

**BOARD OF STUDIES
DEPARTMENT OF NEUROSURGERY
(M.Ch. Neurosurgery)**

June - 2019

Minutes of meeting

The meeting of the board of studies for super-specialty course in Neurosurgery as constituted and notified by the University was held on 05.07.2019 in the department of Neurosurgery.

The following members were present at the meeting:

Prof. Yashbir Dewan (Chairman)

Dr. Ranjit Kumar (Member)

Prof. Sanjay Behari (Member)

Prof. V.D.Sinha (Member)

Detailed discussion took place regarding the various issues of super-specialty training, curriculum and evaluation. All necessary amendments were incorporated by general consent and the final report was prepared and signed by all members.

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Prof. Yashbir Dewan

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Prof. Sanjay Behari

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Prof. V. D. Sinha

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Dr. Ranjit Kumar

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Approved copy of the curriculum of M.Ch. Neurosurgery board of studies duly signed
by the internal and external experts after recommended correction

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Prof. Yashbir Dewan

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Prof. Sanjay Behari

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Prof. V. D. Sinha

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Dr. Ranjit Kumar

**SWAMI RAM HIMALAYAN UNIVERSITY
HIMALAYAN INSTITUTE OF MEDICAL SCIENCES**

DEPARTMENT OF NEUROSURGERY

M. Ch IN NEUROSURGERY (THREE YEARS) COURSE

I

AIMS

To produce a Neurosurgeon with core neuroscience knowledge, competent to manage a wide range of emergency neurosurgical presentations with sound technical operative skills and surgical judgement and well versed with microsurgical skills. The Neurosurgical Training Programme will comprehensively cover all the subjects pertaining to Basic Neurosciences, Clinical Neurology, Clinical Neurosurgery, Operative Neurosurgery and Developments taking place in the basic neurosciences, applied clinical neurosciences.

OBJECTIVES

1. Broad foundation of theoretical knowledge; clinical experience, skills and competences in: Basic and applied clinical neurosciences, Basic neurosurgical care, Neuro-intensive care, Emergency Neurosurgery care.
2. Basic Science Knowledge relevant to Neuroanatomy, Physiology, Pharmacology - in particular safe prescribing, Pathological principles underlying system specific pathology, Microbiology and Diagnostic and interventional radiology.
3. Competent to provide advanced trauma and life support resuscitation when necessary; assess through a full neurological history and examination; establish a differential diagnosis; initiate and interpret investigations for patients presenting with a wide range of common neurological disorders.
4. Maintenance of medical records, patient counselling and consent; emphasis on bioethics.
5. Competence in the management of patients presenting with a range of symptoms and elective and emergency conditions, all aspects of the assessment and initial clinical management of the major disorders of the nervous system, operative preparation and post-operative care of patients presenting with core neurosurgical conditions.

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6. Manage the perioperative care and recognize common complications and either be able to deal with them or know to whom to refer.
7. Competent to take care of common emergency problems like brain and spine trauma, spontaneous intracranial haemorrhage including Sub arachnoid haemorrhage and hypertensive intracerebral haematomas, acute hydrocephalus. Management of acute raised intracranial pressure from brain tumours. Epilepsy. Acute spinal cord and nerve root compression and cauda equina syndrome. The common elective problems include assessment and management of various brain tumours, the investigation and management thereof. The management and investigation of patients with epilepsy, stroke and movement disorders. The management investigation and assessment of patients with spinal degenerative disease including spinal stenosis and disc protrusions. Spinal tumors of all types.
8. Should be thoroughly familiar with aseptic techniques, Skin preparation and draping for Cranial, Spinal and peripheral nerve cases. Neurosurgical positioning -Supine, Prone, Lateral, Sitting position –Positioning of Children -Advanced positioning, use of gel padding, horseshoe, pins. Basic instruments and handling -Basic trays, suction and diathermy -Spinal instruments-Microscopic instruments. Competent in Basic surgical skills: To safely administer appropriate local anaesthetic agents, To handle surgical instruments safely, To handle tissues safely, To incise and close superficial tissues accurately, To tie secure knots, To safely use surgical diathermy, To achieve homeostasis of superficial vessels, To use a suitable surgical drain appropriately.
9. Basic knowledge of the operative Instruments and Equipment (Operative microscope, Endoscope, CUSA, Drill and Ultrasound etc.)
10. Formulate a research question, write a research proposal and carry out a prospective/retrospective study and publish its results.

