



**BHARATH INSTITUTE OF HIGHER EDUCATION  
AND RESEARCH**

# **PROGRAM**

# **MCh Neurosurgery**

**(Revised with effect from 2019-2020 onwards)**

## A) AIM OF TRAINING

The candidate at the completion of training would be expected to have acquired knowledge, skills, aptitude and attitudes to be able to function as an independent clinician / consultant and a teacher acquainted with research methodology.

### Objectives:

The end product:

1. Should be well acquired with the current literature on relevant aspects of the basic, investigative, clinical and operative neurosciences.
2. Should have learned indications and performance skills of common neurosurgical operations.
3. Should have acquired performance skills and ability to interpret relevant clinical investigations.
4. Should be able to diagnose, plan investigations and treat common conditions in the speciality by relevant current therapeutic methods.
5. Should be acquainted with allied and general clinical disciplines to ensure appropriate and timely referral.
6. Should be capable of imparting basic neurosurgical training.
7. Should be able to identify, frame and carry out research proposals in the relevant speciality.

## Program Outcomes:

PO1: Knowledge, skills, aptitude and attitudes to be able to function as an independent clinician / consultant.

PO2: Competence to be a teacher.

PO3: Ability to conduct clinical researches.

## Program Specific Outcomes:

PSO1: Attitude to be up to date with the current literature on relevant aspects of the basic, investigative, clinical and operative neurosciences.

PSO2. Knowledge of indications and possession of performance skills of common neurosurgical operations.

PSO3. Possession of performance skills and ability to interpret relevant clinical investigations.

PSO4. Ability to diagnose, plan investigations and treat common conditions in the speciality by relevant current therapeutic methods.

PSO5. Acquaintance with allied and general clinical disciplines to ensure appropriate and timely referral.

PSO6. Ability to impart basic neurosurgical training.

PSO7. Ability to identify, frame and carry out research proposals in the relevant speciality.

## B) TRAINING SYSTEM

Full time, based on the residency pattern.

## C) ELIGIBILITY

### **Essential:**

M.S. (General. Surgery only) degree of an Indian University recognized by the Medical Council of India or any other examination recognized for the purpose by the MCI.

### **Desirable:**

Rotation in Neurosurgery for at least 2 weeks during postgraduate clinical training.  
Prior experience of working in a recognized Neurosurgery department

## Mode of selection

Once a year, through an all India competitive examination. This would comprise of a written test followed by a departmental assessment, in line with University guidelines.

*The eligibility criteria and selection of candidates will be in accordance with University guidelines.*

## TRAINING METHODS

1. Clinical teaching in the outpatient clinics, emergency room and operation theatres. Clinical teaching rounds in ward and bedside presentations.
2. Special teaching sessions like Neuroradiology discussion, Tumour boards, Neuro-endocrine clinics, interdepartmental case discussions with Neurology.
3. Seminars, journal clubs, mortality and morbidity conferences.
4. Treatment planning sessions.
5. Assisting and performing neurosurgical operations.
6. Paper presentations at conferences.
7. Preparation of manuscript for publication.
8. Training in an experimental microsurgical laboratory (desirable)
9. Classes for undergraduates and junior residents undergoing training in Neurosurgery

# COURSE CONTENT

1. Clinical Neurosurgery including history taking, physical examination, diagnosis, selection and planning of relevant investigations, appropriate treatment and rehabilitation of patients with neurosurgical disorders including those presenting as emergencies.
2. Essentials of Clinical Neurology especially with reference to disorders common in India and those likely to present to the Neurosurgeons.
3. Basic medical sciences relevant to the practice of Neurosurgery including anatomy, physiology, biochemistry, pharmacology and epidemiology.
4. Surgical Neuropathology and the essentials of the Pathology of Neurological disorders likely to present to the Neurosurgeon.
5. Principles, technique and interpretation of Neuroradiological procedures like CT and MRI scans, angiography and interventional procedures
6. Principles and interpretation of common Neuro-physiological, Neuro-ophthalmological, Neuro-otological and Neuro-endocrinological tests especially with reference to Neurosurgical disorders.
7. Performance of common neurosurgical operations in the supra and infra-tentorial compartments, in the spine and on the peripheral nerves – initially under supervision and later independently. Ability to use the operating microscope is mandatory.
8. Familiarity with various types of anaesthesia used in neurosurgery their indications and contraindications, the use of ventilators and techniques of monitoring and resuscitation.
9. Pharmacology of various drugs used in Neurosurgery.
10. Knowledge of the history of neurological surgery and its allied disciplines with special reference to India.
11. Knowledge of recent advances in the field of neurological surgery.
12. Preparation of papers for presentation at scientific conferences and for publication.
13. Introduction to the techniques involved in the organization and development of a department, its subsections and newer facilities.
14. It is desirable to have microsurgical laboratory training where candidates learn dissection/suturing of fine arteries /nerves under microscope and skull base dissections.
15. Development of proper attitudes towards patients, subordinates, colleagues and seniors.
16. Should have knowledge about computers and their applications in clinical practice.

## D) SUB-SPECIALTY TRAINING:

### **Neuro-Anaesthesiology:**

There should be didactic lectures, covering anaesthetic techniques in Neurosurgical procedures, critical care management of an unconscious patient, resuscitation, ventilators and other life support systems. Neurosurgery trainees would also be expected to know the basics of anesthetic drugs and their interaction with systemic diseases and neurosurgical disease. Neurosurgery trainees would continue their training in the operation theatre by discussions with the Anaesthesiologists during the training period.

### **Neuroradiology:**

Combined weekly Neuroradiology rounds or meetings. Candidates will rotate with Radiology for two weeks in the second year of training.

### **Medical Neurology and Neurophysiology:**

Candidates should have 2 months (1 month in the second year and 1 month in the fourth year of the course) training in Neurology to familiarize themselves with common neurological disorders. During this period candidate should also familiarize themselves with the technique and interpretation of EEG / EMG / NCV and evoked potentials.

### **Neuropathology:**

There should be a 4 week rotation in Neuropathology during the third year, during which they should be familiarized with the techniques of grossing, staining procedures, brain cutting, autopsy methods and tissue processing including frozen sections and should be able to identify histological features of the common neurosurgical disorders. In addition, participation in regular clinicopathological conferences through the training period is essential.

### **Neuro-chemistry, Neuro-immunology:**

There should be an encapsulated course of didactic lectures to familiarize the trainees with the elements and techniques of neuro-chemistry and neuro-immunology.

## **E) CLINICAL ROTATIONS**

1. Neurology – total 2 months, one month in the first year of the course and another month in the second year of the course. Candidates are expected to familiarize themselves with common neurological disorders. During this period candidate should also familiarize themselves with the technique and interpretation of EEG / EMG / NCV and evoked potentials.
2. Neuro-radiology – 2 weeks in the first year of training
3. Neuropathology – 4 weeks in the second year of training

## F) TRAINING IN OTHER INSTITUTIONS

Candidate in the third year should visit other neurosurgical centers recognized by MCI for at least 4 weeks to be able to observe their practices and understand the difference in approaches to various neurosurgical problems.

It is desirable to have training in certain special areas at another center, when facilities like microsurgical lab training and interventional Neuro-radiology are not available within the parent department or institute.

## H) ESSENTIAL PRE-REQUISITE FOR APPEARING FOR THE M.Ch (Neurosurgery) FINAL EXAMINATION:

1. Logbook of work done (surgical procedures performed / assisted, case presentation and other academic activities), rotations, internal assessment report.
2. Publications / paper based on review of available clinical material from the department.
3. One laboratory oriented project / prospective research related to Neurosurgery / thesis completed in all respects for publication preferably published. The thesis / dissertation should be in accordance with University guidelines.
4. Attendance as per rules of the institute – minimum 80% in each year of the course

## Course Outcomes:

### **Course I (U15M5NU01) Basic Neurosciences**

CO1: Knowledge of anatomy (including embryology) and physiology, necessary in the practice of neurosurgery in the community.

CO2: Knowledge of pharmacology, necessary in the practice of neurosurgery in the community.

CO3: Knowledge of pathology, necessary in the practice of neurosurgery in the community.

CO4: Knowledge of other basic sciences including epidemiology necessary in the practice of neurosurgery in the community.

**Basic medical sciences relevant to the practice of Neurosurgery including anatomy, physiology, biochemistry, pharmacology and epidemiology. Surgical Neuropathology and the essentials of the Pathology of Neurological disorders likely to present to the Neurosurgeon.**

## Course II (U15M5NU02) Applied Neurosciences

CO1: Competency to apply the knowledge of anatomy and physiology in the practice of neurosurgery in the community.

CO2: Competency to apply the knowledge of pharmacology in the practice of neurosurgery in the community.

CO3: Competency to apply the knowledge of Surgical Neuropathology and the essentials of the Pathology of Neurological disorders likely to present to the Neurosurgeon.

CO4: Competency to apply the knowledge in the other basic sciences including epidemiology in the practice of neurosurgery in the community.

Essentials of Clinical Neurology especially with reference to disorders common in India and those likely to present to the Neurosurgeons.

**Candidate should also familiarize themselves with the technique and interpretation of EEG / EMG / NCV and evoked potentials.**

Should be **familiarized with the techniques of grossing, staining procedures, brain cutting, autopsy methods and tissue processing including frozen sections** and should be able to identify histological features of the common neurosurgical disorders. In addition, participation in regular clinicopathological conferences through the training period is essential.

## Course III (U15M5NU03) Neuroradiology and Operative Neurosurgery

CO1: Competency to perform common neurosurgical operations. Ability to use the operating microscope is mandatory.

CO2: Familiarity with various types of anaesthesia used in neurosurgery their indications and contraindications, the use of ventilators and techniques of monitoring and resuscitation.

CO3. Competency in clinical Neurosurgery including history taking, physical examination, diagnosis, selection and planning of relevant investigations, appropriate treatment and rehabilitation of patients with neurosurgical disorders including those presenting as emergencies.

CO4: Knowledge of essentials of Clinical Neurology especially with reference to disorders common in India and those likely to present to the Neurosurgeons.

CO5: Knowledge of the principles, technique and interpretation of Neuroradiological procedures like CT and MRI scans, angiography and interventional procedures

CO6: Knowledge of the principles and interpretation of common Neuro-physiological, Neuro-ophthalmological, Neuro-otological and Neuro-endocrinological tests especially with reference to Neurosurgical disorders.

**Performance of common neurosurgical operations in the supra and infra-tentorial compartments**, in the spine and on the peripheral nerves – initially under supervision and later independently. Ability to use the operating microscope is mandatory.

Familiarity with various types of anaesthesia used in neurosurgery their indications and contraindications, the use of ventilators and techniques of monitoring and resuscitation.

Post surgical rehabilitation of patients

Post operative quality of life

Pharmacology of various drugs used in Neurosurgery.

Aneurysmal coiling and its long term prognosis

**Neurosurgery trainees would also be expected to know the basics of anesthetic drugs and their interaction with systemic diseases and neurosurgical disease.**

#### **Course IV (U15M5NU04) Recent Advances in Neurosurgery**

CO1: Knowledge of recent advances in the field of neurological surgery.

CO2: Attitude to be a lifelong learner.

CO3: Familiarity with recent publications in neurosurgery.

Knowledge of the history of neurological surgery and its allied disciplines with special reference to India.

**Knowledge of recent advances in the field of neurological surgery.**

Preparation of papers for presentation at scientific conferences and for publication.

Newer methods in the treatment of spontaneous Intracranial Hemorrhages

Statistical correlation of the effectiveness of various methods used in neurosurgery and its outcome

**Introduction to the techniques involved in the organization and development of a department, its subsections and newer facilities.**

#### **Course V Soft Skills (U15M5NU05) – Elective Course**

CO1: Knowledge about computers and their applications in clinical practice.

CO2: Competency to use the knowledge in ethics and etiquette to have proper attitudes towards patients, subordinates, colleagues and seniors.



CO3: Competency to work as a member of a team/team leader in the organization and development of a department, its subsections and newer facilities.

CO4: Ability to conduct a clinical study.

CO5: Preparation of papers for presentation at scientific conferences and for publication.

K) EVALUATION OF M.Ch (Neurosurgery):

Thesis / dissertation will have to be submitted for evaluation by the completion of 2yrs and 6 months of the course

### **Timing of examinations**

- a) **Part 1** – at the end of 18 months of training  
Two papers on basic neurosciences including anatomy, physiology, pharmacology, pathology, biochemistry, clinical neurology, neuroradiology, 100 marks each  
*pass marks will be 50% overall*

**Candidates will necessarily have to pass the above mentioned examination to be eligible to take the final examination**

- b) **Part 2** - at the end of 3 years of training  
Four papers – Basic Neurosciences (applied), Clinical Neurology and Neurosurgery (2 papers), advances and operative Neurosurgery, 100 marks each, total 400 marks  
*pass marks will be 50% overall*

**Candidates will necessarily have to pass in the theory examinations to be eligible to take the final practical examination and viva voce**

### **Practical examinations**

Distributed as follows

1. Practical clinical examination comprising of long and short cases  
total 300 marks
2. Radiology, pathology, operative procedures and general viva  
total 200 marks

*Minimum pass marks will be 50%*

## **Sample Paper I- Basic Neurosciences**

Marks 100 (10 x 10)

Write short notes on

1. Microsurgical anatomy of the 3<sup>rd</sup> cranial nerve
2. Regulation of muscle tone and its abnormalities
3. Pharmacology and use of diphenylhydantoin
4. Microsurgical anatomy of the fourth ventricle
5. Pathology of pineal tumours
6. Blood brain barrier in health and disease
7. Embryology and pathology of split cord malformations
8. Internuclearophthalplegia
9. Vascular supply of the spinal cord
10. Sciatic nerve

## **Sample Paper II – Applied Neurosciences**

Marks 100

1. Discuss the pathology, clinical features, diagnosis and management of a patient with Cushing's disease. (20 Marks)

Write notes on

- a. Management of raised intracranial pressure
- b. Lipomeningocele
- c. Arrested hydrocephalus
- d. Complications of surgery for vestibular schwannoma
- e. Carotid – cavernous fistula
- f. Hangman's fracture
- g. Management of trigeminal neuralgia
- h. Brain abscess

### **Sample Paper III – Neuroradiology and Operative Neurosurgery**

Discuss the pathology, clinical features, diagnosis and management of intracranial germ cell tumours  
Marks 20

**Write notes on**

Marks 80 (8 x 10)

1. Surgical approaches to lesions in the anterior third ventricle
2. Pituitary apoplexy
3. Neuro – navigation
4. Management of lumbar spondylolisthesis
5. Endovascular management of intracranial aneurysms
6. Magnetic resonance spectroscopy and its applications
7. Bone grafts and bone graft substitutes
8. Erbs palsy

### **Sample Paper IV – Recent advances in Neurosurgery**

Marks 100 (10 x 10)

**Write notes on**

1. Minimally invasive spinal surgery
2. Controversies in the management of extra cranial carotid artery stenosis
3. Advances in chemotherapy for malignant gliomas
4. Management of brain metastasis
5. Electrophysiological monitoring during surgery for cerebellopontine angle lesions
6. Role of diffusion tensor imaging in neurosurgery
7. Idiopathic intracranial hypertension
8. Role of endoscopy in the management of hydrocephalus
9. Management of intractable pain
10. Thoracic disc herniation