury, including seat belt use and child restraints, helmet use, and avoidance of driving while impaired

1.2.3. Counsel patients and families regarding appropriate timing of return to athletic activities following neurologic trauma

1.3 Incorporate disease prevention, health promotion, and health surveillance into interactions with individual patients

1.3.1. Apply appropriate secondary prevention strategies for cerebrovascular disease

1.3.2. Recommend screening for relatives of patients with hereditary neurosurgical conditions

2. Respond to the needs of the communities or populations they serve by advocating with them for system-level change in a socially accountable manner

2.1 Work with a community or population to identify the determinants of health that affect them

2.2 Improve clinical practice by applying a process of continuous quality improvement To disease prevention, health promotion, and health surveillance activities

2.3 Contribute to a process to improve health in the community or population they serve

2.3.1. Work to ensure timely access to services and system of care for patients with neurosurgical emergencies, including adequate access to appropriate medical imaging, critical care, pathology, and operating room resources

Neurosurgeon as a Scholar

Definition:

As Scholars, Neurosurgeons demonstrate a lifelong commitment to excellence in practice through continuous learning, and by teaching others, evaluating evidence, and contributing to scholarship.

Key and Enabling Competencies: Post-graduates are able to…

1. Engage in the continuous enhancement of their professional activities through ongoing learning

    1.1 Develop, implement, monitor, and revise a personal learning plan to enhance professional practice

    1.2 Identify opportunities for learning and improvement by regularly reflecting on and assessing their performance using various internal and external data sources

        1.2.1. Seek, maintain and regularly review performance data to continually improve performance

    1.3 Engage in collaborative learning to continuously improve personal practice and contribute to collective improvements in practice

2. Teach students, residents, the public, and other health care professionals

    2.1 Recognize the influence of role-modelling and the impact of the formal, informal,and hidden curriculum on learners

    2.2 Promote a safe and respectful learning environment

    2.3 Ensure patient safety is maintained when learners are involved

        2.3.1. Supervise learners to ensure they work within their limits

    2.4 Plan and deliver learning activities

    2.5 Provide feedback to enhance learning and performance

    2.6 Assess and evaluate learners, teachers, and programs in an educationally appropriate manner

3. Integrate best available evidence into practice

    3.1 Recognize practice uncertainty and knowledge gaps in clinical and other professional encounters and generate focused questions that can address them

    3.2 Identify, select, and navigate pre-appraised resources

    3.3 Critically evaluate the integrity, reliability, and applicability of health-related research and literature

    3.4 Integrate evidence into decision-making in their practice

4. Contribute to the creation and dissemination of knowledge and practices applicable to health

4.1 Demonstrate an understanding of the scientific principles of research and scholarly inquiry and the role of research evidence in health care

4.2 Identify ethical principles for research and incorporate them into obtaining informed consent, considering potential harms and benefits, and considering vulnerable populations

4.3 Contribute to the work of a research program

4.4 Pose questions amenable to scholarly investigation and select appropriate methods to address them

4.4.1. Conduct scholarly work

4.5 Summarize and communicate to professional and lay audiences, including patients and their families, the findings of relevant research and scholarly inquiry

Neurosurgeon as a Professional

Definition:

As Professionals, Neurosurgeons are committed to the health and well-being of individual patients and society through ethical practice, high personal standards of behaviour, accountability to the profession and society, physician-led regulation, and maintenance of personal health.

Key and Enabling Competencies: Post-graduates are able to…

1. Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards

1.1 Exhibit appropriate professional behaviours and relationships in all aspects of practice, demonstrating honesty, integrity, humility, commitment, compassion, respect, altruism, respect for diversity, and maintenance of confidentiality

1.2 Demonstrate a commitment to excellence in all aspects of practice

1.2.1. Maintain a log of procedures and their outcomes, for the purposes of continually improving performance

1.2.2. Identify and respect limits in their expertise

1.3 Recognize and respond to ethical issues encountered in practice

1.4 Recognize and manage conflicts of interest.

1.5 Exhibit professional behaviours in the use of technology-enabled communication

1.5.1. Respect boundaries and patient privacy

2. Demonstrate a commitment to society by recognizing and responding to societal expectations in health care

2.1 Demonstrate accountability to patients, society, and the profession by responding to societal expectations of physicians

