UNMRP

UNIVERSITY NATIONAL MEDICAL RESIDENCY PROGRAM PAKISTAN

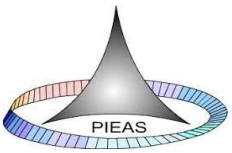
UNIFIED CURRICULA REGISTRY MEDICAL UNIVERSITIES OF PAKISTAN

CURRICULUM

MASTER OF SURGERY
MS
NEUROSURGERY

5 Years, Residential, Stipend Based, Clinical, Full Time

UNIVERSITY NATIONAL MEDICAL RESIDENCY PROGRAM PAKISTAN



United Nations Academic Network (UNAN)

The UNESCO via the NEQMAP Bangkok

Note: All universities are included the international WHO directory discovered on the website of WHO and are duly recognized by the United Nations Academic Network (UNAN) and the UNESCO via the NEQMAP Bangkok

STATUTES

Nomenclature Of The Proposed Course

The name of degree program me shall be MS Neurosurgery. This name is well recognized and established for the last many decades worldwide.

Course Title:

MS Neurosurgery

Training Centers:

Departments of Neurosurgery Medical University

Duration of Course

The duration of MS Neurosurgery course shall be five (5) years First two years in Part I and next three years in Part II with structured training in a recognized department under the guidance of an approved supervisor. The course is structured in three parts:

Part I is structured for the 1st and 2nd calendar years. The candidate will spend the first 06 months of induction period in the chosen specialty. Then the candidate shall undertake clinical training in fundamental concepts of Surgery. At the end of 2nd year the examination shall be held in fundamental concepts of Surgery. The clinical training in Neurosurgery shall start from 3rd year onwards in the recognized institutions.

Part II is structured for 3rd, 4th and 5th calendar years in MS Neurosurgery. It has two components; Clinical and Research. The candidate shall undergo clinical training to achieve educational objectives of MS Neurosurgery (knowledge & skills) along with rotation in relevant fields. Over the five years duration of the course, candidate will spend total time equivalent to one calendar year for research during the training. Research can be done as one block in 5th year of training or it can be done in the form of regular periodic rotations over five years as long as total research time is equivalent to one calendar year.

Admission Criteria

For admission in MS Neurosurgery course, the candidate shall be required to have:

- MBBS Degree
- Completed one year house job
- Registration with PMDC

- Passed Entry Test conducted by JCAT Joint Commission Admission Testing
- Having up to the mark credentials as per rules (no. of attempts in each professional, any gold medals or distinctions, relevant work experience, Rural/ Army services, research experience in a recognized institution, any research article published in a National or International Journal) may also be considered on case to case basis.

Exemptions: A candidate holding FCPS/MRCS/Diplomate/equivalent qualification in General Surgery shall be exempted from Part-I Examination and shall be directly admitted to Part-II Examination, subject to fulfillment of requirements for the examination.

Registration And Enrollment:

- Total number of students enrolled for the course must not exceed 2 per supervisor/year.
- The maximum number of trainees that can be attached with a supervisor at a given point of time (inclusive of trainees in all years/phases of MS training), must not exceed 6.
- Beds to trainee ratio at the approved teaching site shall be at least 5 beds per trainee.
- The University will approve supervisors for MS courses
- Candidates selected for the courses after their enrollment at the relevant institutions shall be registered as per prescribed Registration Regulation.

Accreditation Related Issues Of The Institution:

A. Faculty

Properly qualified teaching staff in accordance with the requirements of Pakistan Medical and Dental Council (PMDC)

B. Adequate Space

Including class-rooms (with audiovisual aids), demonstration rooms, computer lab and clinical patholo gy lab etc.

C. Library

Departmental library should have latest editions of recommended books, reference books and latest journals (National and International).

- Accreditation of Neuro surgery training program can be suspended on

temporary or permanent basis by the University, if the program does not comply with requirements for residents training as laid out in this curriculum.

- Program should be presented to the University along with a plan for implementation of curriculum for training of residents.
- Programs should have documentation of residents training activities and evaluation on monthly basis
- To ensure a uniform and standardized quality of training and availability of the training facilities, the University reserves the right to make surprise visits of the training program for monitoring purposes and may take appropriate action if deemed necessary.

Learning Objectives/outcomes

AIM

The aim of five years MS program in Neurosurgery is to train residents to acquire the competency of a specialist in the field so that they can become good teachers, researchers and clinicians in their specialty after completion of their training.

GENERAL OBJECTIVES

MS Neurosurgery training should enable a student to:

1. Access and apply relevant knowledge to clinical practice:
    - Maintain currency of knowledge
    - Apply scientific knowledge in practice
    - Appropriate to patient need and context
    - Critically evaluate new technology
2. Safely and effectively performs appropriate surgical procedures:
    - Consistently demonstrate sound surgical skills
    - Demonstrate procedural knowledge and technical skill at a level appropriate to the level of training
    - Demonstrate manual dexterity required to carry out procedures
    - Adapt their skills in the context of each patient and procedure
    - Maintain and acquire new skills
    - Approach and carries out procedures with due attention to safety of patient, self and others
    - Critically analyze their own clinical performance for continuous improvement.
3. Design and implement effective management plans:
    - Recognize the clinical features, accurately diagnose and manage neurological problems
    - Formulate a well-reasoned provisional diagnosis and management plan based on a thorough history and examination

- Formulate a differential diagnosis based on investigative findings.
- Manage patients in ways that demonstrate sensitivity to their physical, social, cultural and psychological needs
- Recognize disorders of the nervous system and differentiate those amenable to surgical treatment
- Effectively manage the care of patients with neurotrauma including multiple system trauma
- Effectively recognize and manage complications
- Accurately identify the benefits, risks and mechanisms of action of current and evolving treatment modalities
- Indicate alternatives in the process of interpreting investigations and in decision- making
- Manage complexity and uncertainty
- Access and implement a risk management plan onside all issues relevant to the patient Identify risk
- Assess and implement a risk management plan
- Critically evaluate and integrate new technologies and techniques.

4. Organize diagnostic testing, imaging and consultation as needed:

- Select medically appropriate investigative tools and monitoring techniques in a cost- effective and useful manner
- Appraise and interpret appropriate diagnostic imaging and investigations according to patients' needs
- Critically evaluates the advantages and disadvantages of different investigative modalities

5. Communicate effectively

- Communicate appropriate information to patients (and their family) about procedures, po tentialities and risks associated with surgery in ways that encourage their participation in informed decision making
- Communicate with the patient (and their family) the treatment option as including benefits and risks of each
- Communicate with and co-ordinate health management teams to achieve an

optimal surgical environment

- Initiate the resolution of misunderstandings or disputes
- Modify communication to accommodate cultural and linguistic sensitivities of the patient

6. Recognize the value o f knowledge and research and its application to clinical practice

- Assume responsibility for self-directed learning
- Critically appraise new trends in neurosurgery
- Facilitate the learning of others.

7. Appreciate ethical issues associated with Neurosurgery:

- Consistently apply ethical principles
- Identify ethical expectations that impact on medico-legal issues
- Recognize the current legal aspects of informed consent and confidentiality
- Be accountable for the management of their patients.

8. Prof essionalism by:

- Employing a critically reflective approach to Neurosurgery
- Adhering with current regulations concerning workplace harassment
- Regularly carrying out self and peer reviewed audit
- Acknowledging and have insight into their own limitations
- Acknowledging and learning from mistakes

9. Work in collaboration with m embers of an interdisciplinary team where appropriate

- Collaborate with other professionals in the selection and use of various types of treatments assessing and weighing the indications and contraindications associated with each type
- Develop a care plan for a patient in collaboration with members of an interdisciplinary team

- Employ a consultative approach with colleagues and other prof essionals
- Recognize the need to refer patients to other professionals.

10. Management and Leadership

- Effective use of resources to balance patient care and system resources
- Identify and differentiate between system resources and patient needs
- Prioritize needs and demands dealing with limited system resources.
- Manage and lead clinical teams
- Recognize the importance of different types of expertise which contribute to the effective functioning of clinical team.
- Maintain clinically relevant and accurate contemporaneous records

11. Health advocacy:

- Promote health maintenance of patients
- Advocate for appropriate health resource allocation
- Promote health maintenance of colleagues and self scholar and teacher

SPECIFIC LEARNING OUTCOMES

On completion of the training program, Neurosurgery trainees including those pursuing an academic pathway will be expected to have demonstrated competence

in all aspects of the published syllabus. The specific training component would be targeted for establishing clearly defined standards of knowledge and skills required

to practice Neurosurgery at secondary and tertiary care level with proficiency in

the Basic and applied clinical neurosciences, Basic neurosurgical care, Neurointensive care, Emergency (A&E) medicine and Complementary surgical disciplines.