ESSENTIAL PRE-REQUISITE FOR STARTING M. Ch (NEUROSURGERY) COURSE

Society Memberships: (Minimum Three Societies – NSI or NSSI+ NTSI + Any one from below)
 NTSI / NSSI / NTSI / NSSA / SBSI / Vascular Society / Peripheral Nerve Society / Stereotactic/
 Paediatric Neurosurgery / Neuro Oncology/ SBSI / Neuro Oncology

1. Applied for associate membership of one of the National Neurological Society NSI/NSSI
2. Applied for associate membership of Neurotrauma Society of India
3. Applied for associate membership (As per Interest) Skull base Society / Vascular/ Pediatric Neurosurgery
4. Membership of international neurosurgical societies based on sub-specialty interest is also desirable.

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TO BE COMPLETED WITHIN 12 MONTHS OF JOINING

1. Computer knowledge:

The candidate should be well versed with the basic operation of the computer, including the Microsoft Word, Excel, Power point and Access programs.

2. Statistical knowledge:

The candidate should undergo a basic training program for the Biostatistics (organized by the University) to understand the basic methodology of research.

3. Structured course at scientific communication:

The candidate should undergo a basic training on how to make presentations, how to write a paper, how to do literature search, how to make a poster etc.

TRAINING METHODS

1. Clinical teaching in the OPD, Emergency and Operation theatres. Clinical teaching rounds in Neurosurgery Ward and bed side presentations.
2. Seminars
3. Journal clubs
4. Mortality, morbidity Meeting.
5. Pre-Operative Treatment planning sessions.
6. Neuroradiology combined interdepartmental meetings
7. Neuro Pathology interdepartmental Meetings.
8. Assisting and performing neurosurgical operations.
9. Paper presentations at conferences.
10. Preparation of manuscript for publication.
11. Training in an experimental microsurgical laboratory
12. Training in Neuro and Spinal Endoscopy
13. Focused workshops
14. Cadaveric Dissection
15. Group discussion

LEARNING GOALS

Basic neurosciences courses:

Principles of neuroanatomy, neurophysiology, neuropharmacology, neuropathology, neuro-microbiology, basic principles of neuro-anaesthesia and critical care.

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Clinical Interpretation:

History taking and Clinical examination, clinical localization, differential diagnosis and elicitation of physical signs.

Neuro-radiology:

MRI sequences, CT scans, various modalities of angiography, plain radiograph and fluoroscopy, preoperative and intraoperative ultrasound.

Neurotrauma:

Candidate should be competent to handle all major cranial and spine trauma and also participate in intensive care management of these cases. Basic ventilator and ICU neuro-monitoring including measurement of ICP.

Spinal surgery:

Competent in all aspects of the emergency and urgent operative care of patients with spinal disorders including:

1. Reduction and internal stabilisation of atlanto-axial, sub-axial and thoraco-lumbar fractures and dislocations.
2. Metastatic disease of the spine: Posterior decompression and stabilisation using pedicle screw, hook and sub-laminar wire constructs; corpectomy and instrumented reconstruction of the anterior column.
3. Primary tumors of the spine: Techniques for local ablation of benign lesions and en bloc resections of malignant tumors.
4. Intradural tumors: Radical resection of intradural, extra-medullary tumors; biopsy and optimal resection of intramedullary tumors.
5. Syringomyelia and hind brain anomalies: Foramen magnum decompression, syringostomy, syringe-pleural shunting, detethering and duroplasty.
6. Advanced surgery of the ageing and degenerative spine: including the management of osteoporotic collapse, vertebroplasty, kyphoplasty; stabilisation of the osteoporotic spine; operative management degenerative spondylolisthesis and scoliosis.
7. The rheumatoid and ankylosed spine: Management of atlanto-axial subluxation; cranial settling and odontoid migration; sub-axial degeneration; cervico-dorsal kyphosis.
8. Spinal deformity: including the multidisciplinary management of patients with spinal dysraphism, diastematomyelia, kypho-scoliosis etc.
9. Minimally invasive and endoscopic spine surgery.

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Skull base surgery:

Skull-base and craniofacial surgical access: including

1. Standard variations of fronto-basal, fronto-orbital, trans-zygomatic, infratemporal, trans-temporal, far-lateral, trans-sphenoidal, trans-maxillary and trans-petrous approaches.
2. Microsurgical and endoscopic transphenoidal resection of pituitary tumours.
3. Pterional, subfrontal, interhemispheric and trans-ventricular approaches, Retrosigmoid, translabyrinthine and middle fossa approach.
4. Management of cranio-facial trauma: including multi-disciplinary management of fronto-orbital disruption.
5. Management of post-operative CSF fistulae; indications for endoscopic repair of basal CSF fistula; techniques for open repair and skull-base reconstruction.
6. Surgery for orbital lesions.