2.2 Demonstrate a commitment to patient safety and quality improvement

3. Demonstrate a commitment to the profession by adhering to standards and participating in physician-led regulation

3.1 Fulfil and adhere to the professional and ethical codes, standards of practice, and laws governing practice

3.1.1. Apply professional standards for the determination of neurologically determined death

3.1.2. Apply professional standards and laws governing capacity and competence for medical decision making

3.1.3. Apply the law as well as local policies and procedures relevant to substitute decision making, and document advance directives and goals of care

3.1.4. Contribute to public safety through adherence to requirements for mandatory reporting, such as driving restrictions, reportable infections and suspicious injuries

3.2 Recognize and respond to unprofessional and unethical behaviours in physicians and other colleagues in the health care professions

3.3 Participate in peer assessment and standard-setting

4. Demonstrate a commitment to physician health and well-being to foster optimal patient care

4.1 Exhibit self-awareness and manage influences on personal well-being and professional performance

4.1.1. Develop effective strategies to monitor fatigue and mitigate its effects on clinical performance

4.1.2. Demonstrate knowledge of occupational hazards in neurosurgical practice and implement measures to minimize those risks

4.2 Manage personal and professional demands for a sustainable practice throughout the physician life cycle

4.3 Promote a culture that recognizes, supports, and responds effectively to colleagues in need

MILESTONES

(Minimum Levels 2/3 to be achieved by the end of the program)

Patient Care 1: Brain Tumor				
Level 1	Level 2	Level 3	Level 4	Level 5
Performs a history and physical examination in patients with a brain tumor	Explains the risks and benefits of craniotomy for brain tumor	Formulates a diagnostic and treatment plan for a patient with a brain or spinal cord tumor	Adapts standard treatment plans and techniques to special circumstances (e.g., recurrence, bone marrow suppression)	Leads discussion at an interdisciplinary tumor board
Places an external ventricular drain; assists with set-up, opening, and closing for brain tumor craniotomies	Assists with routine craniotomy for brain tumor	Performs routine craniotomy for brain tumor; assists with complex craniotomy for brain tumor	Performs complex craniotomy for brain tumor; assists with advanced craniotomy for brain tumor	Performs advanced craniotomy for brain tumor
Provides routine perioperative care for brain tumor patients	Recognizes and initiates work-up of routine complications (e.g., air embolism, CSF fistula, hematoma)	Manages routine complications and recognizes complex complications (e.g., refractory cerebral edema, major vascular injury)	Manages complex complications	Utilizes patient outcome data for quality improvement or the development of adjunctive therapy protocols

Patient Care 2: Surgical Treatment of Epilepsy and Movement Disorders				
Level 1	Level 2	Level 3	Level 4	Level 5
Performs a history and physical examination in patients with epilepsy or movement disorders	Explains the risks and benefits of functional neurosurgical procedures	Formulates a diagnostic and treatment plan for a patient with epilepsy or a movement disorder	Adapts standard treatment plans and techniques to special circumstances (e.g., Parkinson's plus, multifocal epilepsy)	Leads discussion at an interdisciplinary epilepsy center patient management conference
Performs stereotactic frame placement or frameless navigation registration; assists with set-up, opening, and closing for functional neurosurgical procedures	Assists with routine functional neurosurgical procedures	Performs routine functional neurosurgical procedures; assists with complex functional neurosurgical procedure	Performs complex functional neurosurgical procedures; assists with advanced functional neurosurgical procedures	Performs advanced functional neurosurgical procedures, including interpretation of electrophysiological data
Provides routine perioperative care for movement disorder and epilepsy patients	Recognizes and initiates work-up of routine complications (e.g., seizures, device infection)	Manages routine complications and recognizes complex complications (e.g., status epilepticus,	Manages complex complications	Utilizes patient outcome data for quality improvement; designs care pathways for epilepsy or movement disorder

		dystonia)		patients

Patient Care 3: Pain and Peripheral Nerve Disorders				
Level 1	Level 2	Level 3	Level 4	Level 5
Performs a history and physical examination in patients with chronic pain or a peripheral nerve disorder	Explains the risks and benefits of chronic pain and peripheral nerve procedures	Formulates a diagnostic and treatment plan for patients with chronic pain or peripheral nerve disorders	Adapts standard treatment plans and techniques to special circumstances (e.g., cancer pain, deafferentation pain)	Leads discussion at an interdisciplinary case conference or specialty clinic for chronic pain or peripheral nerve disorder patients
Interrogates and programs	Assists with routine chronic pain and	Performs routine chronic pain and peripheral nerve	Performs complex chronic	Performs advanced chronic