1. Neuroanatomy:

To have a working knowledge of the structure and development of the central and peripheral nervous system together with the related parts of the head and spine and associated structures of neurosurgical importance.

2. Neurophysiology:

To be familiar with the normal and abnormal physiology and metabolism of the body and central nervous system.

To be familiar with the basic principles of neuropharmacology and Neurochemistry with special reference to the actions, interactions and to six effects of drugs currently used in neurosurgery.

To be familiar with the basic principles and interpretation of EEG, EMG and other techniques of applied neurophysiology, particularly those used intra-operatively and in neurointensive care.

3. Neuropathology:

To be familiar with the pathological changes and cellular organization of the central and peripheral nervous system during disease process.

To have a working knowledge of the gross and microscopic pathology of diseases affecting the nervous system

To recognize gross and microscopic preparations

To be familiar with the various pathogenic organisms responsible for infections of the nervous system.

4. Neuroradiology:

To be able to recognize and comment on abnormalities present on plain X-Rays of the skull, spine and other regions of neurosurgical interest and to interpret special investigations such as myelograms, angiograms, CT and MRI scans

To be familiar with the principles of radiobiology and radio therapy

To be familiar with the application of radionuclide studies to the diagnosis of neurological disorders.

5. Neurosurgery Related Clinical Competence

The ability to construct a diff essential diagnosis, interpret investigations and construct a management plan for common conditions in practice of neurosurgery in the following specialties:

i. Clinical Neurology:

To be able to take a neurological history and to assess the value of different symptom patterns in indicating involvement of specific neurological systems and functio ns and/or particular disease processes

To be able to conduct and to demonstrate a reliable clinical examination relating to the nervous system and to elicit and interpret signs of dysfunction of different systems and their components

To be able to arrive at a well reasoned diagnosis and to recognize the common neurological disorders and differentiate those amenable to surgical treatment

To be conversant with all common neurosurgical disorders

To be able to describe in detail and to discuss the choice of the appropriate conventional neurosurgical procedures available

To be conversant with safety in the operating theatre, the use of instruments and infection control procedures

To demonstrate competence in all aspects of the care of the patient during diagnostic tests, at operations, in the postoperative period and during rehabilitation

To be familiar with the principles of psychiatry, neuro-psychology, neuro-opthalmology, neuro- otology and neuro-anaesthesia

To be able to demonstrate those attitudes that ref lect awareness of, and respect for, individuality and autonomy of patients and careers at all stages of management, including counseling and providing explanations of the nature of disease and potential methods of treatment .

ii. Paediatric Neurosurgery:

The resident shall be proficient in the management of developmental disorders of the neuraxis including craniofacial anomalies and spinal dysraphism; all forms of hydrocephalus; intrinsic tumours of the brain and spine and a wide range of rarer pathologies. Paediatric neurosurgeons often contribute to the management o f related disorders such as hydrocephalus, spinal dysraphism and epilepsy presenting in young adults.

iii. Neuro-oncology:

The training is based on advances in basic oncological science and the so phisticated delivery of intra-lesional therapies for the management of malignant intrinsic tumours of the nervous system with refinement of surgical techniques using radiological and functional guidance; improvements in adjuvant chemotherapy and radiotherapy; greater understanding of the molecular biology of CNS tumours and better organization of oncology services.

iv. Functional Neurosurgery:

Functional neuro surgery involves the surgical management of a wide range of neurolo gical problems including intractable pain, epilepsy, spasticity and movement disorders. Traditional ablative surgery is being replaced by deep brain and spinal cord stimulation. Research into neuromodulation using gene therapy, biological vectors and pharmacological agents offers the prospect of effective treatment for neurodegenerative and disabling psychiatric diseases

v. Neurovascular Surgery:

Residents should be proficient in working closely with their interventional colleagues dealing with complex aneurysms, vascular malfo rmations and occlusive cerebrovascular diseases.

vi. Skull-base surgery

Residents are expected to flourish in technical advances in microsurgery, surgical approaches and reconstructions in the routine practice of dealing with disorders of the skull-base including common tumours such as meningiomas, acoustic neuromas and pituitary adenomas. Skull-base surgery is often undertaken jointly with neuro-otological, plastic and maxillofacial surgeons. The resident should also be aware of the adjuvant treatments with so phisticated radiosurgery and fractio nated stereotactic radiotherapy for patients with skull-base tumours

vii. Spinal surgery

Spinal surgery is now the largest subspecialty in neurosurgery and accounts for more than 50% of the operative workload of some departments in European hospitals. The resident should demonstrate a comprehensive service delivery for primary and

secondary spinal malignancy, spinal trauma, spinal pain and degenerative spinal disorders.

viii. Traumatology:

The resident must be able to provide a prompt neurosurgical intervention and neurointensive care and management in patients with head injury which remains a major cause of death and disability in children and young adults

6. Research Experience:

All residents in the categorical program are required to complete an academic outcomes-based research project during their training. This project can consist of original bench top laboratory research, clinical research or a combination of both. The research work shall be compiled in the form of a thesis which is to be submitted for evaluation by each resident before end of the training. The designated Faculty will organize and mentor the residents through the process, as well as journal clubs to teach critical appraisal of the literature.

REGULATIONS

- **Scheme of the course**

A summary of five years course in MS Neurosurgery is presented as under:

	Components	Examination
Part-I	**Fundamental concepts in Surgery** The candidate will spend the first 06 months of induction period in the chosen specialty. Training in basic clinical techniques of Surgery with compulsory rotation s for 18 months starting after completing 06 months **Rotations in Surgery & Allied specialities:** 3 elective rotations, of two months each in any of the following: 1. Urology 2. Orthopaedic Surgery 3. Plastic Surgery 4. Thoracic Surgery 5. Paediatric Surgery **Mandatory Workshops:** 6. Basic Surgical Skills 7. Communication skills 8. Computer skills and SPSS 9. Biostatistics & Research Methodology	Part-1 examination at the end of 02nd year of MS Neurosurgery program. **1. Written** Paper 1 & 2 basic principle of Surgery **2. Oral & Practical/clinical examination** OSCE Clinical examination (long case, Short Case • **Log Book**

Part-II	**Clinical component of Part II** Professional Education in Neurosurgery : Training in Neurosurgery during 3rd, 4th & 5th year of MS Neurosurgery program. compulsory rotations in relevant fields,:- 3 months rotation in Neurology 3 weeks rotation in Oncology 3 weeks rotation in NeuroAnesthesiology 3 weeks rotation in Neuroradiology **Research component of Part III** Research and Thesis Writing: Research work/Thesis writing project must be completed and thesis be submitted before the end of training ❖ in 03 years of training in Neurosurgery there will be 135 weeks in Neurosurgery and 21 weeks for rotations	Part-II examination in specialized compon ents of Neurosurgery at th e en d of 5th year of MS Neurosurgery program. I. **Written.** Papers 1 & 2: Problem-based questions in the su bject II. **Oral &Practical/Clinical Examination** III. OSCE IV. Clinical Examination (Long Case, Short Cases • **Log Book** V. Part-II thesis examination with defense at the end of fifth year of MS Neurosurgery Program.

TEACHING STARTEGIES

CONTENT OUTLINE

Part I MS Neurosurgery

Fundamental Principles of Surgery

- History of surgery
- Preparing a patient for surgery
- Principles of operative surgery: asepsis, sterilization and antiseptics
- Surgical infections and antibiotics
- Basic principles of anaesthesia and pain management
- Acute life support and critical care:
- Pathophysiology and management of shock
- Fluids and electrolyte balance/ acid base metabolism
- Haemostasis, blood transfusion
- Trauma: assessment of polytrauma, triage, basic and advanced trauma
- Accident and emergency surgery
- Wound healing and wound management
- Nutrition and metabolism
- Principles of burn management
- Principles of surgical oncology
- Principles of laparoscopy and endoscopy
- Organ transplantation
- Informed consent and medicolegal issues
- Molecular biology and genetics
- Operative procedures for common surgical manifestations e.g cysts, sinuses, fistula, abscess, nodules, basic plastic and reconstructive surgery

- Principles of basic diagnostic and interventional radiography
- Principles and interpretation of conventional and advanced radiographic procedures

Common Surgical Skills

Incision of skin and subcutaneous tissue:

- Langer's lines
- Healing mechanism
- Choice of instrument
- Safe practice

Closure of skin and subcutaneous tissue:

- Options for closure
- Suture and needle choice
- Safe practice

Knot tying:

- Choice of material
- Single handed
- Double handed
- Superficial
- Deep

Tissue retraction:

- Choice of instruments
- Placement of wound retractors
- Tissue forceps

Use of drains:

- Indications
- Types
- Insertion
- Fixation
- Management/removal

Incision of skin and subcutaneous tissue: Ability to use scalpel, diathermy and scissors
Closure of skin and subcutaneous tissue:

Accurate and tension free apposition of wound edges

Haemostasis:

- Control of bleeding vessel (superficial)
- Diathermy o Suture ligation
- Tie ligation
- Clip application Plan investigations Clinical decision making

Case work up and evaluation; risk management

Pre-operative assessment and management:

- Cardiorespiratory physiology
- Diabetes mellitus
- Renal failure
- Pathophysiology of blood loss
- Pathophysiology of sepsis
- Risk factors for surgery
- Principles of day surgery

Management of comorbidity Intraoperative care:

- Safety in theatre

- Sharps safety
- Diathermy, laser use
- Infection risks
- Radiation use and risks
- Tourniquets
- Principles of local, regional and general anaesthesia

Post-operative care:

- Monitoring of postoperative patient
- Postoperative analgesia
- Fluid and electrolyte management
- Detection of impending organ failure
- Initial management of organ failure
- Complications specific to particular operation
- Critical care

Blood products:

- Components of blood
- Alternatives to use of blood products
- Management of the complications of blood product transfusion including children

Antibiotics:

- Common pathogens in surgical patients
- Antibiotic sensitivities
- Antibiotic side-effects
- Principles of prophylaxis and treatment

Safely assess the multiply injured patient:

- History and examination
- Investigation
- Resuscitation and early management
- Referral to appropriate surgical subspecialties

Technical Skills

- Central venous line insertion
- Chest drain insertion
- Diagnostic peritoneal lavage
- Bleeding diathesis & corrective measures, e.g. warming, packing
- Clotting mechanism; Effect of surgery and trauma on coagulation
- Tests for thrombophilia and other disorders of coagulation
- Methods of investigation for suspected thromboembolic disease
- Anticoagulation, heparin and warfarin
- Role of V/Q scanning, CT angiography and thrombolysis
- Place of pulmonary embolectomy
- Awareness of symptoms and signs associated with pulmonary embolism and DVT
- Role of duplex scanning, venography and d-dimer measurement
- Initiate and monitor treatment

Diagnosis and Management of Common Paediatric Surgical Conditions:

- Child with abdominal pain
- Vomiting child
- Trauma
- Groin conditions

a. Hernia

b. Hydrocoele

c. Penile inflammatory conditions

d. Undescended testis

e. Acute scrotum

- ❖ Abdominal wall pathologies
- ❖ Urological conditions
- ❖ Constipation
- ❖ Head / neck swellings
- ❖ Intussusception
- ❖ Abscess
- ❖ In growing toenail

In terms of general experience it is expected that trainees would have gained exposure to the following procedures and to be able to perform those marked (*) under direct supervision.

Elective Procedures

- ❖ Inguinal hernia
- ❖ (not neo-natal)
    - Orchidopexy
    - Circumcision*
    - Lymph node biopsy*
    - Abdominal wall herniae
    - Insertion of CV lines
    - Management of in growing toenails*
    - EUA rectum*
    - Manual evacuation*

- Open rectal biopsy
- Excision of skin lesions*

Emergency Procedures

- ❖ Appendicectomy
- ❖ Incision and drainage of abscess*
- ❖ Pyloromyotomy
- ❖ Operation for testicular torsion*
- ❖ Insertion of pleural drain*
- ❖ Insertion of suprapubic catheter*
- ❖ Reduction of intussusception

Part II- MS Neurosurgery

Clinical Component

1. Common Neurosurgical Disorders

Congenital and Paediatric Neurosurgery

- Neurological evaluation of the neonate and infant Developmental malformations of the CNS and its coverings Spina bifida and its variants; aetiology
- Encephalocoele
- Craniosynostosis; principles of craniofacial reconstruction Paediatric head injury
- Prevention and treatment of secondary insults relating to transfer and emergency surgery in head-injured children
- Subdural effusions of infancy
- Intracranial and spinal tumours in children
- Phakomatoses (neurofibromatoses; tuberous sclerosis) Craniovertebral anomalies
- Vascular lesions in the paediatric age-group
- Epidemiology, natural history, pathophysiology and clinical features of subarachnoid haemorrhage, haemorrhagic stroke and ischaemia stroke in children secondary to intracranial aneurysms, arteriovenous malformations and fistulae, cavernomas, arterial dissection, moya- moya disease and venous sinus thrombosis
- Surgical and endovascular strategies for the management of acute intracranial vascular disorders in children
- Ethical considerations Hydrocephalus and CSF disturbances CSF physiology
- Pathophysiology, investigation and classification of hydrocephalus and its complications Benign intracranial hypertension
- Medical and surgical methods of treatment of hydrocephalus and long term complications

Cerebrovascular Neurosurgery

- Pathophysiology and clinical diagnosis of cerebral ischaemia
- Extracranial carotid/vertebral disease; carotid endarterectomy; brain revascularisation Medical prevention of occlusive cerebrovascular disease
- Spontaneous intracranial/spinal haemorrhage especially SAH and intracerebral haemorrhage

Pathology, classification and natural history of cerebral aneurysms and AVM's

- Surgery of and perioperative management of aneurysms, AVM's, cavernomas and haematomas
- Miscellaneous cerebrovascular lesions e.g. Caroticocavernous fistulae, venous thrombosis. Role of interventional radiology

Trauma - Head and Spine

(For neurointensive care and rehabilitation - see relevant sections)

- Mechanisms and patterns of traumatic brain and spinal cord damage
- Pathophysiology of CNS trauma
  a. Cerebral perfusion and oxygenation
  b. Raised intracranial pressure
  c. Impaired intracranial compliance
- Intracranial herniation
- Epidemiology and prevention of head and spinal injury
- Pathophysiology of spinal cord injury
- Classification of cervical spinal fracture dislocations
- Biomechanics of spinal instability
- Indications for halo traction and external stabilization
- Indications for and principles of open reduction and stabilization
- Transport, retrieval and pre-hospital care
- Initial resuscitation and triage

- Clinical Assessment
- Natural history of recovery from head injury including neurological,
- cognitive and behavioural disability and post- traumatic epilepsy
- Management including operation for 'surgical' complications (eg. acute and chronic haematoma, open injury, CSF fistula, traumatic vascular injuries, spinal instability, late hydrocephalus).
- 'Medical' management of persisting unconsciousness
- Assessment of outcome, factors affecting prognosis and late sequelae
- Perioperative and neuro-intensive care
- Respiratory functions and ventilation
- Management of disorders of fluid balance; nutrition and feeding
- Blood coagulation and transfusion
- DVT and pulmonary embolism
- Fever in neurosurgical patients
- Confusion, restlessness and agitation in neurosurgery
- Informed consent and medicolegal aspects
- Postoperative seizures
- Diagnosis of brainstem death
- Monitoring techniques in Neurointensive care and Theatre
- Principles of prophylactic drug treatment
- Other post-operative complications
- The neurogenic bladder

Infections

- The pathophysiology of intracranial and spinal sepsis
- Infective complications of neurosurgical procedures – treatment and prophylaxis

- Intracranial and spinal abscess/ empyema-clinical features, investigation and management
- The aetiology and pathophysiology of spinal sepsis
- Indications for drainage of spinal epidural abscess by laminectomy and multiple laminotomies
- Bacterial, viral, fungal and parasitic infections of the CNS and spine
- Opportunistic infections, HIV and AIDS
- The aetiology and pathophysiology of vertebral osteomyelitis and discitis, including pyogenic, tuberculous and atypical infections
- Indications for percutaneous and open biopsy
- Principles of anti-microbial chemotherapy
- Indications for operative intervention
- Principles of peri-operative care
- Surgical complications and their management

Neuro-oncology

- Presenting features and investigations of tumours involving the central nervous and peripheral nervous system
- Classification, natural history and pathology of benign and malignant intracranial neoplasia
- Pathophysiology of raised intracranial pressure associated with space occupying tumours
- Diagnostic imaging of intracranial tumours including the interpretation of CT and MRI scans and the role of MRS
- Principles and techniques of tumour biopsy
- Stereotaxy, robotics/ endoscopic techniques in CNS tumour management
- Operative management of intracranial and spinal tumours.
- Principles of fractionated radiotherapy, stereotactic radiotherapy and radiosurgery Role of adjuvant chemotherapy
- Principles of clinical trials and their application to neuro-oncology

