بسم الله الرحمن الرحيم

CURRICULUM / STATUTES/ REGULATIONS

FOR 5 YEARS MS Neurosurgery

Faisalabad Medical University

Faisalabad

Contents

Section A

VISION STATEMENT:

Faisalabad Medical University has been established since 05-05-2017 for purpose of imparting better medical education and encouraging and arranging extensive research and publication in the field of medical science. The vision of university is:

"Striving to achieve national and international stature in undergraduate and postgraduate medical education with strong emphasis on professionalism, leadership, community health services, research and bioethics"

MISSION STATEMENT

The mission of the University is:

"Educate Healthcare professionals to prevent, diagnose and treat human illnesses to practice evidence-based medicine with focus on lifelong healthcare in order to meet the challenges of community needs and competitive medical profession at the same time"

STATUTES

Nomenclature

The name of degree programmer shall be MS Neurosurgery.

Course Title:

MM Medical education

Training Centers

Department of Neurosurgery in Affiliated Hospitals of Faisalabad Medical University, Faisalabad.

Duration of Course

The duration of course shall be five (5) years with structured training in a recognized department under the guidance of an approved supervisor.

Course structure:

1. **Core knowledge:** Competency based learning for trainees. (2 exams to be conducted by university. Continuous internal assessment to be included throughout the Programme, which is conducted by the department and will carry weightage in final assessment)
2. **Clinical Training** in respective specialty
3. **Research and Thesis writing.**

4. **Mandatory Workshops** throughout the course of programme will be conducted. The basic workshops will be attended by all trainees from all specialties and will be evenly distributed throughout the course:

    1. **Communication skills**
    2. **Research synopsis and thesis writing skills**
    3. **Basic Biostatistics and Research Methodology**
    4. **Information Technology Skills**
    5. **Initial Life Support (ILS)**

At the end of each workshop, assessment will be done regarding the workshop and certificates will be issued to passing trainees only. The workshops will be conducted by the University and will be paid as in all post-graduate programmes and supervised by the department of Medical Education, FMU, Faisalabad. The trained certified coaches/teachers will be invited and they will get incentive from the university. All the interested trainers will contact the department for inclusion in trainers list.

Feedback of the facilitators will be recorded for the continuation of the process. Medical education department will issue yearly planner for these workshops in the light of curriculum document. University will certify it.

5. Specialty Specific workshops

1. Basic surgical skills

The course is structured in three parts:

Part I: Candidate will start his/her training in Department of Neurosurgery from 1st day till 6 months. Candidate will gain basic knowledge of the Neurosurgery i.e., Anatomy, Physiology and orientation to the subject, basic principles, history taking and case presentation, inpatient and out-patient care. During this time the candidate will select a topic for synopsis, complete his/her synopsis.

Part II: after 6 months (7th month) till 2 years, he/she will do a rotational training in General surgery under a supervisor allocated in surgical department. The candidate shall undertake clinical training in fundamental concepts of general surgery from 7th months till 24 months.

During Part-II, the candidate must submit the synopsis for approval. At the end of 2nd year, the intermediate examination shall be held in fundamental concepts of General Surgery. The clinical training in Neurosurgery shall be rejoined from 3rd year onwards in Neurosurgery department.

Part III is structured for 3rd, 4th and 5th calendar years in MS Neurosurgery. The candidate shall undergo training to achieve educational objectives of MS Neurosurgery

Section B:

Admission Criteria

Central induction Policy as per Government rules

Registration and Enrollment

The number of PG Trainees/ Students and Beds to trainee ratio at the approved teaching site will be as per policy of Pakistan Medical & Dental Council

The University will approve supervisors for MS/MD courses.

Candidates selected for the courses after their selection and enrollment shall be registered with FMU 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). Supervisors will be decided by the university according to the set standards and rules.

B. Adequate resources

The university will provide adequate resources Including class-rooms (with audiovisual aids), demonstration rooms, computer lab, clinical pathology lab, theaters, instruments and other equipment etc. for proper Training of the residents as per their course outcomes and objectives.

C. Library

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

Freezing of Program & leave Rules:

Freezing of training, Maternity leave, Ex Pakistan Leave and Extra Ordinary Leave etc. would be allocated through the Office of Dean Postgraduate to the competent authority.

Section C:

AIMS AND OBJECTIVES OF THE COURSE

AIM

The aim of five years MS in Neurosurgeryis to train residents to acquire the competency of a specialist in the relevant field so that they can become good clinicians, teachers, researchers and community health provider in their specialty after completion of their training according to the global standards.