implanted devices; assists with setup, opening, and closing for chronic pain and peripheral nerve procedures Provides routine perioperative care for chronic pain or peripheral nerve disorder patients	peripheral nerve procedures Recognizes and initiates work-up of routine complications (e.g., implanted device failure or infection)	procedures; assists with complex chronic pain and peripheral nerve procedures Manages routine complications and recognizes complex complications (e.g., intrathecal drug overdose or withdrawal)	pain and peripheral nerve procedures; assists with advanced chronic pain and peripheral nerve procedures Manages complex complications	pain and peripheral nerve procedures Utilizes patient outcome data for quality improvement; designs care pathways for chronic pain or peripheral nerve disorder patients

Patient Care 4: Spinal Neurological Surgery				
Level 1	Level 2	Level 3	Level 4	Level 5
Performs a history and physical examination in patients with degenerative, traumatic, or neoplastic spinal disorders	Explains the risks and benefits of spinal surgery	Formulates a diagnostic and treatment plan for a patient with degenerative, traumatic, or neoplastic spinal disorders	Adapts standard treatment plans and techniques to special circumstances (e.g., spinal deformity, postirradiated spine, or infection)	Leads discussion at an interdisciplinary spine case conference or specialty clinic
Implements spinal bracing or traction; assists with set-up, opening, and closing for spinal surgery procedures	Assists with routine spinal surgery procedures	Performs routine spinal surgery procedures; assists with complex spinal surgery procedures	Performs complex spinal surgery procedures; assists with advanced spinal surgery and reconstructive procedures	Performs advanced spinal surgery and reconstructive procedures
Provides routine perioperative care for spinal surgery patients	Recognizes and initiates work-up of routine complications (e.g., pain,	Manages routine complications and recognizes complex	Manages complex complications	Utilizes patient outcome and registry data for quality improvement and

	surgical site infection)	complications (e.g., myelopathy, cerebrospinal fluid (CSF) leak, instrument failure/malposition)		treatment selection

Patient Care 5: Vascular Neurological Surgery				
Level 1	Level 2	Level 3	Level 4	Level 5
Performs a history and physical examination in patients with	Explains the risks and benefits of vascular neurosurgical and endovascular	Formulates a diagnostic and treatment plan for a patient with ischemic or	Adapts standard treatment plans and techniques to special circumstances	Leads discussion at an interdisciplinary vascular neurosurgical

ischemic or hemorrhagic stroke or vascular neurosurgical disorders Manages and obtains CSF samples from external ventricular drains; assists with setup, opening, and closing for vascular neurosurgical and endovascular procedures Provides routine perioperative care for vascular neurosurgical and endovascular patients	procedures Assists with routine vascular neurosurgical and endovascular procedures Recognizes and initiates work-up of routine complications (e.g., seizure, hydrocephalus)	hemorrhagic stroke or vascular neurosurgical disorders Performs routine vascular neurosurgical and endovascular procedures; assists with complex vascular neurosurgical and endovascular procedures Manages routine complications and recognizes complex complications (e.g., cerebral vasospasm, herniation syndrome, intra-operative aneurysm	(e.g., vasculitis, ischemic heart disease) Performs complex vascular neurosurgical and endovascular procedures; assists with advanced vascular neurosurgical and endovascular procedures Manages complex complications	and endovascular surgery case conference or specialty clinic Performs advanced vascular neurosurgical and endovascular procedures Utilizes patient outcome data for quality improvement; designs care pathways for vascular neurosurgical and endovascular patients

		rupture)		