- Specific management of tumours of the brain, skull base and orbit including glioma, meningioma, pituitary and parasellar tumours, cerebellar pontine angle tumours, metastases, tumours of the ventricular system and pineal region, lymphoma, medulloblastoma, epidermoid, dermoid, haemangioblastoma and chordoma
- Specific management of primary and secondary tumours involving the spinal column, intramedullary, intra and extra dural tumours of the spinal canal and tumours of the nerve roots and peripheral nerves
- Prognosis of CNS and peripheral nerve tumours
- Principles of palliative care

Spinal disorders (for congenital, trauma, tumour and vascular disorders, see relevant sections)

- Differential diagnosis of spinal cord compression and root dysfunction – investigation and management
- Biomechanics of the spine and principles of spinal stabilization/fusion; approaches to the spine
- Conservative management of spinal disorders
- Degenerative and inflammatory spinal disease - e.g. rheumatoid arthritis, cervical spondylotic myelopathy/radiculopathy, thoracic discs, lumbar disc disease, spinal stenosis and spondylolisthesis
- Syringomyelia; arachnoiditis
- Management of spasticity

Pain

- Pathophysiology of pain; differential diagnosis
- General and psychological factors in pain management Analgesics and pain relief
- Craniofacial pain syndromes
- Trigeminal and glossopharyngeal neuralgia - history, drug treatment, percutaneous and posterior fossa approaches
- Nerve blocks, electrical stimulation and RF lesions for pain relief; implants; cordotomy DREZ lesions; Dorsal rhizotomy

Peripheral nerves

The diagnosis and treatment of common peripheral nerve problems including entrapment neuropathies, thoracic outlet and brachial plexus, causalgia and sympathetic dystrophy

Theory and practice of nerve repair and cranial nerve reconstruction

Functional and Stereotactic Neurosurgery

- Principles and techniques of stereotactic and computer-assisted imageguided surgery
- Stereotactic radiosurgery
- Movement disorders and their surgical treatment
- Investigation, medical and surgical management of epilepsy and other functional disorders
- Classification, causes and presentations of dysphasias, speech dyspraxia and dyslexia
- Classification, causes and presentations of dysarthria
- Role of speech and language therapists in assessment and treatment
- Neurological causes of dysphagia
- Indications for laryngoscopy, videofluoroscopy, nasogastric and percutaneous gastric feeding
- Aaetiology, differential diagnosis, investigation and initial management of patients presenting with sphincteric disorders
- Interpretation of urodynamic studies
- Aetiology, differential diagnosis, investigation and initial management of patients presenting with movement disorders

  a. Parkinson's disease

  b. Iatrogenic movement disorders

  c. Dystonic syndromes

  d. Choreiform syndromes

- Disorders of memory and cognition associated with head injury, subarachnoid haemorrhage, hydrocephalus, structural lesions of the frontal and temporal lobes and disorders of the limbic system

Neuro-ophthalmology / Neuro-otology

- Visual acuity and visual fields; fundal examination
- Patterns of visual loss in relation to common bulbar, retrobulbar, sellar, parasellar and optic pathway disorders
- Analysis of diplopia and nystagmus in relation to common cranial nerve and brainstem disorders
- Significance of abnormalities of the pupils, fundi, external ocular movements and the visual fields
- Significance of abnormalities of hearing and of the vestibular system
- Common causes of conductive and sensorineural hearing loss
- Principles of audiological assessment

Rehabilitation of the Neurosurgical Patient

- Distinction between, and relevance of, concepts of limitation, disability and handicap
- Methods of assessment
- Patterns of natural history of recovery after Neurosurgical treatment, outcome and confounding factors
- Use of components of rehabilitation provided by specific medical and paramedical disciplines and interdisciplinary approaches, including community and family reintegration

Evidence based Neurosurgery; Audit and Trial design

- To understand the provisional nature of knowledge
- To be able to acknowledge and identify failure of current treatments
- To cope with uncertainty and biological variability
- To be able to critically assess the neurosurgical literature
- To be aware of the relevant rational and quantitative methods to resolve uncertainty

Relevant topics

- Principles of audit and randomized controlled trials
- Outcome assessment
- Design and appraisal of clinical studies - evaluation of published reports
- Clinical trials: design, randomization, patient numbers, end points and power; statistical analysis, confidence intervals and clinical significance.
- Drug studies : phases 1 - 4
- Informed consent
- Issues of organization and delivery of neurosurgical care

2. Common Neurosurgical Presentations

1. Impaired consciousness and non-traumatic coma due to:
    - Meningitis
    - Encephalitis
    - Intracranial haemorrhage
    - Acutely raised ICP
    - Hydrocephalus
    - Hypoxaemia and ischaemia
    - Cardiogenic shock
    - Hypoglycaemia
    - Epilepsy
    - Metabolic encephalopathies
    - Drugs and toxins
2. Traumatic coma
3. Weakness and paralysis
    - Ocular, cranial nerve, limb, trunk and respiratory muscle weakness

4. Headache - acute and chronic- associated with
    - ❖ Benign headache syndromes
    - ❖ Migraine, cluster headache and related syndromes
    - ❖ Space occupying lesions
    - ❖ Meningitic disorders
    - ❖ Intracranial haemorrhage
    - ❖ Trigeminal neuralgia
    - ❖ Atypical craniofacial pain syndrome
5. Dizziness, unsteadiness and falls
    - ❖ Cerebellar, vestibular, extrapyramidal and autonomic dysfunction
6. Pain and sensory loss
    - ❖ Musculoskeletal, neurogenic and neuropathic pain and sensory loss
7. Movement disorder associated with;
    - ❖ Parkinson's disease
    - ❖ Iatrogenic movement disorders
    - ❖ Dystonic syndromes
    - ❖ Choreiform syndromes
8. Hearing disorder
    - ❖ Conductive and sensorineural hearing loss
9. Visual disorder
    - ❖ Common bulbar, retrobulbar, sellar, parasellar and optic pathway disorders
    - ❖ Nystagmus and diplopia
10. Language and speech disturbance presentations;
    - ❖ Dysphasias

- Speech dyspraxia
- Dyslexia
- Dysarthria

11. Swallowing disorders with neurological causes of dysphagia

12. Disorders of the Sphincteric and sexual function

- Neurological enuresis
- Constipation
- Diarrhea
- Urgency of micturition/dribbling

13. Memory and cognitive disorders associated with;

- Head injury
- Subarachnoid haemorrhage
- Hydrocephalus
- Structural lesions of the frontal and temporal lobes
- Disorders of the limbic system

14. Acute and chronic presentations of organic and psychiatric behavioural disorders relating to;

- Alcohol and drug abuse
- Encephalitis
- Organic dementia
- Psychosis

15. Ill child with hydrocephalus, impaired consciousness and sepsis

3. Common Neurosurgical Skills and Procedures

On completion of the initial training in Part I, the trainees will be competent in all aspects of the basic, operative and non operative care of surgical patients

During Part II training, they will understand the importance of neurosurgical care and management with particular reference to common neurosurgical presentations recognizing and preventing secondary insults to the central nervous system. They will be capable of resuscitating, assessing and initiating the surgical management of patients deteriorating as a result of intracranial and systemic complications. They will demonstrate sound judgment when seeking more senior support, prioritizing medical interventions and escalating the level of medical care.

Neuro-Traumatology:

General Management of the Head Injured Patient:

1. Medical management of acutely raised intracranial pressure
2. Indications for operation intervention including the use of pressure monitoring
3. Principles, diagnosis and confirmation of brain death
4. Principles of intensive care of head injured patients
5. Principles of spinal stabilization and radiological assessment in head injury patients
6. Role of neurological rehabilitation
7. Clinical assessment of the multiply-injured patient.
8. Neurological assessment of the head-injured patient including:
    - ❖ Assessment and categorization of impaired consciousness
    - ❖ Recognition and interpretation of focal neurological deficits
9. Prioritization of clinical risk
10. Interpretation of CT scans and plain radiology
11. Accurate documentation
12. Indications for ICP monitoring
13. Insertion of ICP monitor
14. Insertion of frontal subdural and intraparenchymal ICP monitors using a standard frontal burr hole and/or twist drill craniostomy
15. Calibration, zeroing and interpretation of ICP traces
16. Potential complications of the procedure