LEARNING OBJECTIVES:

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
- Consider 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, potentialities and risks associated with surgery in ways that encourage their participation in informed decision making
    - Communicate with the patient (and their family) the treatment options 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 of 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.Professionalism 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 members 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 professionals ▪ 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 programme, 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.

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.

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

- 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.

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

Neuroradiology & Neuroradiotherapy:

- 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 radiotherapy

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

Neurosurgery Related Clinical Competence:

The ability to construct a differential 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 functions 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, neuropsychology, neuro-ophthalmology, neuro-otology and neuroanaesthesia

- To be able to demonstrate those attitudes that reflect 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 of 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 sophisticated 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 neurosurgery involves the surgical management of a wide range of neurological 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.

Neurovascular Surgery:

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

v. 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-ontological, plastic and maxillofacial surgeons. The resident should also be aware of the adjuvant treatments with sophisticated radiosurgery and fractionated stereotactic radiotherapy for patients with skull - base tumours.

vi. 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.

vii. 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.

Content list:

Basic Sciences:

Student is expected to acquire comprehensive knowledge of Anatomy, Physiology,

Pathology & Pharmacology relevant to surgical practice appropriate for Neurosurgery.

1. Anatomy

- Detailed Anatomy of the organ systems of body, their blood supply, nerve supply, lymphatic drainage and important gross relations to other organs as appropriate for neurosurgical operations
- Developmental Anatomy and associated common congenital abnormalities
- Features of Surface, Imaging and Applied Anatomy within skull, brain, spinal cord, peripheral nervous system and head and neck
- Relate knowledge to assessment of clinical situation or progress of disease condition

Embryogenesis of the brain and spinal cord

- Embryogenesis of supporting structures - skull and vertebral column
- Common anatomical variations and developmental abnormalities ▪ Embryogenesis of the skeleton and muscle development

Structure, blood supply, innervation, surface and three-dimensional relationships of the:

- Scalp
- Skull
- Meninges
- Orbit
- Cranial fossae
- Cranial foraminae
- Cranial nerves

Cortical Topography:

- Projection and association tracts
- Organization of the basal ganglia
- Structure, organization and connections of the cerebellum, pons and brainstem
- Cranial nerves and their relationships
- Visual and auditory pathways
- Ventricular system and choroid plexus
- Subarachnoid space and cisterns
- Circle of Willis and principle regional and segmental blood supply ▪ Venous drainage and dural sinuses

Structure, blood supply, innervation, surface and threedimensional relationships of the:

- Vertebral column
- Spinal cord: ascending and descending tracts
- Spinal nerve roots
- Cauda equina

Structure, innervation and Distribution of autonomic and peripheral nervous system:

- Sympathetic and parasympathetic pathways
- Visceral and pelvic innervation: control of sphincter function
- Brachial plexus
- Lumbosacral plexus

- Course, distribution and innervation of the major peripheral nerves

Applied Anatomy

- Stereotaxis
- Embryology and mal-development
- Differences between foetal, infant, child and adult brain
- Development of facial and cranial skeleton
- Branchial arches and the vascular system
- Development of the ventricular system
- Development of the cerebral hemispheres
- Development of brain stem and cranial nerves
- The notochord
- The subependymal plate (subventricular zone)
- Development of the pituitary gland
- The external granular layer of the cerebellum
- Spinal cord development
- Applied embryology of the CNS and its coverings

2. Physiology

- Functional Neurophysiology: Cellular organization, structure function correlations and physiological alterations in the central and peripheral nervous systems of body
- Clinical Neurophysiology: Relate knowledge to assessment of clinical situation or progress of disease condition

Functional Neurophysiology:

- Structure and function of neurons and glial cells
- Synaptic function, action potentials and axonal conduction
- Higher cerebral functions
- Sleep and coma
- Memory and disorders of the limbic system
- Control of motor function: ascending and descending pathways, basal ganglia and cerebellar function
- The special senses
- Hypothalamic-pituitary function

- Cerebral blood flow and metabolism
- Cerebral auto-regulation and vasospasm
- Blood brain barrier and cerebral edema
- Intracranial pressure dynamics
- Cerebral ischaemia and neuroprotection
- CSF hydrodynamics - production and absorption

Autonomic Nervous System:

- Differing effects of sympathetic and parasympathetic innervation ▪ Effects on differing physiological processes

Clinical Neurophysiology:

- Principles of electroencephalography
- Principles of somatosensory, motor and brainstem evoked potential monitoring
- Peripheral neuropathies and entrapment neuropathies including:
  - Structure and function of peripheral nerves o Use of nerve conduction studies
- Disorders of the neuromuscular junction including:
  - Structure and function of smooth and striated muscle o Use of electromyographic studies

Clinical Skills

- Interpretation of the results of EEG, EMG and NC studies
- Membrane biochemistry and signal transduction
- Enzymes and biologic catalysis
- Tissue metabolism
- Carbohydrate metabolism
- Lipid metabolism
- Nitrogen metabolism

Neurochemistry (Including Neuroendocrinology)

- Fundamentals of Chemistry
- Introduction to acid-base chemistry and equilibrium

- Fundamentals of Neurochemistry
- CNS metabolism
- Principle of neuronal communication
- Mechanism controlling transmitter release
- Transduction mechanisms in the post-synaptic cells
- Characteristics of synaptic potential
- Process of synaptic summation (spatial and temporal)
- Neurotransmitters & Synaptic Transmission
- Neurotransmitters and receptors
- Important neurotransmitters and chemical messengers

Chemical Classification

- Nitric Oxide
- Eicosanoids
- Acetylcholine
- Amino acid transmitters
- Serotonin
- Catecholamines
- Peptides

Functional Classification

- Metabolism
- Important second messenger pathways
- Pathophysiologic mechanism of conditions interfering chemical transmission
- Neurochemistry of common neurological diseases (Alzheimer's disease, alcoholism, anxiety, sleep disorders etc.)
- Neuroendocrinology and Neurohormones
- Molecular bases of neuroendocrine regulation
- Neuroendocrinology of hypothalamus, pituitary gland, hypothalamic-pituitary-gonadal axis, sleep and arousal etc.)
- Homeostasis and biological rhythms
- Gene expression and the synthesis of proteins
- Bioenergetics; fuel oxidation and the generation of ATP
- Biotechnology and concepts of molecular biology with special emphasis on use of recombinant DNA techniques in medicine and the molecular biology of cancer

3. Pharmacology

- ✦ The Evolution of Medical Drugs
- ✦ British Pharmacopia
- ✦ Introduction to Pharmacology
- ✦ Receptors
- ✦ Mechanisms of Drug Action
- ✦ Pharmacokinetics
- ✦ Pharmacokinetic Process
- ✦ Absorption
- ✦ Distribution
- ✦ Metabolism
- ✦ Desired Plasma Concentration
- ✦ Volume of Distribution
- ✦ Elimination
- ✦ Elimination rate constant and half life
- ✦ Creatinine Clearance
- ✦ Drug Effect
- ✦ Beneficial Responses
- ✦ Harmful Responses
- ✦ Allergic Responses
- ✦ Drug Dependence, Addiction, Abuse and Tolerance
- ✦ Drug Interactions
- ✦ Dialysis
- ✦ Drug use in pregnancy and in children

4. Pathology

Pathological alterations at cellular and structural level in infection, inflammation, ischaemia, neoplasia and trauma affecting the nervous system.

Cell Injury and adaptation

- ✦ Reversible and Irreversible Injury
- ✦ Fatty change, Pathologic calcification
- ✦ Necrosis and Gangrene
- ✦ Cellular adaptation
- ✦ Atrophy, Hypertrophy,
- ✦ Hyperplasia, Metaplasia, Aplasia Inflammation

- Acute inflammation
- Cellular components and chemical mediators of acute inflammation
- Exudates and transudate
- Sequelae of acute inflammation
- Chronic inflammation
- Etiological factors and pathogenesis
- Distinction between acute and chronic (duration) inflammation
- Histologic hallmarks
- Types and causes of chronic inflammation, non-granulomatous & granulomatous,

Haemodynamic disorders

- Etiology, pathogenesis, classification and morphological and clinical manifestations of Edema, Hemorrhage, Thrombosis, Embolism, Infarction & Hyperaemia
- Shock; classification etiology, and pathogenesis, manifestations.
- Compensatory mechanisms involved in shock
- Pathogenesis and possible consequences of thrombosis
- Difference between arterial and venous emboli

Neoplasia

- Dysplasia and Neoplasia
- Benign and malignant neoplasms
- Etiological factors for neoplasia
- Different modes of metastasis
- Tumor staging system and tumor grade

Immunity and Hypersensitivity

- Immunity
- Immune response
- Diagnostic procedures in a clinical Immunology laboratory
- Protective immunity to microbial diseases
- Tumour immunology
- Immunological tolerance, autoimmunity and autoimmune diseases. ▪ Transplantation immunology
- Hypersensitivity
- Immunodeficiency disorders

- ✦ Immunoprophylaxis & Immunotherapy

Related Microbiology

- ✦ Role of microbes in various central and peripheral nervous system diseases ▪ Infection source
- ✦ Nosocomial infections
- ✦ Bacterial growth and death
- ✦ Pathogenic bacteria
- ✦ Vegetative organisms
- ✦ Spores
- ✦ Important viruses
- ✦ Important parasites
- ✦ Surgically important microorganisms
- ✦ Sources of infection
- ✦ Asepsis and antisepsis
- ✦ Sterilization and disinfection
- ✦ Infection prevention
- ✦ Immunization
- ✦ Personnel protection from communicable diseases ▪ Use of investigation and procedures in laboratory

Special Pathology

- ✦ Cerebral hypoxia and ischemia
- ✦ Cytopathology of neurons and glial in response to ischemia, hypoxia and trauma
- ✦ Diffuse axonal injury
- ✦ Congenital malformations of the nervous system
- ✦ Cerebral and spinal vascular disorders and lesions of extracranial vessels
- ✦ Brain and spinal cord trauma
- ✦ Acute and chronic inflammatory processes in the CNS
- ✦ Meningitis, encephalitis, brain abscess and other disorders of bacterial, viral, fungal or parasitic origin
- ✦ Principles and practice of antibiotic therapy
- ✦ Slow viruses and the brain
- ✦ Bacterial, fungal and parasitic meningitis, encephalitis and abscess formation
- ✦ Viral encephalitis
- ✦ Slow viruses, CJD and VCJD
- ✦ HIV associated infections, tumours and leukoencephalopathies

- ✦ The dementias
- ✦ Causes of epilepsy
- ✦ Demyelinating diseases
- ✦ Diseases of the scalp, skull and meninges
- ✦ Diseases and degenerative disorders of the spine
- ✦ Inborn errors of metabolism
- ✦ Diseases of muscle
- ✦ Brain shifts, herniation and raised intracranial pressure
- ✦ Classification, epidemiology and pathology of CNS tumours
- ✦ Techniques of biopsy and tissue preparation, staining and immunohistochemical
- ✦ Orbital tumours
- ✦ Tumour biology, cell kinetics, tumour markers, immunocytochemistry

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 anesthesia 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:

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

Closure of skin and subcutaneous tissue:

Options for closure

Suture and needle choice

Safe practice **Knot tying:** o Choice of material o Single handed o Double handed o superficial o Deep

Tissue retraction: o Choice of instruments o Placement of wound retractors o Tissue forceps

Use of drains: o Indications o Types o Insertion

o Fixation o Management/removal

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

- o Accurate and tension free apposition of wound edges **Haemostasis:**
- o Control of bleeding vessel (superficial)
- o Diathermy o Suture ligation o Tie ligation o Clip application o Plan investigations o Clinical decision making o Case work up and evaluation; risk

management **Pre-operative assessment and management:** o Cardiorespiratory physiology o Diabetes mellitus o Renal failure

- Pathophysiology of blood loss

Pathophysiology ofsepsis

Risk factors for surgery

Principles of day surgery o Management of comorbidity **Intraoperative care:**

- Safety in theatre o Sharps safety o Diathermy, laser use o Infection risks o Radiation use and risks o Tourniquets o Principles of local, regional and general anaesthesia **Post-operative care:**
- Monitoring of postoperative patient o Postoperative analgesia o Fluid and electrolyte management o Detection of impending organ failure o Initial management of organ failure o Complications specific to particular operation o Critical care

Blood products:

- Components of blood
- Alternatives to use of blood products
- Management of the complications of blood product transfusion including children **Antibiotics:** o Common pathogens in surgical patients
- Antibiotic sensitivities o Antibiotic side-effects o Principles of prophylaxis and treatment **Safely assess the multiply injured patient:** o History and examination
- Investigation
- Resuscitation and early management o Referral to appropriate surgical subspecialties

Technical Skills

Central venous line insertion

Chest drain insertion

Diagnostic peritoneal lavage o Bleeding diathesis & corrective measures, e.g. warming, packing o Clotting mechanism; Effect of surgery and trauma on coagulation o Tests for thrombophilia and other disorders of coagulation o Methods of investigation for suspected thromboembolic disease o Anticoagulation, heparin and warfarin o Role of V/Q scanning, CT angiography and thrombolysis o Place of pulmonary embolectomy o Awareness of symptoms and signs associated with pulmonary embolism and DVT

o Role of duplex scanning, venography and d-dimer measurement o Initiate and monitor treatment

Diagnosis and Management of Common Paediatric Surgical Conditions:

- Child with abdominal pain
- Vomiting child
- Trauma
- Groin conditions o Hernia o Hydrocoele o Penile inflammatory conditions o Undescended testis o 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

S 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, moyamoya 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
  - Cerebral perfusion and oxygenation
  - Raised intracranial pressure
  - 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 absces s 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 image-guided 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 t reatment 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
- Parkinson's disease
- Iatrogenic movement disorders
- Dystonic syndromes
- 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 ocu lar 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

1. Common Neurosurgical Presentations

- ✦ 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
- ✦ Traumatic coma
- ✦ Weakness and paralysis
  - Ocular, cranial nerve, limb, trunk and respiratory muscle weakness
- ✦ 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
- ✦ Dizziness, unsteadiness and falls
  - Cerebellar, vestibular, extrapyramidal and autonomic dysfunction
- ✦ Pain and sensory loss

- Musculoskeletal, neurogenic and neuropathic pain and sensory loss

- ✦ Movement disorder associated with;
  - Parkinson's disease
  - Iatrogenic movement disorders
  - Dystonic syndromes
  - Choreiform syndromes
- ✦ Hearing disorder
  - Conductive and sensorineural hearing loss
- ✦ Visual disorder
  - Common bulbar, retrobulbar, sellar, parasellar and optic pathway disorders
  - Nystagmus and diplopia
- ✦ Language and speech disturbance presentations;
  - Dysphasias
  - Speech dyspraxia
  - Dyslexia
  - Dysarthria
- ✦ Swallowing disorders with neurological causes of dysphagia
- ✦ Disorders of the Sphincteric and sexual function
  - Neurological enuresis
  - Constipation
  - Diarrhea
  - Urgency of micturition/dribbling
- ✦ Memory and cognitive disorders associated with;
  - Head injury
  - Subarachnoid haemorrhage
  - Hydrocephalus
  - Structural lesions of the frontal and temporal lobes
  - Disorders of the limbic system
- ✦ Acute and chronic presentations of organic and psychiatric behavioural disorders relating to;
  - Alcohol and drug abuse
  - Encephalitis
  - Organic dementia
  - Psychosis
- ✦ Ill child with hydrocephalus, impaired consciousness and sepsis

2. 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:

- Medical management of acutely raised intracranial pressure
- Indications for operation intervention including the use of pressure monitoring
- Principles, diagnosis and confirmation of brain death
- Principles of intensive care of head injured patients
- Principles of spinal stabilization and radiological assessment in head injury patients
- Role of neurological rehabilitation
- Clinical assessment of the multiply-injured patient.
- Neurological assessment of the head-injured patient including:
  - Assessment and categorization of impaired consciousness
  - Recognition and interpretation of focal neurological deficits ▪ Prioritization of clinical risk

Interpretation of CT scans and plain radiology

- Accurate documentation
- Indications for ICP monitoring
- Insertion of ICP monitor
- Insertion of frontal subdural and intraparenchymal ICP monitors using a standard frontal burr hole and/or twist drill craniostomy

- Calibration, zeroing and interpretation of ICP traces
- Potential complications of the procedure
- Burr hole evacuation of chronic subdural haematoma
- Management of anti-platelet and anti-coagulant medication
- Neurological assessment of patients with a CSDH
- Interpretation of CT scans
- Post-operative assessment and management
- Performance of single and multiple frontal and parietal burr hole
- 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
- Delayed cranioplasty of skull vault
- Management of soft tissue trauma
- Indications for primary and secondary closure of wounds
- Indications for antibiotic prophylaxis
- Assessment of tissue perfusion and viability
- Wound exploration under local and general anaesthesia
- Wound debridement
- Arrest of scalp haemorrhage
- Layered closure of the scalp without tension
- Suturing technique
- Wound drainage and head bandaging
- Use of external mobilization including cervical collars and spinal boards
- Application of halo traction
- Application of a halo-body jacket
- 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 puncture, 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 Space- Occupying Intracranial Lesions:

- Craniotomy for superficial, lobar supratentorial intrinsic tumour. In particular:
  - Safe patient positioning
  - Planning and siting of craniotomy with and without image-guidance
  - Intra-operative management of raised ICP
  - Appropriate exposure of the tumour, using operating microscope as necessary
  - Safe use of fixed retractors
  - Precise use of suction, electro-coagulation and ultrasonic aspiration - 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 Peri-Operative Management of Patients with Space- Occupying Intraspinal 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 encephal oceles
- 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 the cervical disc, PLL, central and unco-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.

Section D:

PROGRAMME FORMAT

SCHEME OF THE COURSE OF MS NEUROSURGERY PROGRAM

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

Course Structure	**Components**
Part- I	Basic knowledge of the Neurosurgery i.e., Anatomy, Physiology and orientation to the subject, basic principles, history taking and case presentation, inpatient and out-patient care. Selection of topic for synopsis and complete his/her synopsis For first 6 months
Part- II	Core knowledge in Surgery: Training in clinical techniques of Surgery with first two mandatory workshops and basic surgical skill workshop Synopsis is to be submitted at the end of 2nd year
Part- III	**Clinical component of Part III** Professional Education in Neurosurgery: Training in Neurosurgery during 3rd, 4th & 5th year of MS Neurosurgery program. Three years of training with remaining compulsory workshops and six mandatory rotations.

	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.

ROTATION:

Neurosurgery trainees will do three optional rotations in Part-II and six mandatory rotations during Part-III training.

Serial No.	Rotations: Title		Duration	Placement
1.	ENT	neuro-otorhinolaryngology	3 weeks	Part-III
2.	Eye	neuro-ophthalmology	3 weeks	Part-III
3.	Radiotherapy	neuro-oncology	3 weeks	Part-III
4.	Radiology	neuro-radiology	3 weeks	Part-III
5.	Pathology	neuro-Pathology	3 weeks	Part-III
6.	Anesthesia	Neuro Anesthesia	3 weeks	Part III
8.				

-

Sub specialty Training: During neurosurgery training, the candidated must rotate to Neurology unit for three months:

Section E:

Assessment Plan:

Program Duration	Course contents	Assessment method
At the end of 2nd year of program	1. Revision of core MBBS component including basic and clinical components. 2. Basic knowledge and Acquiring skill related to the specialty according to the objectives made. 1. First 2 mandatory Workshops as described in course outline. 3. Submission of synopsis	**Intermediate Examination:** to be taken by university. It will include: a) Written=300 b) TOACS/ OSCE /LONG CASE/ SHORT CASE=300 **Total Marks =600**
At the end of 4th/5 year	1. Training to act as an individual while managing patient or performing any task as defined by the objectives. 2. Training to act as a teacher, researcher, leader and a player in a team. 3. Overall development of a health care professional with all the set competencies of the Program. 4. All the mandatory and specialty-oriented workshops to be completed as mentioned in the curriculum 5. Rotations as described in the curriculum completed 6. Thesis completion and submission	**Final Examination** to be conducted by university. It will include: a) Written=300 b) TOACS/OSCE/LONG CASE/SHORT CASE=300 c)Continuous internal assessment=100 Thesis evaluation =300 **Total marks=600+100+300=1000**

Components of Intermediate Examination

- Written: Total Marks =300
- Clinical, TOACS/OSCE = 300

Total = 600

Components of Final Examination:

- Written: 300 Marks
- Clinical, TOACS/OSCE = 300 Marks
- Continuous internal assessment =100
- Thesis Evaluation = 300 Marks

Total = 1000 Marks

Intermediate Examinations:

Intermediate examination would be conducted for the candidate getting training, at the end of 2nd calendar year of the program.

Eligibility Criteria:

1. Candidate remained on institution roll during the period approved for appearing in examination.
2. Certificate of completion of mandatory workshops.
3. Completion of Log book signed by supervisor/concerned Head of Department.
4. Certificate of submission of Ethical Review Committee approved synopsis to the university if required as per rules of synopsis submission.
5. Evidence of payment of examination fee as prescribed by the University from time to time.
6. Certificates submitted through Principal/Dean/Head of academic institution shall be accepted as valid towards the candidature of an applicant.
7. submission of application for the examination and the conduct of examination.

Intermediate Examination Schedule and Fee:

a) Intermediate Examination at completion of two years training, will be held twice a year.

b) There will be a minimum period of 30 days between submission of application for the examination and the conduction of examination.

c) Examination fee will be determined periodically by the University.

d) The examination fee once deposited cannot be refunded / carried over to the next examination under any circumstances.

e) The Controller of Examinations will issue Roll Number Slips on receipt of prescribed application form, documents satisfying eligibility criteria and evidence of payment of examination fee.

Written Examination:

The written examination will consist of 100 single best answer type Multiple Choice Questions. Each correct answer in the multiple-choice question paper will carry 02 marks. The short essay question will be clinical scenario or practice based, and each question will carry 10 marks.

The marks of written exam will be divided as follows:

- MCQs (single best type) = 200 Marks
- SEQ (10 marks) =100

Declaration of Results

The candidates scoring 60% marks in the written examination will be considered pass and will then be eligible to appear in the clinical and oral examination.

Clinical, TOACS/OSCE:

The clinical and TOAC/OSCE & Oral examination will evaluate patient care competencies in detail,

The examination will be of 300 total marks consisting of the following components

Clinical, TOACS/OSCE = Total Marks 300

a) 2 short Cases (50 each) = 100 marks

b) 1 Long Case = 100 marks

c) TOACS/OSCE & ORAL =100 marks (10 stations with 10 marks each)

- Each short case will be of 07 minutes duration, 05 minutes will be for examining the patient and 02 minutes for discussion.
- The long case and oral examination will each be of 30 minutes duration.

Declaration of Results

- A student scoring 60% in long case, 60% in short cases ad 60% in TOACS/OSCE will be considered pass in the examination.
- A maximum total of four consecutive attempts (availed or unavailed) will be allowed in the Intermediate Examination during which the candidate will be allowed to continue his training program. If the candidate fails to pass his Intermediate Examination within the above-mentioned limit of four attempts, candidate shall have to take entire Intermediate examination including written examination again

Final Examination

(At the end of 4th/5th Calendar year of the program)

Eligibility Criteria:

To appear in the Final Examination the candidate shall be required:

1. Result card showing that the candidate has passed intermediate Examination.
2. Certificate of completion of 4/5 Years training duly signed by Supervisor, Head of parent Department and that of the Head of Department where rotations were done (if prescribed in the curriculum).
3. Evidence of thesis submission to Department of Examination of the University.
4. Evidence of payment of examination fee as prescribed by the university from time to time.
5. The examination fee once deposited cannot be refunded / carried over to the next examination under any circumstances.
6. Candidate remained on institution roll during the period required for appearing in examination.
7. Only those certificates, submitted through Principal/Dean/Head of academic institution shall be accepted.

Final Examination Schedule and Fee:

a) Final examination will be held twice a year i.e. at least six months apart.
b) Examination fee will be determined and varied at periodic intervals by the University.
c) The examination fee once deposited cannot be refunded / carried over to the next examination under any circumstances.
d) The Controller of Examinations will issue an Admittance Card with a photograph of the candidate on receipt of prescribed application form, documents satisfying eligibility criteria and evidence of payment of examination fee. This card will also show the Roll Number, date / time and venue of examination.

Written Part of Final Examination

a) The written examination will consist of 100 single best answer type Multiple Choice Questions (MCQs) and 10 Short Essay Questions (SEQs). Each correct answer in the Multiple-Choice Question paper will carry 02 marks. Each Short Essay Question will carry 10 marks.

b) The Total Marks of the Written Examination will be 300 and to be divided as follows:

- Multiple Choice Question paper Total Marks = 200
- Short Essay Question paper Total Marks = 100

Total=300

Paper 1

- MCQs 100 (2marks each)

Paper 2

- SEQs 10 (10 marks each)

a. Paper 1 shall comprise of hundred (100) "single best answer" type Multiple Choice Questions. Each Question shall carry 02 marks.

b. Paper 2 shall comprise of ten (10) Short Essay Questions, each carrying 10 marks.

Declaration of Results

c. The candidates scoring 60% marks in aggregate of Paper 1 and Paper 2 of the written examination will be declared pass and will become eligible to appear in the Clinical Examination.

Clinical, TOACS/OSCE:

a) The Clinical Examination will consist of 04 short cases, 01 long case and TOACs/OSCE with 01 station for a pair of Internal and External Examiner. Each short

b) The Total Marks of Clinical and TOACs/OSCE & Oral will be 300 and to be divided as follows:

- 4 Short Cases (25 each) Total Marks = 100
- 1 Long Case Total Marks = 100
- TOACS/OSCE & ORAL Total Marks = 100

Total= 300

Declaration of Results

- A student scoring 60% in long case, 60% in short cases ad 60% in TOACS/OSCE will be considered pass in the examination.

- Candidate, who passes written examination, shall be allowed a maximum of three availed attempts within two years to pass Clinical/Oral examination. However, in case of failure to pass Clinical examination within stipulated attempts the credit of passing the written examination shall stand withdrawn and candidate shall have to take entire examination including written examination, afresh.

- Candidate who has completed his/her training along with all the requirements mentioned in the curriculum, shall have to appear in the written of final examination at least once within a period of 7 /8years (from the time of induction in the training). Failure to comply with this, the matter will be referred to the competent authority through proper channel for final decision.

Synopsis and Thesis Writing:

Thesis writing must be completed and thesis be submitted at least 6 months before the end of final year of the program.

Thesis evaluation & defense will be carried out at the end of $4^{th}/5^{th}$ calendar year of MS/MD.

Submission / Evaluation of Synopsis

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

b) The research topic in clinical subject should have 30% component related to basic sciences and 70% 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.

c) Synopsis of research project shall be got approved by the end of the 2^{nd} year of MS/MD 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.

Submission and evaluation of Thesis Evaluation (300 Marks)

1. The Thesis shall be submitted to the Controller of Examination through Head of Institute, duly signed by the Supervisor, Co-Supervisor(s) and Head of the Department.
2. Submission of Thesis is a prerequisite for taking Final Theory Examination.
3. Examiners shall be appointed by the Vice chancellor on recommendation of Controller of Examination from a panel approved by Advance Studies & Research Board for evaluation of thesis.

4. All MD/MS/MDS thesis shall be evaluated by two examiners, one internal and one external (The supervisor must not be the evaluator)
5. Thesis defense shall be held after approval of evaluation reports by Advanced Studies & Research Board.
6. Thesis defense shall be conducted by the examiners who evaluated Thesis of the candidate.
7. The candidate scoring 60% marks in Thesis defense examination will be declared as pass in the examination.

Continuous Internal assessment

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

Attendance

- Students joining postgraduate training program shall work as full-time residents during the duration of training and maximum 2 leaves are allowed in one month, and should take full responsibility and participation in all facets of the educational process. The period of training for obtaining degrees shall be four/five completed years

Presentations

- In addition to the conventional teaching methodologies interactive strategies will also be introduced to improve both clinical and communication skills in the upcoming consultants. Presentations must be conducted regularly as scheduled and attended by all available faculty and residents. As a policy, active participation of the postgraduate resident will be encouraged. Proper written feedback will be given for these presentations and that will be a part of Resident's Portfolio as well.

Reflection of the events to be written by the residents as well and must be included in their portfolios.

Task evaluation

- This competency will be learned from journal clubs, review of literature, policies and guidelines, audit projects, medical error investigations, root cause analysis and awareness of healthcare facilities. Active participation and ability to fulfill given tasks will be encouraged. Written feedback must be given and documented to be included in portfolio

Continuous Internal Assessment format (100 Marks)

1. The award of continuous internal assessment shall be submitted confidentially in a sealed envelope.
2. The supervisor shall submit cumulative score of internal assessment of all training years to be added together to provide a final cumulative score of Continuous Internal Assessments of all the trainees to the Head of the Department/ Dean of Post Graduate studies.
3. The Head of Department/ Dean shall submit the continuous internal assessment score through the Principal/ Registrar office to the Examination Department of the University. Score of continuous internal assessment once submitted shall be final and cannot be changed subsequently under any circumstances.
4. The weightage of internal assessment in the final examination will be 10%.
5. Continuous Internal Workplace Based Assessments will be done by the supervisors, that may be based on but not limited to:
    a. Generic and Specialty Specific Competency Assessments
    b. Multisource Feedback Evaluations
    c. Assessment of Candidates' Training Portfolio

TOOLS OF ASSESSMENT FOR THE COURSE:

TOOL USED:	DOMAIN TESTED:
MCQs	Knowledge
SEQs	Knowledge
TOACS/OSCE	Knowledge. Skill Attitude
PRESENTATIONS (wards, seminars, conferences, journal clubs)	Knowledge. Skill Attitude
Portfolios and log books.	Skill Attitude
Short cases.	Knowledge

	Skill Attitude
Long cases	Knowledge Skill Attitude
Continuous internal assessment	Skill Attitude
Feedback from department where rotation is being conducted.	Knowledge Skill Attitude

Section F

Award of MS Neurosurgery

A candidate having declared successful in all the components of examination i.e. *Theory, Clinical and Thesis* shall be declared pass and shall be conferred degree in Neurosurgery

Section G:

Log Book

As per format approved by the university

Section H

Portfolio:

As per format approved by the university

Section I

Paper Scheme

Final Examination

Written:

MCQ: 100

SEQ: 10

Sr. No.	TOPIC	NUMBER OF MCQs	LEVEL	NUMBER OF SEQ
1	Neurotraumatology	10	C-2	1
2	Cerebrovascular Neurosurgery	10	C-3	1
3	Paediatric Neurosurgery	10	C-2	1
4	Infections of Nervous System	10	C-2	1
5	Neuro Oncology	20	C-3	2
6	Neuro Ophthalmology / Neuro Otology	10	C-2	1
7	Skull Base Surgery	10	C-2	1
8	Spinal Surgery	10	C-3	1
9	Functional & Sterotactic Neurosurgery	10	C-3	1

Section J

Resources and references
(books and other resource material)

- Bailey & Love Short practice of surgery.
- Essential Surgical Practice by Cuschieri.
- Principal of Neurosurgery by Setti Rengachary.
- Greenberg's Handbook of Neurosurgery.
- Youmans Neurological Surgery.
- Neurological Examination Made Easy

Section K

List of authors and contributors

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