Patient Care 6: Pediatric Neurological Surgery				
Level 1	Level 2	Level 3	Level 4	Level 5
Performs an age appropriate history and physical examination with developmental assessment, including for non-accidental trauma	Explains the risks and benefits of pediatric neurosurgical procedures; adapts diagnoses to agerelated variations	Formulates a diagnostic and treatment plan for a pediatric patient; determines prognosis in severe brain injury and/or diagnoses brain death in infants and children	Adapts standard treatment plans and techniques to special circumstances (e.g., very young children and infants)	Leads discussion at an interdisciplinary pediatric case conference or specialty clinic; counsels expectant parents regarding fetal anomalies
Performs CSF shunt tap and	Assists with routine pediatric neurosurgical	Performs routine pediatric	Performs complex pediatric	Performs advanced pediatric

valve programming; assists with set-up, opening, and closing for pediatric neurosurgical procedures Provides routine perioperative care for pediatric neurosurgical patients	procedures Recognizes and initiates work-up of routine complications, including in pre-verbal children (e.g., CSF shunt failure, seizure)	neurosurgical procedures; assists with complex pediatric neurosurgical procedures Manages routine complications and recognizes complex complications (e.g., hematoma, CSF leak)	neurosurgical procedures; assists with advanced pediatric neurosurgical procedures Manages complex complications	neurosurgical procedures Utilizes patient outcome data for quality improvement; designs care pathways for pediatric neurosurgical patients

Patient Care 7: Traumatic Brain Injury (TBI)				
Level 1	Level 2	Level 3	Level 4	Level 5
Performs a	Explains risks	Selects patients	Adapts standard	Leads discussion

history and physical examination in patients with severe TBI and assigns a Glasgow Coma Scale score Places an intracranial pressure (ICP) monitor; assists with set-up, opening, and closing for neurotrauma procedures Provides routine perioperative care for patients with TBI	and benefits of trauma neurosurgical procedures; evaluates patients with multiple trauma Assists with routine procedures for patients with TBI Recognizes and initiates work-up of routine complications (e.g., sinus injury, air embolus)	for operative intervention; prioritizes the management of injuries in patients with multiple trauma Performs routine procedures for patients with TBI; assists with complex procedures for patients with TBI Manages routine complications and recognizes complex complications (e.g., cerebral herniation syndrome, persistent CSF fistula)	treatment plans to special circumstances (e.g., medical comorbidity, coagulopathy) Performs complex procedures for patients with TBI; assists with advanced procedures for patients with TBI Manages complex complications	at interdisciplinary trauma unit rounds and/or conference Performs advanced procedures for patients with TBI Utilizes patient outcome data for quality improvement; designs care pathways for neurotrauma patients

Patient Care 8: Critical Care				
Level 1	Level 2	Level 3	Level 4	Level 5
Performs a history and physical examination in critically-ill patients	Manages transient intracranial hypertension (e.g., hyperosmolar agents, CSF drainage)	Manages refractory intracranial hypertension (e.g., cerebral perfusion pressure directed therapy, advanced monitoring, decompressive craniectomy)	Diagnoses and initiates management of acute respiratory distress syndrome	Leads a multidisciplinary neurocritical care team
Inserts arterial and central venous catheters	Assists with routine	Performs routine and assists with	Performs complex and assists with	Performs advanced neurocritical care unit procedures;

	neurocritical care unit procedures; manages airway and performs endotracheal intubation	complex neurocritical care unit procedures; manages difficult and emergency airways	advanced neurocritical care unit procedures; manages or initiates management of surgical airways	performs bronchoscopy Manages complex critically-ill patients (e.g., septic shock, organ failure); designs care pathways for critically-ill patients
Manages neurocritical care unit admissions and discharges	Recognizes and initiates work-up of routine systemic complications (e.g., pneumonia, infection, pulmonary embolus, cardiac dysrhythmia, myocardial infarction)	Manages routine systemic complications and prioritizes simultaneous critical clinical events	Manages metabolic and nutritional support for critically-ill patients	

Medical Knowledge 1: Information Gathering and Interpretation				
Level 1	Level 2	Level 3	Level 4	Level 5
Correlates normal neuroanatomy and physiology with function Gathers, interprets, and reports basic diagnostic test results (e.g., serology, chest radiograph, brain and spine CT)	Correlates pathological neuroanatomy and physiology with function Describes indications for standard diagnostic testing	Identifies anatomical and temporal patterns of disease occurrence Prioritizes, orders, and interprets diagnostic tests appropriate to clinical urgency and complexity	Interprets unusual variations in patterns of disease occurrence Prioritizes, orders, and interprets complex diagnostic studies (e.g., SPECT, cerebral perfusion, MR tractography)	Effectively teaches anatomic-pathological correlation Utilizes complex diagnostic approaches in novel situations