17. Burr hole evacuation of chronic subdural haematoma
18. Management of anti-platelet and anti-coagulant medication
19. Neurological assessment of patients with a CSDH
20. Interpretation of CT scans
21. Post-operative assessment and management
22. Performance of single and multiple frontal and parietal burr hole
23. Craniotomy for supratentorial traumatic haematoma, in particular:
    - ❖ Planning and siting of craniotomies for evacuation of extradural and subdural haematomas
    - ❖ Handling the "tight" brain
    - ❖ Achieving haemostasis in the coagulopathic patient
    - ❖ Achieving haemostasis from the skull base and venous sinuses
    - ❖ Elevation of compound depressed skull fracture with dural repair
24. Delayed cranioplasty of skull vault
25. Management of soft tissue trauma
26. Indications for primary and secondary closure of wounds
27. Indications for antibiotic prophylaxis
28. Assessment of tissue perfusion and viability
29. Wound exploration under local and general anaesthesia
30. Wound debridement
31. Arrest of scalp haemorrhage
32. Layered closure of the scalp without tension
33. Suturing technique
34. Wound drainage and head bandaging
35. Use of external mobilization including cervical collars and spinal Boards

36. Application of halo traction

37. Application of a halo-body jacket

38. The role of posttraumatic neurological rehabilitation

General Management of Hydrocephalus:

- The assessment and operative management of adult patients with communicating and non communicating hydrocephalus
- The assessment of children with hydrocephalus; emergency external ventricular drainage in children with acute hydrocephalus
- The insertion and revision of ventriculo-peritoneal, ventriculo-atrial and lumbo-peritoneal shunts; endoscopic third ventriculostomy
- Image-guided placement of ventricular catheters
- Management of neonatal post-haemorrhagic hydrocephalus

General Management of Subarachnoid Haemorrhage:

- Principles of resuscitation and timing of interventions.
- Indications for CT scanning, diagnostic lumbar punctuure, CT angiography and digital subtraction angiography.
- Principles of management of post-haemorrhagic hydrocephalus
- Indications for endovascular and surgical intervention
- Interpretation of CT scans including assessment of intracranial blood load, haematomas and hydrocephalus
- Basic interpretation of cerebral angiography
- Diagnostic & therapeutic lumbar puncture
- To undertake an atraumatic lumbar puncture
- Interpretation of basic microscopy and biochemistry
- Principles of spectrophotometry
- Management of delayed secondary ischaemia
- Principles governing the augmentation of cerebral blood flow

- Assessment of a deteriorating patient
- Recognition and management of secondary insults
- Interpretation of CT scans
- Management of hypervolaemic hypertension
- Insertion of central venous catheter
- Insertion of lumbar drain
- Insertion of external ventricular drain
- Management of post-haemorrhagic hydrocephalus
- Indications for external ventricular drainage and lumbar subarachnoid drainage
- Assessment of the unconscious and deteriorating SAH patient
- Interpretation of CT scans
- The management of hydrocephalus complicating intracranial haemorrhage,head injury and intracranial space occupying lesions;
- Insertion and taping of CSF reservoirs; insertion and maintenance of lumbar and ventricular drains
- External ventricular drainage, ventriculoperitoneal shunting, lumbar CSF drainage and shunting, ventriculo-cisternostomy
- Insertion of ventricular drain/access device

Neuro-Oncology:

All trainees will be competent to manage patients with high grade intrinsic tumours, metastases and convexity meningiomas. Trainees with a special interest in neuro-oncology will participate fully in the multidisciplinary management of neuro-oncology patients and will be familiar with current developments in molecular neuro-oncology, emerging surgical techniques and the ethical, regulatory and practical considerations governing clinical trials in neuro oncology.

Assessment and Peri-Operative Management of Patients with SpaceOccupying Intracranial Lesions:

- Craniotomy for superficial, lobar supratentorial intrinsic tumour. In particular:

a. Safe patient positioning

b. Planning and siting of craniotomy with and without image-guidance

c. Intra-operative management of raised ICP

d. Appropriate exposure of the tumour, using operating microscope as necessary

e. Safe use of fixed retractors

f. Precise use of suction, electro-coagulation and ultrasonic aspiration

g. Intracranial haemostasis

- Advanced surgical techniques including awake craniotomy; stereotactic craniotomy, intraoperative neurophysiological monitoring
- Advanced image guidance with integration of functional data; Intraoperative imaging techniques
- Use of intraoperative chemotherapy wafers
- Third ventriculostomy
- The management of low grade intrinsic tumours using advanced techniques
- The surgical approaches to tumours of the ventricular system and pineal gland including the transfrontal transventricular excision of intraventricular tumours and cysts
- Transcallosal transventricular excision of lesions of the third ventricle and foramen of Munro
- Indications for biopsy of intracranial tumours
- Risks of biopsy
- Principles of image-guided surgery
- Principles of radiosurgery and stereotactic radiotherapy and the indications for their use as adjunctive and/or primary treatment modalities.
- Indications for neuroimaging
- Image-guided frameless and/or frame-based stereotactic biopsy including Setting up a computer workstation and importing and interrogating image data
    - Positioning the patient and applying a cranial fixator
    - Obtaining and confirming accurate patient registration

- Positioning and performing a suitable burr hole
- Passage of biopsy probe and biopsy
- Preparation of smear histology (when available)

- Management of raised intracranial pressure
- Principles of operative management
- Detection and management of post-operative complications e.g. cerebral swelling, intracranial haematomas and intracranial sepsis; the management of post-operative seizures
- Basic interpretation of CT and MRI scans
- Interpretation of CT and MRI scans and selection of biopsy targets

Assessment and perioperative management of patients presenting with Space occupying intra spinal lesions:

- Assessment and perioperative management of patients presenting with acute spinal disorders e.g. cauda equina and spinal root compression
- General and basic surgical management of patients with malignant spinal cord compression
- The surgical management of degenerative spinal disorders e.g. lumbar compressive radiculopathies by lumbar microdiscectomy and associated microsurgical decompressions
- The surgical management of compressive cervical myeloradiculopathies
- Including the multi-disciplinary management of patients with intracranial neoplasia
- Extradural spinal biopsy and decompression by laminectomy in selected patients without segmental instability
- Instrumented posterior spinal stabilization
- The management of spinal shock
- The ward management of patients with spinal instability
- The detection and initial management of postoperative complications including compressing haematomas, CSF fistula and spinal sepsis
- The operative management of supra-tentorial intrinsic tumours

- The operative management of convexity meningiomas e.g. use of duraplasty and cranioplasty

CNS Sepsis:

- General management of CNS infections e.g. ventriculitis, cerebral abscess, subdural empyema and spinal epidural abscess
- The operative management of cerebral abscess by burr hole aspiration

Paediatric Neurosurgery:

All trainees will undertake at least a six month placement in a paediatric neurosurgery service under the direct supervision of paediatric neurosurgeons with a full-time or major commitment to paediatric surgery. The service must provide a comprehensive range of paediatric neurosurgical care. On completion of general paediatric training trainees will be competent to assess and undertake the emergency neurosurgical management of the critically-ill child with raised intracranial pressure. On completion of a special interest fellowship in paediatric neurosurgery trainees will be competent in all aspects of the non-operative neurosurgical management of children presenting with disorders of the nervous system. They will have detailed knowledge of the statutory framework governing the care of children, paediatric neurointensive care, the principles of paediatric neuro-rehabilitation and of the management of non-accidental injury. They will be competent to undertake all aspects of the emergency neurosurgical operative care of children and to undertake a range of elective procedures in the following fields with appropriate supervision:

Paediatric Neuro-oncology:

- Stereotactic and image guided biopsy of paediatric tumours
- Endoscopic biopsy of third ventricular tumours
- Resection of supratentorial and infratentorial intrinsic tumours
- Approaches to suprasellar, third ventricular and pineal tumours
- Management of spinal cord tumours

Paediatric Head Injury:

- Decompressive craniectomy
- Cranioplasty
- Management of growing fractures
- Craniofacial reconstruction including the management of simple craniosynostosis,

syndromic craniosynostosis, post-traumatic deformity

- Management of CSF fistulae

Paediatric Hydrocephalus:

- Assessment of the ill child with hydrocephalus, impaired consciousness and sepsis
- Differential diagnosis of shunt malfunction
- Interpretation of CT scans in shunted children
- Taping and draining from an Ommaya reservoir
- Taping a shunt
- External ventricular drainage

Spinal Dysraphism:

- Management of neonatal spina bifida, meningoceles and encephaloceles
- Spinal cord tethering syndromes
- Management of congenital and acquired spinal deformity e.g. syndromic spinal deformity and post-operative spinal deformity

Functional Neurosurgery:

Trainees with a special interest in functional neurosurgery will develop additional expertise as follows:

Surgical Management of Pain:

- Implantation of spinal cord stimulators
- Insertion of intrathecal drug delivery systems
- Ablative surgical treatment for pain including DREZ lesioning, cordotomy and myelotomy
- Neuromodulatory techniques including peripheral nerve, motor cortex and deep brain stimulation.
- Neurovascular compression syndromes: including microvascular decompression of the trigeminal nerve; microvascular decompression of the facial nerve; percutaneous trigeminal rhizotomy

Surgical Management of Spasticity:

- Medical and surgical treatments for spasticity
- Implantation of intrathecal drug delivery systems
- Other surgical treatments for spasticity including phenol blocks, neurectomies and rhizotomy.