Neurovascular surgery:

1. Surgical and endovascular strategies for the management of ruptured and un-ruptured intracranial aneurysms.
2. Surgical treatment of ruptured aneurysms of the anterior circulation.
3. Principles of microvascular reconstruction and bypass for complex aneurysms Intra-cranial vascular malformations.
4. Endovascular and radio surgical strategies for the management of arteriovenous malformations
5. Surgical treatment of superficial cortical arteriovenous malformations.
6. Surgical and endovascular treatment of dural arteriovenous fistulae.
7. Image-guided resection of cavernomas.
8. Management of primary intracerebral hematomas.
9. Management of venous occlusive disorders Acute and chronic cerebral ischemia.
10. Medical, surgical and endovascular management of extracranial arterial occlusive disease.
11. Revascularization in ischemic vascular disease.

Neuro-oncology:

1. Competent to manage patients with high grade intrinsic tumours, metastases and convexity meningiomas.
2. Multidisciplinary management of neuro-oncology patients should be familiar with current developments in molecular neuro-oncology.
3. Emerging surgical techniques and the ethical, regulatory and practical considerations governing clinical trials in neuro-oncology.
4. Trained in advanced surgical techniques: including awake craniotomy; stereotactic craniotomy.

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5. Intraoperative neurophysiological monitoring; advanced image guidance with integration of functional data; intraoperative imaging techniques.
6. The use of adjuvant chemo-radiotherapy.
7. Third ventriculostomy, optimal resection of lobar low grade intrinsic tumours, Tumours of the ventricular system and pineal region.
8. Surgical approaches to the third ventricle and pineal, transfrontal transventricular excision of intraventricular tumours and cysts, transcallosal transventricular excision of lesions of the third ventricle and foramen of Munro. Brainstem tumours, intrinsic brainstem tumours.
9. Stereotactic biopsy of accessible lesions.
10. Radiosurgery and stereotactic radiotherapy: including the principles of radiosurgery and stereotactic radiotherapy and the indications for their use as adjunctive and/or primary treatment modalities.
11. Neuro-navigation and image guided surgeries.

Functional surgery and Pain management:

1. Pharmacotherapy for management of pain including postoperative patient controlled pumps.
2. Implantation of spinal cord stimulators; the insertion of intrathecal drug delivery systems.
3. Knowledge of ablative surgical treatment for pain including DREZ lesioning, cordotomy and myelotomy and of neuromodulatory techniques including peripheral nerve, motor cortex and deep brain stimulation.
4. Microvascular decompression of the trigeminal nerve; microvascular decompression of the facial nerve; percutaneous trigeminal rhizotomy.
5. Spasticity: In-depth understanding of medical and surgical treatments for spasticity; implantation of intrathecal drug delivery systems; knowledge of other surgical treatments for spasticity including phenol blocks, neurectomies and rhizotomy.
6. 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 and video EEG interpretation and Electrocorticography. Surgery for cortical dysplasias and other epileptogenic foci.
7. Movement disorders Multidisciplinary assessment and selection of patients with movement disorders e.g. Parkinsons's disease, Tremors, dystonia and Hemibalismus; selection, targeting and placement of deep brain stimulation electrodes; management of neuro-stimulators; radiofrequency lesioning. Stereotactic probe placements, interpretation and pharmacotherapy of movement disorders.

Paediatric neurosurgery:

1. Competent in all aspects of the non-operative neurosurgical management of children presenting with disorders of the nervous system.

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.....
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2. Detailed knowledge of the statutory framework governing the care of children, Paediatric neurointensive care, the principles of Paediatric neurorehabilitation and of the management of non-accidental injury.
3. Competent to undertake all aspects of the emergency neurosurgical operative care of children and to undertake a range of elective procedures Hydrocephalus- including the insertion and revision of ventriculo-peritoneal, ventriculo-atrial and lumbo-peritoneal shunts; endoscopic third ventriculostomy; image-guided placement of ventricular catheters, external ventricular drain and lumbar drain placement.
4. Competent to undertake Resection of supratentorial and infratentorial intrinsic tumors; approaches to suprasellar, third ventricular and pineal tumours; management of spinal cord tumours.
5. Paediatric head injury: Decompressive craniectomy; cranioplasty; management of growing fractures; craniofacial reconstruction; management of CSF fistulae.
6. Spinal dysraphism: Management of spina bifida, meningoceles and encephaloceles; spinal cord tethering syndromes, Congenital and acquired spinal deformity: including the management of syndromic spinal deformity and post-operative spinal deformity.
7. Craniofacial disorders: Management of simple craniosynostosis, syndromic craniosynostosis, post-traumatic deformity.
8. Childhood brain and spine infections and their management.
9. Treatment for cerebral palsy and spasticity.
10. Pediatric vascular lesions e.g AVMs, aneurysms, Moya Moya disease, Sinus pericranii, angiomas.