Medical Knowledge 2: Critical Thinking for Diagnosis and Therapy				
Level 1	Level 2	Level 3	Level 4	Level 5
Lists a differential diagnosis for common clinical presentations	Provides a comprehensive differential diagnosis for a wide range of clinical presentations	Provides a focused differential diagnosis based on individual patient presentation	Interprets anomalous presentations and rare disorders	Studies and reports challenging diagnostic presentations

Lists therapeutic options for common clinical presentations	Explains advantages and drawbacks of standard therapeutic options	Justifies optimal therapeutic option based on individual patient presentation	Adapts therapeutic choice to anomalous or rare patient presentations	Creates new or modifies existing therapeutic options

Systems-Based Practice 1: Patient Safety				
Level 1	Level 2	Level 3	Level 4	Level 5
Describes principles of patient safety; performs safe and effective handoffs and transitions of care in routine	Recognizes and reports patient safety events; performs safe and effective hand-offs and transitions of care in complex	Discloses patient safety events; supervises handoffs and transitions of care	Analyzes patient safety events and offers error prevention strategies; advocates for safe and effective transitions of	Actively engages teams in process and system modification to prevent patient safety events; improves care transition

clinical situations	clinical situations		care within and across health care systems	practices within and across health care systems

Systems-Based Practice 2: Quality Improvement				
Level 1	Level 2	Level 3	Level 4	Level 5
Describes basic quality improvement methods and metrics	Participates in local quality improvement initiatives (e.g., surgical site infection (SSI) reduction, care pathway implementation)	Identifies quality improvement opportunities and assists in the development, implementation, and analysis of a quality improvement project	Advances multiple quality improvement initiatives through participation in a quality improvement working group or committee	Creates, implements, and assesses quality improvement initiatives

Systems-Based Practice 3: Health Care Systems Awareness				
Level 1	Level 2	Level 3	Level 4	Level 5
Describes principles of Indian health payment systems	Analyzes how personal practice affects the health care system (e.g. test ordering, length of stay, readmissions)	Seeks information about neurosurgical career options and identifies professional mentor(s)	Prepares for transition to practice (e.g. information technology, risk management, billing and coding, financial, personnel)	Collaborates with nursing and administrative teams to promote high value, quality care within a health care system

Practice-Based Learning and Improvement 1: Evidence-Based Practice				
Level 1	Level 2	Level 3	Level 4	Level 5
Applies institutional treatment guidelines in basic patient care; identifies and reports complications	Applies published treatment guidelines in standard patient care; tracks personal clinical care outcomes	Critically adapts guideline recommendations to individual patient specifics and preferences; evaluates and applies available outcomes data to improve patient care	Participates in the creation and implementation of institutional guidelines or evidence-based practice protocols; analyzes and reports outcomes data	Promotes evidence-based practice by publishing clinical guidelines and teaching at local or national conferences; participates in clinical outcomes registry design or administration

Practice-Based Learning and Improvement 2: Research				
Level 1	Level 2	Level 3	Level 4	Level 5
Formulates hypotheses and investigative approaches to clinical or basic scientific	Participates effectively in clinical or basic scientific research	Contributes to peer reviewed clinical or basic scientific literature	Leads a clinical or basic scientific research effort, including application for funding	Receives grant funding for clinical or basic scientific work and makes novel scientific

problems				contribution(s)

Practice-Based Learning and Improvement 3: Mentorship and Teaching				
Level 1	Level 2	Level 3	Level 4	Level 5
Demonstrates self awareness and identifies gaps in knowledge, skills, and experience; incorporates feedback	Teaches medical students, other residents, and patients in informal settings; develops faculty mentorship of self	Teaches health professionals in formal settings (e.g., nursing in-service training, residency teaching conference); mentors medical students	Organizes educational activities at the program level; mentors residents and other health care professionals	Designs and implements clinical rotations, curricula, or learning and assessment tools; models and teaches mentoring to others

Professionalism 1: Ethical Behavior				
Level 1	Level 2	Level 3	Level 4	Level 5
Behaves ethically and professionally and takes	Employs ethical and legal principles (e.g., informed	Performs tasks in a thorough, timely, and respectful	Recognizes, reports, and helps rectify lapses in ethics	Promotes ethical and professional behavior by creating a

responsibility for personal conduct	consent, advance directives, confidentiality, error disclosure, resource stewardship) and appropriately seeks advice	manner in complex or stressful situations and takes ownership of team outcomes	or professionalism, including coaching others	teaching resource, addressing system-level problems, or serving on an ethics panel or Institutional Review Board