Surgical Management of Epilepsy:

- Multidisciplinary assessment and preparation of patients for epilepsy surgery
- Stereotactic placement of depth electrodes and placement of subdural
- Electrode grids
- Temporal lobectomy
- Selective amygdalohippocampectomy
- Callosotomy
- Insertion of vagal nerve stimulators
- Hemispherectomy
- Multiple subpial transections

Surgical Management of Movement Disorders:

- Multidisciplinary assessment and management of patients with movement disorders e.g. Parkinson's disease and dystonia
- Selection, targeting and placement of deep brain stimulation electrodes
- Management of neuro-stimulators; radiofrequency lesioning

Neurovascular Surgery:

Special interest training will take place in units with extensive experience in

the multi-disciplinary management of all common intracranial vascular disorders. Trainees with a special interest in neurovascular surgery will develop additional expertise in:

Intracranial Aneurysms:

- Surgical and endovascular strategies for the management of ruptured and un-ruptured intracranial aneurysms
- Surgical treatment of ruptured aneurysms of the anterior circulation
- Principles of microvascular reconstruction and bypass for complex aneurysms.

Intracranial Vascular Malformations:

- Surgical, endovascular and radiosurgical strategies for the management of arteriovenous malformations
- Surgical treatment of superficial cortical arteriovenous malformations

Other Vascular Disorders:

- Surgical and endovascular treatment of dural arteriovenous fistulae
- Image-guided resection of cavernomas
- Management of primary intracerebral haematomas
- The management of venous occlusive disorders
- Medical, surgical and endovascular management of extracranial arterial occlusive disease

Skull-Base Surgery

Special interest training in skull base surgery will take place in units with extensive multi-disciplinary experience in the management of all

common skull-base disorders. Trainees with a special interest in skull base surgery will develop additional expertise as follows:

Skull-Base and Craniofacial Surgical Access:

- Standard variations of fronto-basal, fronto-orbital, transzygomatic infratemporal, transtemporal, far-lateral, transphenoidal and transmaxillary approaches

Cranial Base Meningiomas:

- Resection of anterior fossa (olfactory groove and suprasellar) meningiomas; tentorial and petrous temporal meningiomas; petroclival meningiomas

Pituitary and Sellar Tumours:

- Microsurgical and endoscopic transphenoidal resection of pituitary tumours
- Pterional, subfrontal, interhemispheric and transventricular approaches to suprasellar tumours

Acoustic Neuromas:

- Retrosigmoid, translabyrinthine and middle fossa resection of acoustic neuromas

Other skull-base tumours:

- Management of other cranial nerve schwannomas, glomus tumours and malignant primary and secondary tumours of the skull-base

Management of cranio-facial trauma:

- Management of fronto-orbital disruption

Repair of CSF Fistulae:

- Management of postoperative CSF fistulae
- Indications for endoscopic repair of basal CSF fistula
- Techniques for open repair and skull-base reconstruction

Spinal Surgery:

- On completion of a special interest fellowship in spinal surgery trainees

will be competent in all aspects of the emergency and urgent operative care of patients with spinal disorders. They will develop additional expertise as follows:

Spinal trauma:

Reduction and internal stabilization of atlanto-axial, sub-axial and thoraco-lumbar fractures and dislocations

Metastatic Disease of the Spine:

- Posterior decompression and stabilization using pedicle screw, hook and sub-laminar wire constructs
- Corporectomy and instrumented reconstruction of the anterior column

Primary tumours of the spine

- Techniques for local ablation of benign lesions and en bloc resections of malignant tumours
- Transpedicular and open vertebral and disc biopsy in vertebral osteomyelitis and discitis Intradural Tumours:
- The radical resection of intradural, extra-medullary tumours; biopsy and optimal resection of intramedullary tumours

Syringomyelia and Hind Brain Anomalies:

- Foramen magnum decompression, syringostomy, syringopleural shunting, detethering and duroplasty
- Advanced Surgery of the Ageing and Degenerative Spine:
- Management of osteoporotic collapse, vertebroplasty, kyphoplasty
- Stabilization of the osteoporotic spine
- Operative management degenerative spondylolisthesis and scoliosis
- The assessment, counseling and pre-operative preparation of patients with lumbar radiculopathies
- Interpretation of plain radiographs, CT scan, MRI scans and CT myelograms
- Primary lumbar microdiscectomy
- Primary posterior decompression (laminotomy, hemilaminectomy etc): including
    - Identification of spinal level by pre and intra-operative fluoroscopy
    - Achieving safe access to the spinal canal by micro-surgical fenestration
    - Achieving full decompression of the spinal canal, lateral recess and foramen by appropriate bone and soft tissue resection
    - Protection and safe retraction of neural tissues
- The assessment, counseling and pre-operative preparation of patients with cervical myeloradiculopathies
- Interpretation of plain radiographs, CT scan, MRI scans and CT myelograms

- Single level anterior cervical discectomy with and without fusion
- Standard anterolateral approach to the cervical spine
- Use of fluoroscopy or plain radiographs to confirm spinal level
- Radical and subtotal excision of cervical disc, PLL, and central and onco vertebral osteophytes.
- Protection and full decompression of the spinal cord and spinal nerve roots
- Interbody fusion using autologous bone with or without interbody cages

The Rheumatoid and Ankylosed Spine:

- Management of atlanto-axial subluxation
- Cranial settling and odontoid migration
- Sub-axial degeneration; cervico-dorsal kyphosis

Spinal Deformity:

Multidisciplinary management of patients with spinal dysraphism, diastematomyelia etc

METHODS OF INSTRUCTION/COURSE CONDUCTION

As a policy, active participation of students at all levels will be encouraged. Following teaching modalities will be employed:

1. Lectures
2. Seminar Presentation and Journal Club Presentations
3. Group Discussions
4. Grand Rounds
5. Clinico-pathological Conferences
6. SEQ as assignments on the content areas
7. Skill teaching in ICU, Operation theatres, emergency and ward settings
8. Attend genetic clinics and rounds for at least one month.
9. Self study, assignments and use of internet
10. Bedside teaching rounds in ward
11. OPD & Follow up clinics
12. Long and short case presentations

In addition to the conventional teaching methodologies interactive strategies like conferences will also be introduced to improve both communication and clinical skills in the upcoming consultants. Conferences must be conducted regularly as scheduled and attended by all available faculty and residents. Residents must actively request autopsies and participate in formal review of gross and microscopic pathological material from patients who have been under their care. It is essential that residents participate in planning and in conducting conferences.

1. Clinical Case Conference

Each resident will be responsible for at least one clinical case conference

each month. The cases discussed may be those seen on either the consultation or clinic service or during rotations in specialty areas. The

resident, with the advice of the Attending Surgeon on the Consultation Service, will prepare and present the case(s) and review the relevant literature.

2. Monthly Student Meetings

Each affiliated medical college approved to conduct training for MS Neurosurgery will provide a room for student meetings/discussions such as:

a. Journal Club Meeting

b. Core Curriculum Meetings

c. Skill Development

a. Journal Club Meeting

A resident will be assigned to present, in depth, a research article or topic of his/her choice of actual or potential broad interest and/or application. Two hours per month should be allocated to discussion of any current articles otopics introduced by any participant. Faculty or outside researchers will be invited to present outlines or results of current research activities. The article should be critically evaluated and its applicable results should be highlighted, which can be incorporated in clinical practice. Record of all such articles should be maintained in the relevant department.

b. Core Curriculum Meetings

All the core topics of Neurosurgery should be thoroughly discussed during these sessions. The duration of each session should be at least two hours once month. It should be chaired by the chief resident (elected by the residents of therelevant discipline). Each resident should be given an opportunity to brainstorm all topics included in the course and to generate new ideas regarding the improvement of the course structure

c. Skill Development

Two hours twice a month should be assigned for learning and practicing clinical skills.

List of skills to be learnt during these sessions is as follows:

- Residents must develop a comprehensive understanding of the indications, contraindications, limitations, complications, techniques, and interpretation of results of those technical procedures integral to the discipline
- Residents must acquire knowledge of and skill in educating patients about the technique, rationale and ramifications of procedures and in obtaining procedure- specific informed consent. Faculty supervision of residents in their performance is required, and each resident's experience in such procedures must be documented by the program director.