Peripheral nerve and Brachial plexus surgery:

1. Candidate should be well versed with the principles of brachial plexus and peripheral nerve repair.
2. The candidate should be competent to handle common brachial plexus and peripheral nerve surgeries.
3. Should be able to identify and manage common entrapment neuropathies like Carpal tunnel syndrome, cubital tunnel syndrome, radial nerve compression, common peroneal nerve compression, Thoracic outlet syndrome etc.
4. Should be competent to harvest commonly used cable nerve grafts like sural nerve, partial hypoglossal nerve etc.
5. Should be competent to carry out commonly performed intra and extra-plexus nerve transfers procedures.
6. Should be capable of doing a pre-surgical work-up of all peripheral nerve lesions.
7. Management of nerve related tumors and other diseases.

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Neuro-endoscopy:

Intraventricular and skull base endoscopy, endoscopic assisted surgery, spinal endoscopy, tumor removal under endoscopic guidance.

Radiosurgery and basic radiation therapy:

Basic principles and techniques of radiosurgery; principles of radiation therapy, principles of neoadjuvant and adjuvant radiotherapy.

Interpretation of Brain death and Organ Transplantation:

Awareness about the National guidelines and criteria for brain death and Organ transplantation.

The End Product

- Should be well acquainted with the current literature on relevant aspects of the basic, investigative, clinical and operative neurosciences.
- Should have learned indications and performance skills of common neurosurgical operations.
- Should have acquired performance skills and ability to interpret relevant clinical investigations.
- Should be able to diagnose, plan investigations and treat common conditions in the specialty by
- Relevant current therapeutic methods.
- Should be acquainted with allied and general clinical disciplines to ensure appropriate and timely referral.
- Should be capable of imparting basic neurosurgical training.
- Should be able to identify, frame and carry out research proposals in the relevant specialty.
- Should be able to communicate effectively regarding the ailment with the patient and relatives and be able to take a proper informed consent.
- Should also be able to effectively communicate about the nature of the disease and the steps of procedures with the patient and relatives.

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.....
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.....
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.....
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II

ORGANIZATION OF TEACHING AND TRAINING

Learning in super-specialty degree course shall essentially be self-directed. The teaching and training course will be conducted for a period of 03 years. It will consist of the following:

Faculty Lectures/ Guest faculty lectures:

Faculty lectures once a month which will mainly cover principles of Neurosciences and Emergency care.

Seminars:

Weekly group activity in which a specific topic is presented in an exhaustive manner by the designated residents followed by an open house discussion.

Case presentation:

Once a week with the objective to learn full neurological history and examination; establish a differential diagnosis; initiate and interpret investigations for patients presenting with a wide range of common neurological disorders.

Journal Club:

Monthly activity, with the objective to assess the authenticity of the research article, critical analysis of research question in a given article to present recent trials related to neurosciences and their importance and relevance to our setup. To formulate research project and be able to write a clinical trial.

Neuropathology meet:

Monthly meeting, to learn the process of handling the tissue specimens and various forms of tissue biopsy, discuss neurosurgical cases with usual and unusual pathological findings and to familiarize residents with the common histological findings that help in diagnosis. To learn the latest classification of the tumors and their clinical importance in the diagnosis and prognosis. 2 or 3 cases would be discussed each month. The neurosurgery resident will present the brief case summary, radiology and relevant details mentioning the presumptive diagnosis and the procedure performed. The pathology resident will present the gross morphological and histopathological finding and the diagnosis. At the end of each session, there will be an open discussion amongst the senior faculty members.

Neuroradiology session:

Monthly conference. Besides daily departmental neuro-radiological session, a focused interdepartmental neuro-radiology meet would be conducted along with department of Radiology. In this focused meeting, principles of common radiological investigations, special investigations like MRI, Spectroscopy, CT, CT angiogram, Digital subtraction angiography

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.....
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.....
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.....
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of brain and spine cases will be presented by the resident followed by discussion with the radiology faculty.

Neuro-onco meet (Radiation oncology):

A multidisciplinary treatment planning session for cancer patients held on twice a month. The relevant cases will be presented by the resident (both postop and scheduled for surgery) and treatment planning in consultation with radiation oncologist/medical oncologist will be carried out.

Bedside clinical teaching:

On daily basis. Basic bedside procedures like tracheostomy, lumbar puncture, neurosurgical dressings, twist drill drainage of CSF, endotracheal intubation, basic principles of physiotherapy and rehabilitation.

OPD:

Based on resident's interest they are recommended to attend the departmental specialty clinics.

Research review:

Once a month, to analyze the progress of research projects assigned to the resident with the aim to publish.

Audit:

Morbidity, Mortality and clinical audit with the objective to facilitate implementation of effective and efficient clinical governance and to provide insight and feedback to surgeon's performance. Clinical audit of the commonly performed surgeries, performance of surgeon, infection rate, use of antibiotics, anticonvulsants will be carried out at regular interval. A record should be kept of the audit process in the department and submitted to Medical Superintendent and Dean on weekly basis.