Professionalism 2: Well-Being				
Level 1	Level 2	Level 3	Level 4	Level 5
Describes the importance of personal and professional wellbeing; manages sleep deprivation and fatigue	Evaluates personal and professional well-being; seeks appropriate personal help and fatigue mitigation when needed	Monitors and attempts to optimize professional well-being of the team; adjusts team assignments to mitigate fatigue and promote wellness	Coaches and assists others in meeting professional expectations; recognizes and responds to physical impairment in self and others	Develops a structured plan or team activity to optimize personal and professional well-being, resilience, and success; participates in a peer support program

Interpersonal and Communication Skills 1: Patient and Family Communication				
Level 1	Level 2	Level 3	Level 4	Level 5
Uses language and nonverbal	Establishes therapeutic	Establishes therapeutic	Consistently models and	Formally teaches communication

behavior to exhibit respect, establish rapport, and demonstrate cultural competency	relationships in straightforward encounters using active listening and clear language	relationships, thoughtfully delivers information, and strives for consensus in challenging patient encounters	mentors others in optimal patient and family communications	skills to health care professionals

Interpersonal and Communication Skills 2: Communication in Coordination of Care				
Level 1	Level 2	Level 3	Level 4	Level 5
Accurately records information in the patient record and safeguards protected health information; coordinates care within the neurosurgical service	Communicates orally and in writing in a respectful, organized, clear, concise and timely manner with all members of the inter-professional health care team; coordinates care with consulting services	Effectively manages complex, team-based clinical care; coordinates care within a hospital system	Models and mentors others in effective communication, including bidirectional feedback and conflict resolution; coordinates long-term care, including rehabilitation	Develops or implements strategies for improving communication and teamwork within a health care system; creates care pathways at the health care system level

TEACHING AND LEARNING METHODS

General Principles

- Acquisition of practical competencies being the keystone of postgraduate medical education, postgraduate training is skills oriented.
- Learning in postgraduate program is essentially self-directed and primarily emanating from clinical and academic work. The formal sessions are merely meant to supplement this core effort.

Teaching Sessions

The teaching methodology consists of bedside discussions, ward rounds, case presentations, clinical grand rounds, statistical meetings, journal club, lectures and seminars. Along with these activities, trainees should take part in inter-departmental meetings i.e clinico-radiological meetings that are organized regularly. Trainees are expected to be fully conversant with the use of computers and be able to use databases such as the Pubmed, Scopus etc.

They should be familiar with concept of evidence based medicine and the use of guidelines available for managing various diseases.

Teaching Schedule

Following is the suggested weekly teaching programme:

1. Seminar Once a week
2. Journal club Once a week
3. Bedside clinic Once a week
4. Treatment/Planning session Once a week
5. Neuroradiology session Once a week
6. File audits(discharge/death) Once a week

- Scientific and Academic Forum (SAF) meetings conducted regularly and MCh residents would present interesting cases, seminars and take part in clinico-radiological case discussions.

Conferences

- A resident must attend at least one conference/workshop per year.
- One paper must be presented in at least 3 years.

Schedule of Postings:

OPD: Monday and
Friday
OT: Daily
Emergency Duties: Twice a week

- The M.Ch. resident should do the dressings of the patient that have been operated up on /assisted by them.
- The M.Ch. resident should note down the History and examination of patients admitted and should daily put progress notes in files.
- The normal working hours will be from 8.00 AM to 4.00 PM.
- When on emergency duty, the resident is supposed to stay overnight in the resident room.

Log Book:

All the work carried out during the course will be duly recorded by the candidate in the log book signed by the consultant.

Research Projects

- Every resident shall carry out work on an assigned research project under the guidance of a recognized postgraduate teacher; the project shall be written and submitted in the form of a Thesis. This is mandatory.
- Every resident shall submit Thesis plan to university within time frame set by university
- The resident will:
    i. Identify a relevant research problem
    ii. Conduct a critical review of literature
    iii. Formulate a hypothesis
    iv. Determine the appropriate study design
    v. State the objectives of the study
    vi. Prepare a study protocol
    vii. Undertake a study according to the protocol

viii. Analyze and interpret

ix. Research data, and draw conclusion

x. Write a research paper.