- Residents must have instruction in the evaluation of medical literature, clinical epidemiology, clinical study design, relative and absolute risks of disease medical statistics and medical decision making.

- Training must include cultural, social, family, behavioral and economic issues, such as confidentiality of information, indications for life support systems, and allocation of limited resources.

- Residents must be taught the social and economic impact of their decisions on patients, the primary care physician and society. This can be achieved by attending the bioethics lectures

- Residents should have instruction and experience with patient counseling skills and community education.

- This training should emphasize effective communication techniques for diverse populations, as well as organizational resources useful for patient and community education.

- Residents should have experience in the performance of neurosurgery related clinical laboratory and radionuclide studies and basic laboratory techniques, including quality control, quality assurance and proficiency standards

- Each resident will manage at least the following essential neurosurgical cases and observe and participate in each of the following procedures, preferably done on patients under supervision initially and then independently;

Essential Neurosurgical Conditions:

- Cranial trauma

- Spontaneous intracranial haemorrhage

- Hydrocephalus

- Intracranial tumours

- CNS infectionsSpinal trauma

- Benign intradural tumours

- Malignant spinal cord compression

- Degenerative spinal disorders

- Emergency paediatric care

Essential Operative Competencies: Initial Surgical Approaches

- Burr hole
- Craniotomy - convexity
- Craniotomy - pterional
- Craniotomy - midline supratentorial
- Craniotomy - midline posterior fossa
- Lateral posterior fossa
- Lumbar fenestration
- Laminectomy

General Procedures

- Insertion of lumbar drain
- Tapping/draining of CSF reservoir
- Application of skull traction
- Image Guidance/Stereotaxy set up

Management of Cranial Trauma

- Insertion of Intracranial (ICP) monitor
- Burr hole evacuation of CSDH
- Elevation of depressed skull fracture
- Craniotomy for traumatic haematoma (ICH)

Management of Spontaneous Intracranial Haemorrhage

- Craniotomy for spontaneous intracerebral
- Haematoma (ICH supratentorial)
- Craniotomy for spontaneous intracerebellar
- Haematoma (ICH infratentorial)
- Management of Hydrocephalus

- Insertion of ventricular drain/access device
- Insertion of VP shunt
- Revision of VP shunt

Management of Intracranial Tumours

- Supratentorial tumour biopsy
- Craniotomy for supratentorial intrinsic tumour & metastasis
- Craniotomy for posterior fossa intrinsic tumour & metastasis
- Craniotomy for convexity meningioma

Management of Intradural Spinal Tumours

- Excision of intradural extramedullary tumour
- Management of degenerative spinal disorders
- Lumbar microdiscectomy
- Anterior cervical discectomy

Emergency Paediatric Care

- Insertion of EVD
- Evacuation of intracranial haematoma (ICH)

3. Annual Grand Meeting

Once a year all residents enrolled for MS Neurosurgery should be invited to the annual meeting.

One full day will be allocated to this event. All the chief residents from affiliated institutes will present their annual reports. Issues and concerns related to their relevant courses will be discussed. Feedback should be collected and suggestions should be sought in order to involve residents in decision making.

The research work done by residents and their literary work may be displayed.

In the evening an informal gathering and dinner can be arranged. This will help in creating a sense of belonging and ownership among students and the faculty.

ASSESSMENT TOOLS

It will consist of action and professional growth oriented student centered integrated assessment, with an additional component of informal internal assessment, formative assessment and measurement-based summative assessment.

Student centered integrated assessment

It views students as decision-makers in need of information about their own performance. Integrated Assessment is meant to give students responsibility for deciding what to evaluate, as well as how to evaluate it, encourages students to "own" the evaluation and to use it as a basis for self improvement.

In the proposed curriculum, it will be based on:

- Self Assessment by the student
- Peer Assessment
- Informal Internal Assessment by the Faculty

Self Assessment by the Student

Each student will be provided with a pre-designed self-assessment form to evaluate his/her level of comfort and competency in dealing with different relevant clinical situations. It will be the responsibility of the student to correctly identify his/her areas of weakness and to take appropriate measures to address those weaknesses.

Peer Assessment:

The students will also be expected to evaluate their peers after the monthly small group meeting. This should be followed by a constructive feedback and should be non-judgmental. This will enable students to become good mentors in future.

Informal Internal Assessment by the Faculty

There will be no formal allocation of marks for the component of Internal Assessment so that students are willing to confront their weaknesses rather than hiding them from their instructors.

a. Punctuality

b. Ward work

c. Monthly assessment (written tests to indicate particular areas of weaknesses)

d. Participation in interactive sessions

Formative Assessment

Will help to improve the existing instructional methods and the curriculum in use

Feedback to the faculty by the students:

After every three months students will be providing a written feedback regarding their course components and teaching methods. This will help to identify strengths and weaknesses of the relevant course, faculty members and to ascertain areas for further improvement.

Summative Assessment

It will be carried out at the end of the program to empirically evaluate cognitive, psychomotor and affective domains in order to award diplomas for successful completion of courses.

POLICY/CRITERIA OF HOLDING IME/ MTA

Examinations

- All candidates admitted in MS Neurosurgery course shall appear in IMM examination at the end of second calendar year.
- The examination shall be held on biannual basis.
- The examination shall have the following components:

  a. Written 200 Marks

  b. OSCE 100 Marks

  c. Clinical examination 100 Marks

- There shall be one written paper of 100 marks and one paper of MCQs containing 100 MCQs of 100 marks.

Papers 1 & 2: Principles of General Surgery

- The types of questions shall be of Short/Modified essay type and MCQs (single best).

- Oral & practical/clinical examination shall be held in clinical techniques in General Surgery.
- To be declared successful in Part-II examination the candidate must secure 60% marks in each component.
- Only those candidates, who pass in theory papers, will be eligible to appear in the Oral & Practical/clinical Examination.
- The candidates, who have passed written examination but failed in oral & practical/ clinical examination, will re-appear only in oral & practical/clinical examination.
- The maximum number of attempts to re-appear in oral & practical/clinical Examination alone shall be three, after which the candidate shall have to appear in both written and oral & practical/clinical examinations as a whole.

- To be eligible to appear in Part-II examination the candidate must submit;
  - duly filled, prescribed Admission Form to the Controller of Examinations duly recommended by the Principal/Head of the Institution in which he/she is enrolled;
  - a certificate by the Principal/Head of the Institution, that the candidate has attended at least 75% of the lectures, seminars, practical/clinical demonstrations;
  - Examination fee as prescribed by the University.

FINAL EXAMINATION

All candidates admitted in MS Neurosurgery course shall appear in Part-II (clinical) examination at the end of structured training program (end of 5th calendar year), and having passed the part I examinations. However, a candidate holding FCPS / MRCS / Diplomate / equivalent qualification in General Surgery shall be exempted from Part-I Examinations and shall be directly admitted to Part-II Examinations, subject to fulfillment of requirements for the examination.

The examination shall be held on biannual basis.

To be eligible to appear in Part-II examination the candidate must submit;

- duly filled, prescribed Admission Form to the Controller of Examinations duly recommended by the Principal/Head of the Institution in which he/she is enrolled;
- a certificate by the Principal/Head of the Institution, that the candidate has attended at least 75% of the lectures, seminars, practical/clinical demonstrations;
- Original Log Book complete in all respect and duly signed by the Supervisor (for Oral & practical/clinical Examination);
- certificates of having passed the Part-I examinations;
- Examination fee as prescribed by the University.

The Part-II clinical examination shall have the following components:

- Written 200 marks
- Oral & practical/clinical examination 300 marks

There shall be one written paper of 100 marks and one MCQs paper containing 100 MCQs of 100 marks.

One paper shall have problem-based Short/Modified essay questions, one paper shall have MCQs.

Oral & practical/clinical examination shall have 300 marks for:

- 1 Long Case 100
- 4 Short Cases 100(25 marks each)
- OSCE 100

To be declared successful in Part-III examination the candidate must secure 75% marks in each component.

Only those candidates who pass in theory papers, will be eligible to appear in the Oral & Practical/ Clinical Examination.

The candidates, who have passed written examination but failed in Oral & Practical/ Clinical Examination, will re-appear only in Oral & Practical / Clinical examination.

The maximum number of attempts to re-appear in oral & practical /clinical Examination alone shall be three, after which the candidate shall have to appear in both written and oral & practical/clinical examinations as a whole.

The candidate with 80% or above marks shall be deemed to have passed with distinction.

Log Book/Assignments: Through out the length of the course, the performance of the candidate shall be recorded on the Log Book.

The Supervisor shall certify every year that the Log Book is being maintained and signed regularly.