C.M.E.

Every Saturday, conducted by the department of Medical Education.

Orientation Programme:

Conducted by the department of medical education on joining the Super-specialty course.

Emergency duties:

During their training residents will be on emergency duty daily on rotation basis. This will entail a thorough grounding in management of all types of neurosurgical emergencies.

Research, presentation and publications:

During his tenure, postgraduate student would have two poster presentations at a national conference pertaining to Neurosciences, to read two papers at a National conference. One of the papers need to be presented in Award Paper Section. The candidate shall also publish one

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.....
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article in national and one article in international indexed journal. One of the articles can be in the form of a case report. The article should be accepted for publication so as to make him eligible to appear at the Postgraduate Degree Examination.

Cadaveric Dissection:

A supervised structured time bound practical skills course covering brain and spine anatomy and relevant surgical procedures as per the schedule. The cadaveric module is attached as appendix I.

III

In addition to three year training in the respective specialty, the PG Residents will have an Orientation programme. The orientation programme shall be organized during the first three weeks of their training by the Department of Medical Education.

ORIENTATION PROGRAMME

1. OVERVIEW OF HOSPITAL INFORMATION SYSTEM

2. MEDICAL EDUCATION

- Team building
- Group Dynamics
- Time management
- Attitudes
- Media in Medical Education (OHP, Chalk Board & Power Point)
- Concept Mapping
- E-Learning
- Residents as teachers - Learning by Teaching
- Teaching learning domains
- Learning objectives
- Small group teaching
- How to present a Seminar & Journal Club
- Traits of an effective teacher

3. MEDICAL ETHICS & LEGAL RESPONSIBILITY

- Medical practice in ancient India
- Introduction to Medical ethics-the core of Doctor-Patient Relationship

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- Duties & responsibilities of a Doctor to the patient, family & society
- What is ailing Doctor-patient Relationship?
- Rights and privileges of the patient; Obtaining valid consent and refusal of treatment
- Medical Negligence & CPA; Law, Medicine and the Market
- Medico legal protection
- Consumer forum
- Dealing with partially competent patient
- Dealing a patient who refuse treatment
- Deciding when it is morally justified to withheld information from a patient
- Deciding when it is morally justified to breach confidentiality
- Moral aspect of caring for a patient whose prognosis is poor
- Procedure in Medico Legal cases; Medico legal examination
- Hands-on skills: Medical certificates (Sickness / Fitness, Death Certificate)
- Hands-on skills: Medico legal reports & Medico Legal Formalities, Injury / Alcohol
- Disaster management
- Care of a terminally ill patient

4. **INTERPERSONAL SKILL**

- Importance of communication
- Components of communication
- How to break bad news

5. **CORE TOPICS**

a. Infection control	
	<ol style="list-style-type: none"> 1. Biomedical Waste Management (with hands on activity) 2. Human Biome 3. Disinfection & Sterilization 4. Prevention & control of Hospital Infection 5. Sample collection for microbiological tests in College Lab with form filling. 6. Needle stick injuries and BBIs (Blood Borne Infections) 7. Hands-on training on: Hand hygiene
b. Hands-on Skills	
	<ol style="list-style-type: none"> 1. Ryle's tube insertion 2. Catheterization 3. Insertion of I.V line 4. Arterial puncture 5. I.M injection 6. Hand hygiene

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	<ol style="list-style-type: none"> 7. Hands on Lab skills <ul style="list-style-type: none"> • Use of glucometer and urine dipsticks • Sample collection for Pathology , Biochemistry, Microbiology 8. Filling of Hospital forms 9. Filling of Medico legal forms 10. Blood Pressure Measurement
c. Other Sessions	
	<ol style="list-style-type: none"> 1. DOTS Program at Himalayan Hospital 2. Pharmacovigilance program of India - Filling of the CDSCO form for ADR monitoring (Adverse Drug Reactions) 3. Rational use of Antibiotics 4. National health program 5. Sleep hygiene and life style modification 6. Basic concepts of: X-Ray, USG, CT, MRI

6. BLS COURSE

1. AHA Guidelines (2015) for CPR and ECC Science Update
2. BLS/CPR Basics for Adults
3. BLS/CPR Basics for Children and Infants
4. CPR and AED Demonstrations
5. Hands on skills using mannequins - CPR and AED

7. SCIENCE OF JOYFUL LIVING PROGRAMME

1. Introduction
2. Diet
3. Science of Breath & Practicum
4. Exercise & Practicum (Diaphragmatic Breathing and Systemic Relaxation)
5. Creative use of emotions
6. Meditation & Practicum
7. Stress management & 31 Point Relaxation

8. The Students undergoing postgraduate courses shall be exposed to the following:-

1. Basic Introduction to statistical methods and non linear mathematics for Research work.
2. Critical evaluation of published research
3. Professionalism & Human Behavior.

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IV

CURRICULUM SEMESTER WISE - THEORY

FIRST AND SECOND SEMESTER

Neuroanatomy

- a) Embryology of the nervous system
- b) Descriptive gross and microscopic anatomy
- c) Cross sectional anatomy relevant to interpretation of CT/MRI
- d) Microsurgical anatomy in relation to various operative approaches

Neurophysiology

- a) Physiology of intracranial pressure
- b) Physiology of motor, sensory systems and understanding the basis for clinical Signs / symptoms in pathological states
- c) Physiology of autonomic nervous system
- d) Physiological basis for EEG, Evoked potentials and nerve Conduction / Electromyography studies
- e) Interpretation of EEG/ Evoked potential studies

Basic Neurology:

Basic history taking of neurological illnesses, bedside learning, elicitation of clinical signs.

Neurochemistry

- a) General principles of Neurochemistry
- b) Neurotransmitters – Their distribution, synthesis and functions
- c) Neuro-receptors and their actions
- d) Biochemical changes in trauma and ischemia

Neuropathology

- a) Pathological changes in congenital, traumatic, inflammatory, infectious and neoplastic illnesses of the central and peripheral nervous system
- b) Latest WHO classification of brain tumours and their clinical relevance
- c) Basic molecular classification of brain tumours and their clinical relevance
- d) Basic knowledge of principles of immunohistochemistry and its role in classification of brain neoplasms
- e) Bacteriology, Virology and Parasitology with reference to common neurological infections.

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Neuropharmacology

Pharmacokinetics of the following agents with indications, dosages and common side effects of

- 1) Anti epileptics
- 2) Analgesics
- 3) Anti oedema agents
- 4) Drugs used in Parkinson's disease
- 5) Common agents used for sedation and anaesthesia
- 6) Antipsychotic agents
- 7) Chemotherapeutic agents used in Neuro oncology
- 8) Common antibiotics and anti tuberculous agents
- 9) Anticoagulants, antiplatelet agents and thrombolytics
- 10) IV contrast agents

At the end of first year, the student should have assisted the followings

Craniotomies:

- a) Decompressive craniectomies
- b) Laminectomies
- c) Anterior cervical approaches
- d) Head injury cases
- e) Basic scalp flaps and craniotomies

Should have performed the following

- a) Suturing scalp lacerations
- b) Opening and closure of the scalp
- c) Craniotomy using multiple burr holes and Gigli saw
- d) Ventriculo-peritoneal shunt insertion
- e) Evacuation of chronic subdural haematoma
- f) Lumbar subarachnoid drain insertion
- g) External ventricular drain insertion
- h) Application of skull traction

THIRD AND FOURTH SEMESTER**Clinical Neurology**

- a) History taking and detailed clinical neurological examination of a patient with a neurological symptom, including patients in altered sensorium
- b) Interpretation of the clinical signs elicited in arriving at a clinical diagnosis
- c) Skill to distinguish neurosurgical illnesses from illnesses that may mimic a neurosurgical condition
- d) Concept of Brain death and its significance
- e) Interpretation of plain X-rays of the skull and spine as well as CT/MRI of brain and spine.

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Adequate hands-on experience in performing

- Lumbar Puncture
- External ventricular drainage
- Invasive monitoring of intracranial pressure
- Transcranial Doppler
- Nerve conduction study and electromyography
- Electrode placement for monitoring evoked potentials and EEG

FIFTH AND SIXTH SEMESTER

The candidate appearing for this part is expected to have a thorough knowledge of all the aspects covered above in previous semesters and in addition the following:

- a) History of neurosurgery especially its development in India
- b) Recent advances and Basic research methods in Neurosurgery
- c) Principles behind the working of operating microscope, Laser, Ultrasonic aspirator, Endoscopy, stereotaxy, neuronavigation and any newer developments in operative adjuncts used in the operating room
- d) Basic principles and techniques of radiation therapy in relation to neurosurgery, including radiosurgery
- e) Basic principles in diagnostic and interventional neuroradiology
- f) Acquaintance with recent neurosurgical literature and critically evaluate a journal article
- g) Basic operative skills
- h) Skills in decision making in common scenarios after neurosurgical operations

At the end of 3 year course the student should have assisted the following

- All skull base and vascular procedures including aneurysm clipping
- Excision of superficial and deep seated intra axial and extra axial brain tumours
- Excision of brain tumours in eloquent location
- Excision of spinal cord tumours
- Spine instrumentation

Should have performed the following

- Decompressive craniectomies
- Excision of low grade glioma/convexity meningioma on the surface in non eloquent regions
- Excision of brain abscess
- Lumbar and cervical discectomy
- Laminectomy for spinal tumours
- Releasing CSF from cisterns for tumours (under supervision)

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V

THESIS / RESEARCH PUBLICATIONS

Candidate shall publish at least two original articles in indexed journals. The articles should be accepted for publication at least one month before the university examination. In case the work is not published before the mentioned date, it will be mandatory to have a certification from the university external examiner that the work is publishable.

VI

LOGBOOK**LOG BOOK:**

There shall be two parts of the Logbook. Part 1 will consist of the academic presentations, papers, posters made by the candidate. Part 2 will consist of the operation notes written by the candidate in detail on each day of attending the operation theatre. Both the Logbooks have to be ratified by the head of the department and should be produced at the time of Clinical and Oral Examination. The Log Book shall be regularly checked and assessed by the faculty members imparting the training.

Sample Operative log

S. No.	UHID no.	Date of surgery	Patient's name	Age/gender	Diagnosis	Operation	Chief operating surgeon	Role (S/A1/A2/A3)

S STANDS FOR SURGEON

A1 FIRST ASSISTANT

A2 SECOND ASSISTANT

A3 THIRD ASSISTANT

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VII

GUIDELINES FOR INTERNAL ASSESSMENT

ESSENTIAL PRE-REQUISITE FOR APPEARING FOR M Ch (NEUROSURGERY) EXAMINATION

1. 80% Attendance
 2. 50 % of aggregate marks in all the Internal assessments
 3. Should have appeared for all the Internal Assessments Semester Exams.
 4. Candidate shall publish at least two original articles in indexed journals. The articles should be accepted for publication at least one month before the university examination. In case the work is not published before the mentioned date, it will be mandatory to have a certification from the university external examiner that the work is publishable.
 5. Should have presented poster and paper at a National conference / International conference related to neurosciences.
 6. Duly signed Logbook (Part 1 and 2) of work done (surgical procedures performed/assisted case presentation and other academic activities): rotations, internal assessment report.
 7. Candidate should have completed one month of external posting.
 8. Candidate should have completed the cadaveric module as recommended by the head of the department.
 9. Candidate should have completed the basic course modules as recommended above.
 10. There should be no pending disciplinary action against the candidate.
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1. INTERNAL ASSESSMENT: 80 marks [25 marks each for two internal exams and 30 marks for the overall faculty assessment based on three year overall performance (ward and OT work + attendance + punctuality + patient record keeping + presentations)]to be added in University practical exams.

VIII

EXAMINATIONS

Candidate will have two internal exams, as following

1st Assessment (To be completed from 6 months to 18 months of joining the course)

Theory: One Paper – 3 hours duration – 10 Questions of equal marks.

Basic Science Neurosciences- Neuroanatomy, Physiology, Pharmacology - in particular safe prescribing, Pathological principles underlying system specific pathology, Microbiology and Diagnostic radiology. Emergency Neurosurgery.

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Pre Final Exams (6th Semester Assessment) on same pattern as per University Exam (given below) to be Completed at least 90 days before the Final Theory Exam.

Final University Exam

FINAL EXTERNAL ASSESSMENT AT THE END OF THE COURSE (80%)

A. Theory Exam: 4 Papers each of 3 hours duration. 100 Marks Each Paper

I. Paper –I: 10 Short Questions

Basic Neurosciences - Neuroanatomy, Physiology, Neuro Pharmacology

II. Paper-2: 10 Short Questions

Clinical Neurosciences, Emergency Neurosurgery

III. Paper-3: 10 Short Questions

Operative Neurosciences, Neuropathology, Neuro-microbiology, Neuro-radiology and Neurology

IV. Paper-4: 10 Short Questions

Recent Advances in Neurosciences including clinical trials

B. Practical Exam (320 marks)

Candidate can appear for the practical exams only if he / she has passed the theory exams (50% of the marks in each theory paper individually). The practical exams would be conducted only after the marks for theory exams are available.

1. One Long Case	100 Marks	100
2. Two Short Cases	40 Marks Each Case	80
3. Table viva		
Neuroradiology	20	20
Instruments	20	20
Pathology	20	20
Operative steps	20	20
Grand Viva	20	20
4. Ward rounds	40	40

FINAL RESULT

- Internal assessment (80 marks) + University examination theory (400 marks) + University examination practical (320 marks).
- Candidate should obtain 50 % of marks in each theory paper individually and 50% of marks in overall Practical assessment.

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Prof. V. D. Sinha

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Dr. Ranjit Kumar

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Panel of Examiners for M. Ch. Neurosurgery

No.	Name	Medical College	City	Tel No.
1	Prof. Sarvpreet Singh Grewal	Christian Medical College	Ludhiana	9815500943
2	Prof. Sanjay Behari	Sanjay Gandhi Postgraduate Institute of Medical Sciences	Lucknow	8005451000
3	Prof. Daljeet Singh	Govind Ballabh Pant Institute of Postgraduate Medical Education and Research	New Delhi	9718599353
4	Prof. Bhawani Sharma	Mahatma Gandhi Medical College	Jaipur	9868398232
5	Prof. V. D. Sinha	Sawai Man Singh Medical College	Jaipur	9829052320
6	Prof. S. K. Gupta	Postgraduate Institute of Medical Education and Research	Chandigarh	9316258123
7	Prof. Y. R. Yadav	Netaji Subhash Chandra Bose Medical College & Hospital	Jabalpur	9893711193
8	Prof. Shashank Sharad Kale	All India Institute of Medical Sciences	New Delhi	9868398234
9	Prof. B. K. Ojha	King George's Medical University	Lucknow	9415108077
10	Prof. K. M. Jha	Indira Gandhi Institute Of Medical Sciences	Patna	8544413214
11	Prof. Baylis Vivek Joseph	Christian Medical College	Vellore	9944403878

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X

REFERENCE BOOKS

1. Carpenter's Human Neuroanatomy
2. Snell's neuroanatomy
3. Kandell and Schwartz. Essentials of Neuroscience
4. Ganong. Medical Physiology
5. Plum & Posner's Diagnosis of stupor and coma
6. Dejong's Neurological Examination
7. Youman's Neurological Surgery
8. Schmidek and Sweet. Operative Neurosurgical Techniques Volumes 1 and 2.
9. Rhoton's Cranial Anatomy and Surgical Approaches
10. Benzel's Spine Surgery Volumes 1 and 2.
11. Setty and Rengachary, Textbook of Neurosurgery
12. Ramamurthi and Tandon, Textbook of Neurosurgery
13. Victor and Adam's Neurology
14. www.neurosurgicalatlas.com

****Note:** The editions are as applicable and the latest editions shall be the part of the syllabus

XI

REFERENCE JOURNALS

1. Neurology India
2. Journal of Neurosurgery
3. Journal of Neurosurgery: Spine
4. Journal of Neurosurgery: Pediatrics
5. World Neurosurgery
6. Neurosurgical Focus
7. Neurosurgery
8. British Journal of Neurosurgery

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APPENDIX – I

CADAVERIC DISSECTION MODULE

Session I:

1. Skull Surface marking
2. Standard Burr holes / Twist drill use
3. Commonly used standard Flaps
4. Basics of various craniotomy and basic steps of surgical approaches
5. Marking and Pin positioning
6. Temporalis muscle anatomy and dissection

Session II:

1. Various lobectomies
2. Basic spine laminectomies

Session III:

1. Thoracic spine
2. Thoracic laminectomy
3. T2–12 thoracic pedicle screw fixation
4. Transpedicular approach
5. Costotransversectomy
6. Lateral extracavitary approach

Session IV:

1. Cervical spine
2. Anterior cervical discectomy/corpectomy and plate fixation
3. Keyhole foraminotomy
4. C3–6 cervical laminoplasty/laminectomy
5. C3–6 lateral mass fixation
6. T-1 pedicle screw fixation

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Session V:

1. Lumbar spine
2. Microdiscectomy
3. Foraminotomy
4. Laminectomy
5. Pedicle screw fixation
6. Open TLIF

Session VI:

1. Cervical spine
2. Posterior C1–2 fixation
3. Direct lateral approach
4. Transoral approach

Session VII

1. Orbitozygomatic craniotomy
 - 1- vs 2-piece orbitozygomatic craniotomy
2. Pretemporal approach
3. Extradural anterior clinoidectomy
4. Far-lateral and telovelar approach
5. Vertebral artery and cerebello medullary anatomy
6. Petrosal approaches
7. Anterior and posterior spinal stabilization

Session VIII:

1. Endoscopic approaches to skull base

Session IX:

1. Peripheral nerve
2. Brachial plexus
3. Radial nerve exposure
4. Cubital tunnel
5. Carpal tunnel
6. Guyon's canal
7. Sural nerve Exposure
8. Common Peroneal Nerve exposure
9. Intercostal Nerve exposure
10. Commonly Performed Nerve Transfers

Session X:

1. Carotid endarterectomy, microvascular anastomosis
2. Anterior cervical neck carotid anatomy
3. Carotid endarterectomy technique
4. Microvascular anastomosis‡

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Session XI:

1. Posterior petrosal approach
2. Temporal bone anatomy and drilling technique
3. Exposure of Facial Nerve
4. Retrolabyrinthine approach
5. Translabyrinthine approach
6. Transcochlear approach

Session XII:

1. Anatomy of Orbit
2. Approaches to Orbit
3. Optic Nerve Decompression

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