ASSESSMENT

All the PG residents are assessed daily for their academic activities and also periodically for milestones at 6 month intervals.

General Principles

- The assessment is valid, objective and reliable
- It covers cognitive, psychomotor and affective domains.
- Formative, continuing and summative (final) assessment is also conducted in theory as well as practical. In addition, research project is also assessed separately.

Formative Assessment

- The formative assessment is continuous as well as end of term.
- The former is based on the feedback from the consultants concerned.
- Formative assessment will provide feedback to the candidate about his/her performance and help to improve in the areas they are found waiting.
- Record of internal assessment should be presented to the board of examiners for consideration at the time of final examination.

Internal Assessment

The performance of the resident during the training period should be monitored throughout the course and duly recorded in the log books, as documentary evidence of the ability and daily work of the student.

1. Personal attributes:

- **Behavior and Emotional Stability:** Dependable, disciplined, dedicated, stable in emergency situations, shows positive approach.
- **Motivation and Initiative:** Takes on responsibility, innovative, enterprising, does not shirk duties or leave any work pending.
- **Honesty and Integrity:** Truthful, admits mistakes, does not cook up information, has ethical conduct, exhibits good moral values, loyal to the institution.

- **Interpersonal Skills and Leadership Quality:** Has compassionate attitude towards patients and attendants, gets on well with colleagues and paramedical staff, is respectful to seniors, has good communication skills.

2. Clinical Work:

- **Availability:** Punctual, available continuously on duty, responds promptly on calls and takes proper permission while obtaining leave.
- **Diligence:** Dedicated, hardworking, does not shirk duties, leaves no work pending, and does not sit idle, competent in clinical case work up and management.
- **Academic ability:** Intelligent, shows sound knowledge and skills, participates adequately in academic activities, and performs well in oral presentation and departmental tests.
- **Clinical Performance:** Proficient in clinical presentations and case discussion during rounds and OPD work up. Preparing Documents of the case history/examination and progress notes in the file (daily notes, round discussion, investigations and management) Skill of performing bedside procedures and handling emergencies.

3. Academic Activity: Performance during presentation at Journal club/ Seminar/ Case discussion/Stat meeting and other academic sessions. Proficiency in skills as mentioned in job responsibilities.

4. End of term theory examination The candidate shall be eligible to sit for the final theory and practical exams, only if he/she has a minimun of 80% attendance.

5. End of term practical/oral examinations.

Summative Assessment

- The pass percentage will be 50%.(individually in theory and practical/viva)
- Candidate will have to pass theory and practical examinations separately.

Theory examination		
Paper Name	**Subject**	**Marks**
Paper –I	Basic Sciences as related to Neurosurgery	100
Paper-II	Clinical Neurosurgery	100

Paper-III	Operative Neurosurgery	100
Paper-IV	Recent advances in Neurosurgery	100
Total		**400**
Practical & Viva-Voce Examination		
	Long Case(100 x 1)	100
	Short Cases (2 x 75)	150
	Procedure	50
	Grand Viva including Instruments/Radiology/Pathology	100
Total		**400**

SUGGESTED BOOKS & JOURNALS:

Suggested Books

1. Neuroanatomy
    a. Snell
    b. James Fix
    c. Rhoton Microneurosurgery

2. Clinical Neurological examination
    a. Fuller
    b. Dejong
    c. Strub and Black, higher mental function examination
3. Clinical Neurology
    a. Gelb
    b. Bradley
    c. Adam
4. Neuroradiology

a. Neuroradiology: The Requisites, 4th Edition Authors: Rohini Nadgir, David Yousem
b. Diagnostic Neuroradiology Authors: Anna Osborne

5. Neuropathology
    a. Escourolle & Poirier's Manual of Basic Neuropathology
6. Clinical and Operative Neurosurgery
    a. Youman's
    b. Schmidek and Sweet Operative Neurosurgical Techniques
    c. Greenberg

Suggested Journals

1. Neurosurgery
2. Journal of Neurosurgery
3. Journal of Neurosurgery- Spine
4. Journal of Neurosurgery- Paediatrics
5. Neurology India
6. Neurosurgical Focus
7. Neurosurgical Clinics of North America

MODEL QUESTIONS PAPERS

M.Ch. Neurosurgery

Paper-I: Basic Sciences as Related to Neurosurgery

Maximum Marks: 100. **Time: 3 Hours**

- Attempt **ALL** questions.
- Answer each question and its parts in **SEQUENTIAL ORDER**.
- **ALL** questions carry equal marks.
- Illustrate your answer with **SUITABLE DIAGRAMS**.

1. Describe various structures and their relations in the cerebello-pontine angle cistern with illustrations of microsurgical anatomy of CP angle.
2. With illustrations describe the microsurgical anatomy of IV ventricle.
3. Write a short note on pathophysiology of Spasticity.

4. What are the various types of brain herniations?
5. List the principles of CT scan and MRI scan.
6. Describe and illustrate anatomy of Craniovertebral junction and its ligaments.
7. Describe Internuclear Opthalmoplegia and sites of lesions causing this condition.
8. List two important genetic pathways and their significance in Medulloblastoma.
9. Enumerate the types of cerebral edema & their pathophysiology
10. Discuss false localizing signs in CNS examinations with examples

Paper-II: Clinical Neurosurgery

Maximum Marks : 100 **Time : 3 Hours**

- Attempt **ALL** questions.
- Answer each question and its parts in **SEQUENTIAL ORDER**.
- **ALL** questions carry equal marks.
- Illustrate your answer with **SUITABLE DIAGRAMS**.

Write Short Notes on

1. Current management guidelines of Hypothalamic gliomas.
2. Cervical spondylotic myelopathy
3. Brainstem lesions- Clinical presentation and management options
4. Describe the evaluation and management principles in Acromegaly
5. MRI of the brain showed an enhancing fourth ventricular tumour. What the differentials and how would you manage this patient?
6. Describe the role of Intracranial pressure monitoring in Head Injury.
7. Hemifacial spasm – etiology, diagnosis, treatment options and outcomes
8. A patient presents to you with C 6 level traumatic quadriparesis. X-ray of the cervical spine showed a Grade 2 C5-6 subluxation. Describe the treatment plan.
9. Intracranial ependymoma.
10. Describe the management of a patient for Epilepsy surgery

Paper-III Operative Neurosurgery

Maximum Marks : 100 **Time : 3 Hours**

- Attempt **ALL** questions.
- Answer each question and its parts in **SEQUENTIAL ORDER**.
- **ALL** questions carry equal marks.
- Illustrate your answer with **SUITABLE DIAGRAMS**.

Write Short Notes on

1. Describe the surgical anatomy of the CP angle and the steps in the retrosigmoid approach to Vestibular schwannomas.
2. Surgical management of congenital AAD.
3. Describe the various surgical approaches for brainstem lesions.
4. What are the indications, steps and complications of Transphenoidal surgery for pituitary tumours?
5. What are all the surgical approaches to IIIrd ventricle and elaborate on one of the surgical approaches?
6. Lumbar microdiscectomy vs Endoscopic lumbar discectomy.
7. Role of stereotactic surgery in management of intracranial tumours
8. Write the management of AVM.
9. Neurosurgical management of brain abscess.
10. A 54 years old male presented with complaints of back pain radiating to the abdomen. He has developed both lower limb weakness. What are the differential diagnoses? What are the investigations for evaluating this patient? What are the steps of management of Tuberculous spondylodiscitis?

Paper-IV Recent Advances in Neurosurgery

Maximum Marks : 100 **Time : 3 Hours**

- Attempt **ALL** questions.
- Answer each question and its parts in **SEQUENTIAL ORDER**.
- **ALL** questions carry equal marks.
- Illustrate your answer with **SUITABLE DIAGRAMS**.

Write Short Notes on:

1. Artificial intelligence in Neuro-oncology.
2. The role neuronavigation in cranial surgery.

3. Stereotactic epilepsy surgery.
4. Gene therapy for brain tumours.
5. Use of Tractography in glioma surgery.
6. Spinal cord stimulation in spasticity surgery.
7. Motion preservation spine surgery.
8. Intraoperative use of Fluoroscein in Neurosurgery.
9. Evidence for Stem cell therapy in spinal cord injury
10. Role of Microdialysis in neurocritical care.

Head
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