The Log Book will be developed & approved by the Advanced Studies & Research Board.

The evaluation will be maintained by the Supervisor (in consultation with the Co-Supervisor, if appointed).

The candidate shall be allowed to sit in the Part I examination only after submitting certificates of attendance for all four mandatory workshops and also the rotation certificates.

The candidate shall be allowed to sit in the Part II examination only after submitting the mandatory rotation certificates.

Submission / Evaluation of Synopsis:

The candidates shall prepare their synopsis as per guidelines provided by the Advanced Studies & Research Board, available on website.

The research topic in clinical subject should have 25% component related to basic sciences and 75% component related to applied clinical sciences. The research topic must consist of a reasonable sample size and sufficient numbers of variables to give training to the candidate to conduct research, to collect & analyze the data.

Synopsis of research project shall be submitted by the end of the 3rd year of MS program. The synopsis after review by an Institutional Review Committee shall be submitted to the University for consideration by the Advanced Studies & Research Board, through the Principal / Dean /Head of the institution.

Award of MS Neurosurgery Degree

After successful completion of the structured courses of MS Neurosurgery and qualifying Part-I and Part-II examinations, the degree with title MS Neurosurgery hall be awarded.

TRAINING PROGRAM

(GENERAL INSTRUCTIONS)

A. PURPOSE OF LOGBOOK

- This log book is the prerequisite for Neurosurgery training
- It allows the trainee to record his experience in brief so that his experience can be recorded, deficiencies identified and corrected
- To assist the Supervisor identify and address possible areas of deficiencies promptly.
- To serve as a writer record for the Supervisor when assessing the Candidate's overall training experience.

B. RESPONSIBILITIES OF THE CANDIDATE

- Trainee is required to maintain the log book throughout the course period and entries into the log book should be made from the beginning of the course
- Trainee is advised to carry the logbook with them at all times and to fill it on the same day of the activity
- All entries must be signed by the immediate supervisor
- The trainee should discuss the progress of the logbook with their supervisor at least every two months and a summary of experience must be signed at three months. This regular assessment allows deficiencies in either experience gained or experience available to be remedied early in the posting.
- The trainee should bring to the examination any completed log book in his/her possess ion as well as current log book.
- The trainee may consult with the supervisor/ course co-ordinator regarding logbook.

C. END OF ATTACHMENT

- The original copy of logbook will be submitted by candidate at end of rotation. This is a pre-requisite for issuance of certificate of successful completion
- The Candidate may request for a copy of the logbook at the end of his/her training.

TRAINING CONTENT– Date of discussion:

(Candidate must have this discussion with training supervisor before commencing attachment)

Training Objectives:

_____

_____

_____

Weekly Schedule:

Day	A.M.	P.M.
Monday		
Tuesday		
Wednesday		
Thursday		
Friday		
Saturday		
Sunday		

Clinical Duties:

- ❖ No. of outpatient sessions per week
- ❖ No. of operating sessions per week
- ❖ No. of emergency / duty per week

No. of formal departmental educational activities per week:

- ❖ Lectures
- ❖ Morbidity / Mortality rounds
- ❖ Journal Club meetings
- ❖ Audit meetings
- ❖ Research meetings
- ❖ Others

_____ _____

(Supervisor's name and signature) (Candidate's name and signature)

SUMMARY OF TEACHING EXPERIENCE

Undergraduates, interns, residents, nurses, allied Health professionals, consumer groups and Organizations.

Year of Training	Summary (type of audience, topics, duration etc)

LIST OF SEMINAR / COURSES ATTENDED

Date / Venue	Details (State conference title and papers presented by trainee)

RESEARCH PROJECTS

Date of Commencement : _____

Title/Aim of Research : _____

_____

_____

Co-worker (if any) : _____

Date of Completion : _____

Conclusion & Remarks (List any resulting publications or presentations)

_____

_____

_____

_____

_____

_____

_____

_____

(Attach an abstract of published papers)

Papers Published

Author (s)	Title	Journal References

RECORD OF CASES

S. NO	CR no.	Patient name	Age / Sex	Diagnosis	Procedure done	Level of participation	Outcome	Supervisors Remarks

LEAVE RECORD: (Casual / Study / Sick)

S. No	Type of leave	From	To

Summary of Periodical Discussion with Supervisor / Head of Department

Candidate may use this section to record the details of discussions held with the supervisor / head of department for reference purposes.

Date	Attended by	Summary of Discussion	Follow-up required? If yes, please provide details.	Acknowledgement by supervisor / HOD
	❖ Supervisor ❖ 1-lead of Department			
	❖ Supervisor ❖ 1-lead of Department			
	❖ Supervisor ❖ 1-lead of Department			
	❖ Supervisor ❖ 1-lead of Department			
	❖ Supervisor ❖ 1-lead of Department			
	❖ Supervisor ❖ 1-lead of Department			

Review of Logbook:

(Candidate must submit the logbook to Fellowship Coordinator following the schedule below.)

Schedule	
Start Attachment:	
1st submission	Comments by Coordinator/Director:
	Name & Signature:
	Date:
2nd submission	Comments by Coordinator/Director:
	Name & Signature:
	Date:
3rd submission	Comments by Coordinator/Director:
	Name & Signature:
	Date:
4th **submission**	Comments by Coordinator/Director:
	Name & Signature:
	Date:

(Questionnaire for Candidates (at end attachment)

Please tick the boxes that represent your answer best and complete the open-ended questions when necessary.

	Yes	No	Not Sure
Did the program meet all the objectives	❑	❑	❑
Did the program meet all the objectives as you have indicated before commencing attachment? if no, what do you feel were the possible reasons for not meeting the objectives?	❑	❑	❑
3.With this attachment be recognized as part of anyspecialist training / examination in your country?	❑	❑	❑
4.Will this kind of program be beneficial to other colleagues in your country?	❑	❑	❑
5.Did the teaching faculty display sufficient knowledge in the field?	❑	❑	❑
6.Did the teaching faculty keep up-to date with the latest development in the field?	❑	❑	❑
7.Did the teaching faculty provide support and guidance for your training needs?	❑	❑	❑
8. Did you have enough discussion / evaluation sessions with you supervisor? 8-a. if yes, were the discussion / evaluation sessions helpful in improving your performance / competency?	❑ Please answer Q8-a	❑	❑
9Did you perform any duties / responsibilities that you feel was irrelevant to your learning objectives? 9-a if yes, what were these irrelevant duties / responsibilities? 9-b what percentage of your time were spent on these duties / responsibilities?	❑ Please answer Q9-a	❑	❑
10. Did you participate in any formal teaching sessions (e.g. lectures)? 10-a if yes, were the teaching sessions helpful in meeting your learning objectives? 10-b which sessions did you feel were not helpful, it any (if Q 10-a = No) ?	❑ Please answer Q-A	❑ Please answer Q-b	❑

Confidential Feedback Form

We would be grateful if you could answer the following questions. Your feedback is really valuable for us in improving the standard of training you received.

We assure you that this document will remain strictly confidential.

Name _____Training center_____

Email _____Cell # _____

Please answer the following questions

The option can be one of the following

Poor	Average	Good	Excellent

- How do you evaluate yourself at preoperative assessment of the patient?

Poor	Average	Good	Excellent

- Did you get ample opportunity to assist and perform cases of Neurosurgery trauma?

Poor	Average	Good	Excellent

- After completion of the fellowship, how is your knowledge of basic Neurosurgery skills?

Poor	Average	Good	Excellent

- After completion of training, are you able to perform trauma cases independently?

Poor	Average	Good	Excellent

- Were there any arrangements of lectures for your better understanding of basic concepts of trauma?

Poor	Average	Good	Excellent

- Are you familiar with postoperative rehabilitation protocols?

Poor	Average	Good	Excellent

- How do you feel yourself at managements of preoperative / postoperative complications?

Poor	Average	Good	Excellent

- How was the attitude of your supervisor regarding training?

Poor	Average	Good	Excellent

- How many head trauma cases did you perform independently?

- Please write your valuable comments / suggestions to improve Neurosurgery training program

_____

_____

SUPERVISOR'S COMMENTS ON TRAINEE AND HIS TRAINING EXPERIENCE

(To be completed for every 3

months posting) Period of Training: From: ___To : _____

(Please 4)

	Good	Satisfactory	Inadequate
Overall operating experience	☐	☐	☐
Total number of surgeries performed	☐	☐	☐
Technical & Management skills	☐	☐	☐

Other Remarks:

(Communications/Attitude/Responsibility/Teamwork/Organizational skills,etc)

_____

_____

_____

_____

_____

_____

Signature: _____Date: _____

Name & Designation of Supervisor: