

Guidelines
for
Competency Based Training Programme
in
DNB- Neurosurgery
(Draft Version)



NATIONAL BOARD OF EXAMINATIONS

Medical Enclave, Ansari Nagar, New Delhi-110029, INDIA
Email: mail@natboard.edu.in Phone: 011 45593000

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AIM

The aim of teaching postgraduate students in neurosurgery is to prepare them to have adequate knowledge in the subject, covering both theoretical and practical knowledge, in accordance with the institutional goals

The end product should have acquired knowledge, skills, aptitude and attitudes to be able to function as an independent clinician/consultant and a teacher acquainted with research methodology

PROGRAMME GOAL

The goal of DNB course is to produce a competent surgeon who:

- Recognizes the health needs of adults and carries out professional obligations in keeping with principles of National Health Policy and professional ethics
- Has acquired the competencies pertaining to neuro surgery that are required to be practiced in the community and at all levels of health care system
- Has acquired skills in effectively communicating with the patients, family and the community
- Is aware of the contemporary advances and developments in medical sciences.
- Acquires a spirit of scientific enquiry and is oriented to principles of research methodology
- Has acquired skills in educating medical and paramedical professionals

PROGRAMME OBJECTIVES

Curriculum objective has been to impart essential clinical knowledge so that he/she becomes capable of working up and treating a neurosurgical problem in a logical way inculcating preventive and socioeconomic aspects also in care

The objectives of postgraduate degree training programme - in terms of knowledge and skills – are to enable a candidate to

- Recognize the key importance of medical problems in the context of the health priority of the country
- Practice the specialty of Neuro surgery in keeping with the principles of professional ethics
- Identify social, economic, environmental, biological and emotional determinants of adult Neuro Surgery and know the therapeutic, rehabilitative, preventive and promotion measures to provide holistic care to all patients
- Take detailed history, perform full physical examination and make a clinical diagnosis; Perform and interpret relevant investigations (Imaging and Laboratory); Perform and interpret important diagnostic procedures;
- Diagnose illnesses in adults based on the analysis of history, physical examination and investigative work up
- Plan and deliver comprehensive treatment for illness in adults using principles of rational drug therapy; Plan and advise measures for the prevention of diseases
- Plan rehabilitation of adults suffering from chronic illness, and those with special needs; Manage emergencies efficiently
- Demonstrate skills in documentation of case details, and of morbidity and mortality data relevant to the assigned situation

- Demonstrate empathy and humane approach towards patients and their families and respect their sensibilities
- Demonstrate communication skills of a high order in explaining management and prognosis, providing counseling and giving health education messages to patients, families and communities.
- Develop skills as a self-directed learner, recognize continuing educational needs; use appropriate learning resources, and critically analyze relevant published literature in order to practice evidence-based medicine;
- Demonstrate competence in basic concepts of research methodology and epidemiology; Facilitate learning of medical/nursing students, practicing surgeons , para-medical health workers and other providers as a teacher-trainer
- Play the assigned role in the implementation of national health programs, effectively and responsibly
- Organize and supervise the desired managerial and leadership skills;
- Function as a productive member of a team engaged in health care, research and education.

KNOWLEDGE: At the end of the course, upon successful completion of training and passing the examination the student is expected to

- Acquire comprehensive knowledge of the basics of neurosurgery including all allied specialties related to neurosurgery like Neuroanatomy, neuropathology, Neuroinfections, neuroimmunology, Preventive Neurology, Neuroepidemiology, Paediatric Neurology.
- Possess a complete knowledge of all the commonly used Neurosurgery procedure diagnostic tests like Electroencephalography, evoked Potentials, etc...

- Possess knowledge of the recent advances in the subject of Neurosurgery and all its allied specialities and working knowledge of the sophisticated and routine equipments, consumables used in Neurosurgery especially with respect to Neurochemistry, neurogenetic and molecular diagnostic techniques.
- Possess knowledge of principles of research work in the field of Neurology and Neurosurgery in both the clinical and experimental field with the ability to analyse data
- Acquire knowledge in the performance and interpretation of special investigations such as Polysomnography, Video EEG, autonomic function tests, Transcranial Doppler tests, Magnetic Electrical Stimulations.
- Acquire knowledge in interpretation of common neuroimaging investigations such as CT scanning, MRI scanning, MR and Digital subtraction angiography, MR spectroscopy and Single Photon Emission Computerized Tomography.

SKILLS

- Diagnose and manage majority of conditions in the specialty of Neurosurgery on the basis of clinical assessment, and appropriate investigations.
- Possess complete clinical Diagnostic Skills for the recognition of common Nervous system diseases.
- Acquire skills in the performance and interpretation of special investigations such as Polysomnography, Video EEG monitoring, EEG – Telemetry, autonomic function tests, Transcranial Doppler tests.
- Acquire skills in invasive procedures such as lumbar puncture, intrathecal drug administration, CSF manometry; assisting in digital subtraction angiography and intraarterial thrombolysis; and Nerve and muscle biopsy and their interpretation of relevant histopathology.

- Acquire exposure in sophisticated neuromodulation procedures such as planning of deep brain stimulation, vagal nerve stimulation.
- Able to apply sound clinical judgement and rational cost effective investigations for the diagnosis and management of Neurosurgery Cases in the OPD, WARDS, Emergency Room and Intensive Care Unit.
- Be able to teach undergraduate students MBBS and Post Graduate Students MS General Surgery or Paediatric Surgery as well as investigative Neurosurgery.
- Be able to perform Clinical and Investigative studies and to present in Seminars, meetings and conference etc...
- Have the ability to organise specific teaching and training programmes for para medical staff, associated professionals and patient education programmes.
- Should be able to develop good communication skills and give consultations to all other departments of the hospital.
- Demonstrate skills in documentation of individual case details as well as morbidity and mortality data relevant to the assigned situation.
- Demonstrate empathy and humane approach towards patients and their families and exhibit interpersonal behaviour in accordance with the societal norms and expectation.
- .Develop skills as self-directed learner, recognize continuing educational needs: select and use appropriate learning resources.
- Develop skills in using educational methods and techniques as applicable to the teaching of medical / nursing students, general physicians and paramedical health workers.

ELIGIBILITY CRITERIA FOR ADMISSIONS TO THE PROGRAMME

(A) DNB Neurosurgery Course:

1. Any medical graduate with MS/DNB in General Surgery qualification , who has qualified the **Entrance Examination** conducted by NBE and fulfill the eligibility criteria for admission to DNB **Super Specialty** courses at various NBE accredited Medical Colleges/ institutions/Hospitals in India is eligible to participate in the Centralized counseling for allocation of DNB Neurosurgery seats purely on merit cum choice basis.
2. Admission to 3 years post MBBS DNB Neurosurgery course is only through **Entrance Examination** conducted by NBE and Centralized Merit Based Counseling conducted by National Board of Examination as per prescribed guidelines.

Duration of Course : 3 Years

Every candidate admitted to the training programme shall pursue a regular course of study (on whole time basis) in the concerned recognized institution under the guidance of recognized post graduate teacher for assigned period of the course.

TEACHING AND TRAINING ACTIVITIES

The fundamental components of the teaching programme should include:

1. Case presentations & discussion- once a week
2. Seminar – Once a week
3. Journal club- Once a week
4. Grand round presentation (by rotation departments and subspecialties)- once a week
5. Faculty lecture teaching- once a month
6. Clinical Audit-Once a Month
7. A poster and have one oral presentation at least once during their training period in a recognized conference.

The rounds should include bedside sessions, file rounds & documentation of case history and examination, progress notes, round discussions, investigations and management plan) interesting and difficult case unit discussions.

The training program would focus on knowledge, skills and attitudes (behavior), all essential components of education. It is being divided into theoretical, clinical and practical in all aspects of the delivery of the rehabilitative care, including methodology of research and teaching.

Theoretical: The theoretical knowledge would be imparted to the candidates through discussions, journal clubs, symposia and seminars. The students are exposed to recent advances through discussions in journal clubs. These are considered necessary in view of an inadequate exposure to the subject in the undergraduate curriculum.

Symposia: Trainees would be required to present a minimum of 20 topics based on the curriculum in a period of three years to the combined class of teachers and students. A

free discussion would be encouraged in these symposia. The topics of the symposia would be given to the trainees with the dates for presentation.

Clinical: The trainee would be attached to a faculty member to be able to pick up methods of history taking, examination, prescription writing and management in rehabilitation practice.

Bedside: The trainee would work up cases, learn management of cases by discussion with faculty of the department.

Journal Clubs: This would be a weekly academic exercise. A list of suggested Journals is given towards the end of this document. The candidate would summarize and discuss the scientific article critically. A faculty member will suggest the article and moderate the discussion, with participation by other faculty members and resident doctors. The contributions made by the article in furtherance of the scientific knowledge and limitations, if any, will be highlighted.

Research: The student would carry out the research project and write a thesis/ dissertation in accordance with NBE guidelines. He/ she would also be given exposure to partake in the research projects going on in the departments to learn their planning, methodology and execution so as to learn various aspects of research.

SYLLABUS

1. Basic Neuroanatomy
2. Neurophysiology a. Basic b. Neurophysiology of pain c. Spasticity, memory, limbic systems d. Basal ganglia, cerebellum
3. Neuro chemistry
4. Neuro Pathology
 - a. Tumor – Classification, clinical signs and symptoms
 - b. Brain edema
 - c. Blood brain barrier
 - d. Immunology e. Genetic disorders

IInd year

5. Clinical Neurology – Localization, Neurophysiological studies
6. Neuro diagnosis – CT scan, MRI, PET, X-Rays, Radionucleotide Angiography

IIIrd year

7. Neuro surgery
 - a. Basic principles
 - b. Vascular Neurosurgery
 - c. Tumor Neurosurgery
 - d. Surgical management of pituitary tumour , craniopharyngiom, pineal tumors
 - e. Surgery for congenital malformation
 - f. Special subjects: crainovertebral anamolies, syringomyelia , spinal dysraphism management.
 - g. Tramatic brain Injury, pathophysiology, Intra cranial haematomas.
 - h. Management of spinal cord injury.
 - i. Spinal instrumentation
 - j. Different approaches for disc surgeries

k. Management of brain secondaries

l. Functional neurosurgery

i. Principles of stereotaxic surgery

ii. Selection of targets, disorders of different psychiatric disorders

iii. Deep brain stimulation m. Special surgical procedures for epilepsy

Other areas in which knowledge is to be acquired:

- Biostatistics, Research Methodology and Clinical Epidemiology
- Ethics
- Medico legal aspects relevant to the discipline
- Health Policy issues as may be applicable to the discipline

Theory

The theory syllabus should include the history, epidemiology, etiology, genetics, pathogenesis, clinical manifestations, complications, differential diagnosis, investigations, treatment with special stress on surgical procedures), prevention and prognosis of all neurological diseases in adults

Landmarks in the history of neurosurgery, micro neurosurgery , neuroradiology.

Clinical evaluation of the nervous system – history taking and clinical examination of cognitive functions, cranial nerve examination , neuroophthalmology , examination of motor and sensory systems and reflexes.

Applications of principles of cellular and molecular biology in neurosurgical disorders Diagnostic tests – examination of CSF and related procedures,

electrodiagnostic tests (NCV ,EMG ,EEG ,Evoked potentials , Trans Cranial Doppler , Pet scan , Spect , Angiography , Brain Biopsy)

General and peri operative care-Initial evaluation and treatment of the comatose patient, Seizure disorders and their medical management, Evaluation of the patient with dementia and treatment of normal pressure hydrocephalus, Blood-Brain barrier; cerebral edema, increased intracranial pressure, Brain Herniation, and their control, Pseudotumor cerebri, Neurology, Preoperative evaluation of a neurosurgical patient, Blood coagulation, Neuroanesthesia, Intensive care, Spasticity, Advance in molecular genetics in relation to neurogenetic diseases

Neurosurgical and related techniques-Principles of neurosurgical operative technique, Principles of Neurosurgical operative technique, Endoscopic neurosurgery, Prophylactic antibiotics , Patient positioning, Intraoperative neurophysiologic Monitoring, High speed drills, Intraoperative use of topical hemostatic agents in neurosurgery, Use of fibrin glue in neurosurgery, Calcium phosphate ceramics as bone substitute , Endovascular therapy of vascular lesions of the central nervous system

Neuro - Oncology -Oncogenes and Nervous system tumor, genetic factors in brain tumors, neurofibromatosis and other phakomatoses, Tumor markers, Primary brain tumor: Aspects of imaging and functional localization.

Gliomas - Gliomas: Pathology, Supratentorial gliomas: Clinical features and surgical therapy, Metastatic brain tumor-Surgery for a single brain metastatic, Meningeal carcinomatosis Meningiomas- Meningiomas: Pathology, Imaging, Supratentorial meningiomas:clinical features and surgical management, Infratentorial and foramen magnum meningiomas Epidermoid and dermoid tumor-Epidermoid and dermoid tumors: Pathology, Imaging, Clinical features and surgical management.

Tumors in the region of the pineal gland-Classification and pathology, Clinical features and surgical management , Surgical approaches to pineal tumors.

Cerebellopontine angle tumor-Tumor of the cerebellopontine angle: Pathology,

Tumor of the cerebellopontine angle: Neuro-otologic aspects of diagnosis, tumor of the cerebellopontine angle: clinical features and surgical management via a retrosigmoid approach.

Posterior fossa tumors-Imaging of posterior fossa tumors, Microsurgical Anatomy of the fourth ventricle, Cerebellar Astrocytomas, Medulloblastomas, pediatric brain stem gliomas, Ependymoma, Subependymomas

Sellar and Parasellar tumors- Microsurgical anatomy of sellar region, Imaging of Sellar and Parasellar Lesions, Classification and Pathology of Pituitary tumors, Prolactinomas, Cushing's Disease and Nelson's Syndrome, Pituitary Apoplexy, Trans-sphenoidal Approach to the Pituitary Gland, Transcranial approaches to the Pituitary Gland and Sellar region, Craniopharyngiomas, Optic Gliomas, Suprasellar germinomas, Lateral and Third Ventricle Tumours, Tumours of the Orbit

Neuro-Oncology-Tumours of the skull, Chordomas and Chondrosarcomas of the Cranial Base, trigeminal Neurinomas, Other cranial Nerve Schwannomas, Transfacial- Transmaxillary Approach to the Anterior Skull Base, Transoral Approaches to the clivus and upper cervical spine, Anterolateral cervical approach to the craniovertebral junction, Surgical anatomy of the cavernous sinus, Surgical treatment of tumors involving the cavernous sinus, Approaches to petroclival tumors., primitive neuroectodermal tumors, primary central nervous system lymphomas. Spinal Tumors-Spinal Intradural tumors, Paragangliomas of the cauda equine , Spinal epidural tumors , Primary Neoplasms of the spine.

Adjunctive therapy of central nervous system tumors - Principles of radiotherapy of central nervous system tumors , Radiosurgery for tumors , Radiation injury of the brain and the spinal cord

Vascular Diseases of The Nervous System General information, Measurement of cerebral blood flow, Occlusive cerebrovascular disease, Pathology of ischemic cerebrovascular disease, Thrombolytic therapy for occlusive cerebrovascular disease, surgery for acute brain infarction with mass effect, Extracranial to Intracranial bypass grafting, Aneurysms and Subarachnoid haemorrhage Microsurgical anatomy of saccular aneurysms, Pre- and postoperative management of a patient with ruptured aneurysm, Ophthalmic segment aneurysm, other aneurysms of internal carotid artery, Middle cerebral artery aneurysms , Anterior communicating artery aneurysms, Distal anterior cerebral artery aneurysms, posterior circulation aneurysms, management of intracranial aneurysms and arteriovenous malformations during pregnancy .

Vascular malformations and fistulas Intracranial arteriovenous malformations, Vein of Galen malformation, Stereotactic radiosurgery of intracranial arteriovenous malformations, Spinal vascular malformations. Other vascular disorders Spontaneous intraspinal hemorrhage, Spontaneous intraparenchymal brain hemorrhage.

Cranial And Spinal Trauma Cranial trauma-Pathophysiology of traumatic brain injury , pathology of closed head injury , Neurological evaluation of a patient with head trauma , Radiological evaluation of head trauma , Pediatric head injury, Minor head injury management and outcome , Skull fractures, Growing skull fractures of childhood, Traumatic intracranial hematomas, Delayed and recurrent intracranial hematomas, and [post traumatic coagulopathies, Penetrating wounds of the head, Sequelae of head injury, Pathophysiology and pathology of spinal cord injury, Management of acute spinal cord injury, Cervical spine injuries: Diagnosis and management

Disorders of peripheral and cranial nerves and the autonomic nervous system.- Thoracic outlet syndromes, Entrapment Neuropathies, Nerve Injuries-Peripheral nerve injuries:Types, Causes, and Grading, Brachial plexus injuries, Techniques of nerve repair. Infections- Antimicrobials for use in neurosurgical patients, Diagnosis and management of brain abscess, Acute bacterial meningitis, Spinal epidural and subdural abscesses, Fungal infection.

Developmental anomalies and neurosurgical disorders of childhoodNeuroembryology, Spinal dysraphism, Tethered cord syndrome, Diastematomyia, Chiari malformations, Hydromyelia, Syringomyelia, Hydrocephalus: Pathophysiology and clinical features, Hydrocephalus: Treatment, Shunt system, Shunt complications, Dandy-walker malformation.

Intervertebral disc disease and selected spinal disorders-Cervical disc disease and cervical spondylosis, Cervical ossification of the posterior

Longitudinal ligament, lumbar disc disease, Postoperative intervertebral disc space infections. Lumbar spondylolisthesis, Posterolateral lumbar spinal fusion, The failed back surgery syndrome.

Pain-Anatomy and physiology of pain, Craniofacial pain syndromes: An overview Trigeminal neuralgia:- Introduction, Trigeminal neuralgia: Problems as to cause and consequent, Trigeminal neuralgia: treatment by glycerol Rhizotomy, Trigeminal neuralgia: Treatment by microvascular decompression, Deep brain stimulation for pain relief,

Stereotactic And Functional Neurosurgery- stereotactic surgery; principles and techniques, image guided stereotactic surgery, radiofrequency lesion- making in the nervous system, surgical therapy of movement disorders, surgical treatment of epilepsy

TRAINING ON SUB-SPECIALITY OF NEUROSCIENCES

Neuro-Anaesthesiology : There should be a didactic lectures which may be a common programme for the Neurology and Neurosurgery postgraduates. The major thrust in these would be the resuscitation management of coma, life-support systems and monitoring of patients. The Neurosurgery trainees would have additional requirements in which they should know the interaction of anaesthetic drugs with systemic diseases and neurosurgical disease conditions and for this few more didactic lecture would be required. The major thrust would be on continuing training for the Neurosurgery trainees in the operation theatre as a result of the informal discussions which would be taking place during the training period.

Neuroradiology : Combined Neuroradiology rounds or meetings twice or thrice a week. Clinical Neurology Neurophysiology Candidates should have 2 months (1 month in the beginning and 1 month in the middle of course) training under Neurology department to familiarize themselves regarding common neurological disorders. During this period candidate should also familiarize themselves with the technique and interpretation of EEG/EMG/NCV and evoked potentials.

Neuropathology It is suggested that there should be a 4 week capsuled training for Neurosurgery trainees or regular once a week Neuropath conference in 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 regard to weightage in the examination it is felt that it should be five percent of the theory and the practical examination.

Neuro-Biochemistry, Neuroimmunology In regard to both above it is felt that there should be a capsuled course of didactic lectures which should run every alternate year or so to familiarize the trainees with the elements and techniques of neurochemistry and neuro-immunology. In these subjects it was felt that a total weightage of 1-2% questions of theory and practical should be there. G. VIS

Practical

History, examination and writing of records: History taking should include the back ground information, presenting complaints and history of present illness, history of previous illness, family history, social and occupational history and treatment history.

Detailed physical examination should include general examination and systemic examination (Chest, Cardio-vascular system, Abdomen, Central nervous system, locomotor system and joints), with detailed examination of the abdomen.

Skills in writing up notes, maintaining problem oriented records, progress notes, and presentation of cases during ward rounds, planning investigations and making a treatment plan should be taught. Bedside procedures & Investigations

Therapeutic skills: Venepuncture and establishment of vascular access, Administration of fluids, blood, blood components and parenteral nutrition, Nasogastric feeding, Urethral catheterization, Administration of oxygen, Cardiopulmonary resuscitation, Endotracheal intubation.

Clinical Teaching General, Physical and detailed examinations of CNS should be mastered

The resident should be able to analyse history and correlate it with clinical findings.

- He should be well versed with all radiological procedures like CT Angio, MRI, CT, X-rays, SPECT, DSA
- He should present his daily admissions in morning report and try to improve management skills, fluid balance, and choice of drugs.
- He should clinically analyze the patient & decide for pertinent investigations required for specific patient.

Teaching Schedule Following is the suggested weekly teaching programme in the Department

1. Central Teaching Once a week
2. Seminar / Journal club Once a week
3. Case Presentation Once a week
4. Cath conference Once a week
5. File Audit/Stat Meet. Once a month
6. Grand Round/Interdepartmental Meet Once a month

Each unit should have regular teaching rounds for residents posted in that unit.

The rounds should include bedside case discussions, file rounds (documentation of case history and examination, progress notes, round discussions, investigations and management plan), interesting and difficult case unit discussions. Central hospital teaching sessions will be conducted regularly and DNB residents would present interesting cases, seminars and take part in clinico-pathological case discussions.

Schedule of Posting:

OPD: Twice a week

OT: Twice a week

Emergency: Twice a week

The DNB resident shall be posted in other departments as per the following schedule:

Pathology 15 days

Oncology/radiotherapy 15 days

Radiology 15 days

Anesthesia 15 days

PRACTICAL TRAINING

There will be operative surgical training for three days in a week.

THE FIRST YEAR: Student will be taught to do diagnostic procedures, preparations of the cases for surgery, also act as a 2nd assistant in all the neurosurgical procedures and to be introduced in post operative care.

SECOND YEAR: He/she will be allowed to do craniotomy / laminectomy and other procedures like dural opening for the surgeon and to help the surgeon for the removal of the lesions. He also will be allowed for closure of the wound and subsequent post operative management.

THIRD YEAR: He/she will be allowed to dissect the brain, helping in localizing the lesion and allowing him to deliver the tumor or lesion and also to do bleeding control during surgery with the help of the surgeon.

SPECIAL PROCEDURES TRAINING: He/she will be also exposed to learn other special procedures like deep brain stimulation, stereotactic functional neurosurgery, interventional neurosurgical procedure etc... by deputing them to

various medical colleges where the special neurosurgical procedures are performed as a part of teaching curriculum and he/she has to spend two months outside the institution during second and third year of training.

Minimum operative surgical exposure required for the trainees:

i. Mandatory:

1. 400 cases exposure at least for the whole training program (Minimum 300 cases performed in the OT in a year).
2. At least 2 OTs a week including trauma
3. About 1/3 cranial and 1/3 spinal cases
4. At least 10% supervised/performed independently (at least 10 craniotomies)
5. Spectrum of surgeries should include Neuro-trauma, Neurooncology, Stroke and cerebrovascular surgery, Pediatric Neurosurgery, Spinal surgery
6. If any of the above specialities is not available, the trainee may be posted to other centres where such speciality is available.

ii. Desirable:

Exposure to sub-specialites including

1. Cerebrovascular surgery including endovascular procedures
2. Functional Neurosurgery and Epilepsy surgery
3. Skull base surgery
4. Neuro-endoscopy
5. Peripheral nerve surgery

Lumbar puncture, external ventricular drainage, tracheostomy, endotracheal intubation, emergency scalp suturing, Simple neuro-trauma including chronic subdural hematoma, extradural hematoma, learning elective case exposures, VP shunt (under supervision).

Neurotrauma: contusion and intracerebral hematoma, Elective cases: craniotomy and spinal exposures.

Elective exposures, supervised surgery, Subspeciality exposure depending on interest.

Independent surgery (supervised): Neuro-trauma : Chronic SDH, EDH, depressed fractures, ICH, contusions, (Experience with conventional craniotomy required). 5. Elective cases: VP shunt (always supervised), Gliomas (at least 2 anatomical regions), Surface meningiomas, Chiari malformation, Midline suboccipital exposure and surgery, Lumbar disc and cervical disc surger

**TEACHING PROGRAMME CUMULATIVE DURATION OF THE
STUDY PROGRAM S.NO. PLACES DURATION 1ST YEAR 2ND
YEAR 3RD YEAR**

- 1 Ward +CCU 8 months
- /Neuro OT 8months 15days 1 month 2 Anatomy Dissection 15 days - - 3
ENT Posting 15 days - - 4 Neurology 1 month 1 month - 5 Neuroradiolgy 1
month - - 6 Neuroanaesthesia 15 days 15 days - 7 Neuro pathology 15
days - - Elective Postings – other Institutions - 2 months 2 months
- 1 Ward +CCU/Neuro OT 8 months 1styr 8months 15days 2ndyr 1
month3rdyr
- 2 Anatomy Dissection 15 days 1styr
- 3 ENT Posting 15 days 1styr
- 4 Neurology 1 month 1st yr 1 month2nd yr
- 5 Neuroradiolgy 1 month1st yr
- 6 Neuroanaesthesia 15 days 1st yr 15 days2nd yr
- 7 Neuro pathology 15 days1st yr
- Elective Postings – other Institutions - 2 months2nd yr 2
months3rd yr

JOB RESPONSIBILITIES

Outdoor Patient (OPD) Responsibilities • The working of the residents in the OPD should be fully supervised. • They should evaluate each patient and write the observations on the OPD card with date and signature. • Investigations should be ordered as and when necessary using prescribed forms. • Residents should discuss all the cases with the consultant and formulate a management plan. • Patient requiring admission according to resident's assessment should be shown to the consultant on duty. • Patient requiring immediate medical attention should be sent to the casualty services with details of the clinical problem clearly written on the card. • Patient should be clearly explained as to the nature of the illness, the treatment advice and the investigations to be done. • Resident should specify the date and time when the patient has to return for follow up.

IN-PATIENT RESPONSIBILITIES Each resident should be responsible and accountable for all the patients admitted under his care. The following are the general guidelines for the functioning of the residents in the ward: 17 • Detailed work up of the case and case sheet maintenance: • He/She should record a proper history and document the various symptoms. Perform a proper patient examination using standard methodology. He/she should develop skills to ensure patient comfort/consent for examination. Based on the above evaluation he/she should be able to formulate a differential diagnosis and prepare a management plan. Should develop skills for recording of medical notes, investigations and be able to properly document the consultant round notes. • To organize his/her investigations and ensure collection of reports. • Bedside procedures for therapeutic or diagnostic purpose. • Presentation of a precise and comprehensive overview of the patient in clinical rounds to facilitate discussion with senior residents and consultants. • To evaluate the patient twice daily (and more frequently if necessary) and maintain a progress report in the case file. • To

establish rapport with the patient for communication regarding the nature of illness and further plan management. • To write instructions about patient's treatment clearly in the instruction book along with time, date and the bed number with legible signature of the resident. • All treatment alterations should be done by the residents with the advice of the concerned consultants and senior residents of the unit.

ADMISSION DAY: Following guidelines should be observed by the resident during admission day. • Resident should work up the patient in detail and be ready with the preliminary necessary investigations reports for the evening discussion 18 with the consultant on duty. • After the evening round the resident should make changes in the treatment and plan out the investigations for the next day in advance.

DOCTOR ON DUTY :Duty days for each Resident should be allotted according to the duty roster. The resident on duty for the day should know about all sick patients in the wards and relevant problems of all other patients, so that he/she could face an emergency situation effectively. • In the morning, detailed over (written and verbal) should be given to the next resident on duty. This practice should be rigidly observed. • If a patient is critically ill, discussion about management should be done with the consultant at any time. • The doctor on duty should be available in the ward through out the duty hours.

CARE OF SICK PATIENTS :Care of sick patients in the ward should have precedence over all other routine work for the doctor on duty. • Patients in critical condition should be meticulously monitored and records maintained. • If patient merits ICU care then it must be discussed with the senior residents and consultants for transfer to ICU.

RESUSCITATION SKILLS : At the time of joining the residency programme, the resuscitation skills should be demonstrated to the residents and practical training

provided at various work stations. • Residents should be fully competent in providing basic and advanced 19 cardiac life support. • They should be fully aware of all advanced cardiac support algorithms and be aware of the use of common resuscitative drugs and equipment like defibrillators and external cardiac pacemakers. • The resident should be able to lead a cardiac arrest management team.

DISCHARGE OF THE PATIENT : Patient should be informed about his/her discharge one day in advance and discharge cards should be prepared one day prior to the planned discharge. • The discharge card should include the salient points in history and examination, complete diagnosis, important management decisions, hospital course and procedures done during hospital stay and the final advice to the patient. • Consultants and MCH Residents should check the particulars of the discharge card and counter sign it. • Patient should be briefed regarding the date, time and location of OPD for the follow up visit.

IN CASE OF DEATH : In case it is anticipated that a particular patient is in a serious condition, relatives should be informed about the critical condition of the patient beforehand. • Residents should be expected to develop appropriate skills for breaking bad news. • Follow up death summary should be written in the file and face sheet notes must be filled up and the sister in charge should be requested to send the body to the mortuary with respect and dignity from where the 20 patient's relatives can be handed over the body. • In case of a medico legal case, death certificate has to be prepared in triplicate and the body handed over to the mortuary and the local police authorities should be informed. • Autopsy should be attempted for all patients who have died in the hospital especially if the patient died of an undiagnosed illness.

BEDSIDE PROCEDURES: The following guidelines should be observed strictly:

- Be aware of the indications and contraindications for the procedure and record it in the case sheet. Rule out contraindications like low platelet count, prolonged

prothrombin time, etc. • Plan the procedure during routine working hours, unless it is an emergency. Explain the procedure with its complications to the patient and his/her relative and obtain written informed consent on a proper form. Perform the procedure under strict aseptic precautions using standard techniques. Emergency tray should be ready during the procedure. • Make a brief note on the case sheet with the date, time, nature of the procedure and immediate complications, if any. • Monitor the patient and watch for complications(s).

OT RESPONSIBILITIES • The 1st year resident observes the general layout and working of the OT, understands the importance of maintaining sanctity of the OT, scrubbing, working and sterilization of all the OT Instrument, know how of microscopes. He/ She is responsible shifting of OT patients, for 21 participating in surgery as 2nd assistant and for post operative management of patient in recovery and in ward. The 2nd year resident is responsible for pre op work up of the patient, surgical planning and understanding the rationale of surgery. He/she is the first assistant in surgery and is responsible for anticipating intra op and post op complications and managing them. The final year resident should be able to perform minor/medium/major surgeries independently and assist in medium/major/extra major surgeries. He/she should be able to handle all emergencies and post op complications independently and is responsible for supervision and guidance of his/her juniors.

MEDICO-LEGAL RESPONSIBILITIES OF THE RESIDENTS • All the residents are given education regarding medico-legal responsibilities at the time of admission in a short workshop. • They must be aware of the formalities and steps involved in making the correct death certificates, mortuary slips, medico-legal entries, requisition for autopsy etc. • They should be fully aware of the ethical angle of their responsibilities and should learn how to take legally valid consent for different hospital procedures & therapies. They should ensure confidentiality at every stage.

THESIS PROTOCOL & THESIS

The candidates are required to submit a thesis at the end of three years of training as per the rules and regulations of NBE.

Guidelines for Submission of Thesis Protocol & Thesis by candidates

Research shall form an integral part of the education programme of all candidates registered for DNB degrees of NBE. The Basic aim of requiring the candidates to write a thesis protocol & thesis/dissertation is to familiarize him/her with research methodology. The members of the faculty guiding the thesis/dissertation work for the candidate shall ensure that the subject matter selected for the thesis/dissertation is **feasible, economical** and **original**.

Guidelines for Thesis Protocol

The protocol for a research proposal (including thesis) is a study plan, designed to describe the background, research question, aim and objectives, and detailed methodology of the study. In other words, the protocol is the 'operating manual' to refer to while conducting a particular study.

The candidate should refer to the NBE Guidelines for preparation and submission of Thesis Protocol before the writing phase commences. The minimum writing requirements are that the language should be clear, concise, precise and consistent without excessive adjectives or adverbs and long sentences. There should not be any redundancy in the presentation.

The development or preparation of the Thesis Protocol by the candidate will help her/him in understanding the ongoing activities in the proposed area of research.

Further it helps in creating practical exposure to research and hence it bridges the connectivity between clinical practice and biomedical research. Such research exposure will be helpful in improving problem solving capacity, getting updated with ongoing research and implementing these findings in clinical practice.

Research Ethics: Ethical conduct during the conduct and publication of research is an essential requirement for all candidates and guides, with the primary responsibility of ensuring such conduct being on the thesis guide. Issues like Plagiarism, not maintaining the confidentiality of data, or any other distortion of the research process will be viewed seriously. The readers may refer to standard documents for the purpose.

The NBE reserves the right to check the submitted protocol for plagiarism, and will reject those having substantial duplication with published literature.

PROTOCOL REQUIREMENTS

1. All of the following will have to be entered in the online template. The thesis protocol should be restricted to the following word limits.

- Title : 120 characters (with spacing) page
- Synopsis [structured] : 250-300
- Introduction : 300-500
- Review of literature : 800-1000
- Aim and Objectives : Up to 200
- Material and Methods : 1200-1600
- 10-25 References [ICMJE style]

2. It is mandatory to have ethics committee approval before initiation of the research work. The researcher should submit an appropriate application to the ethics committee in the prescribed format of the ethics committee concerned.

Guidelines for Thesis

1. The proposed study must be approved by the institutional ethics committee and the protocol of thesis should have been approved by NBE.
2. The thesis should be restricted to the size of 80 pages (maximum). This includes the text, figures, references, annexures, and certificates etc. It should be printed on both sides of the paper; and every page has to be numbered. Do not leave any page blank. To achieve this, following points may be kept in view:
 - a. The thesis should be typed in 1.5 space using Times New Roman/Arial/ Garamond size 12 font, 1" margins should be left on all four sides. Major sections viz., Introduction, Review of Literature, Aim & Objectives, Material and Methods, Results, Discussion, References, and Appendices should start from a new page. Study proforma (Case record form), informed consent form, and patient information sheet may be printed in single space.
 - b. Only contemporary and relevant literature may be reviewed. Restrict the introduction to 2 pages, Review of literature to 10-12 pages, and Discussion to 8-10 pages.
 - c. The techniques may not be described in detail unless any modification/innovations of the standard techniques are used and reference(s) may be given.

- d. Illustrative material may be restricted. It should be printed on paper only. There is no need to paste photographs separately.
- 3. Since most of the difficulties faced by the residents relate to the work in clinical subject or clinically-oriented laboratory subjects, the following steps are suggested:
 - a. The number of cases should be such that adequate material, judged from the hospital attendance/records, will be available and the candidate will be able to collect case material within the period of data collection, i.e., around 6-12 months so that he/she is in a position to complete the work within the stipulated time.
 - b. The aim and objectives of the study should be well defined.
 - c. As far as possible, only clinical/laboratory data of investigations of patients or such other material easily accessible in the existing facilities should be used for the study.
 - d. Technical assistance, wherever necessary, may be provided by the department concerned. The resident of one specialty taking up some problem related to some other specialty should have some basic knowledge about the subject and he/she should be able to perform the investigations independently, wherever some specialized laboratory investigations are required a co-guide may be co-opted from the concerned investigative department, the quantum of laboratory work to be carried out by the candidate should be decided by the guide & co-guide by mutual consultation.
- 4. The clinical residents are not ordinarily expected to undertake experimental work or clinical work involving new techniques, not hitherto perfected OR the use of chemicals or radioisotopes not readily available. They should; however, be free to enlarge the scope of their studies or

undertake experimental work on their own initiative but all such studies should be feasible within the existing facilities.

5. The DNB residents should be able to freely use the surgical pathology/autopsy data if it is restricted to diagnosis only, if however, detailed historic data are required the resident will have to study the cases himself with the help of the guide/co-guide. The same will apply in case of clinical data.
6. Statistical methods used for analysis should be described specifically for each objective, and name of the statistical program used mentioned.

General Layout of a DNB Thesis:

- **Title-** A good title should be brief, clear, and focus on the central theme of the topic; it should avoid abbreviations. The Title should effectively summarize the proposed research and should contain the PICO elements.
- **Introduction-** It should be focused on the research question and should be directly relevant to the objectives of your study.
- **Review of Literature** - The Review should include a description of the most relevant and recent studies published on the subject.
- **Aim and Objectives** - The 'Aim' refers to what would be broadly achieved by this study or how this study would address a bigger question / issue. The 'Objectives' of the research stem from the research question formulated and should at least include participants, intervention, evaluation, design.

- **Material and Methods-** This section should include the following 10 elements: Study setting (area), Study duration; Study design (descriptive, case-control, cohort, diagnostic accuracy, experimental (randomized/non-randomized)); Study sample (inclusion/exclusion criteria, method of selection), Intervention, if any, Data collection, Outcome measures (primary and secondary), Sample size, Data management and Statistical analysis, and Ethical issues (Ethical clearance, Informed consent, trial registration).
- **Results-** Results should be organized in readily identifiable sections having correct analysis of data and presented in appropriate charts, tables, graphs and diagram etc.
- **Discussion**—It should start by summarizing the results for primary and secondary objectives in text form (without giving data). This should be followed by a comparison of your results on the outcome variables (both primary and secondary) with those of earlier research studies.
- **Summary and Conclusion-** This should be a précis of the findings of the thesis, arranged in four paragraphs: (a) background and objectives; (b) methods; (c) results; and (d) conclusions. The conclusions should strictly pertain to the findings of the thesis and not outside its domain.
- **References-** Relevant References should be cited in the text of the protocol (in superscripts).
- **Appendices** -The tools used for data collection such as questionnaire, interview schedules, observation checklists, informed consent form (ICF), and participant information sheet (PIS) should be attached as appendices. Do not attach the master chart.

Thesis Protocol Submission to NBE

1. DNB candidates are required to submit their thesis protocol within 90 days of their joining DNB training.
2. Enclosures to be submitted along with protocol submission form:
 - a) Form for Thesis Protocol Submission properly filled.
 - b) Thesis Protocol duly signed.
 - c) Approval letter of institutional Ethical committee. (*Mandatory, non receivable of any one is liable for rejection*)

Thesis Submission to NBE

1. As per NBE norms, writing a thesis is essential for all DNB candidates towards partial fulfillment of eligibility for award of DNB degree.
2. DNB candidates are required to submit the thesis before the cut-off date which shall be 30th June of the same year for candidates appearing for their scheduled December final theory examination. Similarly, candidates who are appearing in their scheduled June DNB final examination shall be required to submit their thesis by 31st December of preceding year.
3. Candidates who fail to submit their thesis by the prescribed cutoff date shall NOT be allowed to appear in DNB final examination.
4. Fee to be submitted for assessment (In INR): 3500/-
5. Fee can be deposited ONLY through pay-in-slip/challan at any of the Indian bank branch across India. The challan can be downloaded from NBE website www.natboard.edu.in
6. Thesis should be bound and the front cover page should be printed in the standard format. A bound thesis should be accompanied with:
 - a. A Synopsis of thesis.
 - b. Form for submission of thesis, duly completed

- c. NBE copy of challan (in original) towards payment of fee as may be applicable.
 - d. Soft copy of thesis in a CD duly labeled.
 - e. Copy of letter of registration with NBE.
7. A declaration of thesis work being bonafide in nature and done by the candidate himself/herself at the institute of DNB training need to be submitted bound with thesis. It must be signed by the candidate himself/herself, the thesis guide and head of the institution, failing which thesis shall not be considered.

LOG BOOK

A candidate shall maintain a log book of operations (assisted / performed) during the training period, certified by the concerned post graduate teacher / Head of the department / senior consultant.

This log book shall be made available to the board of examiners for their perusal at the time of the final examination.

The log book should show evidence that the before mentioned subjects were covered (with dates and the name of teacher(s)) The candidate will maintain the record of all academic activities undertaken by him/her in log book .

1. Personal profile of the candidate
2. Educational qualification/Professional data
3. Record of case histories
4. Procedures learnt
5. Record of case Demonstration/Presentations
6. Every candidate, at the time of practical examination, will be required to produce performance record (log book) containing details of the work done by him/her during the entire period of training as per requirements of the log book. It should be duly certified by the supervisor as work done by the candidate and countersigned by the administrative Head of the Institution.
7. In the absence of production of log book, the result will not be declared.

The detailed guidelines and forms for submission of Thesis

Protocol & Thesis are available at

www.natboard.edu.in.thesis.php

Leave Rules

1. DNB Trainees are entitled to leave during the course of DNB training as per the Leave Rules prescribed by NBE.
2. A DNB candidate can avail a maximum of 20 days of leave in a year excluding regular duty off/ Gazetted holidays as per hospital/institute calendar/policy.
3. MATERNITYLEAVE:
 - a. A female candidate is permitted a maternity leave of 90 days once during the entire duration of DNB course.
 - b. The expected date of delivery (EDD) should fall within the duration of maternity leave.
 - c. Extension of maternity leave is permissible only for genuine medical reasons and after prior approval of NBE. The supporting medical documents have to be certified by the Head of the Institute/hospital where the candidate is undergoing DNB training. NBE reserves its rights to take a final decision in such matters.
 - d. The training of the candidate shall be extended accordingly in case of any extension of maternity leave being granted to the candidate.
 - e. Candidate shall be paid stipend during the period of maternity leave. No stipend shall be paid for the period of extension of leave.
4. Male DNB candidates are entitled for paternity leave of maximum of one week during the entire period of DNB training.
5. No kind of study leave is permissible to DNB candidates. However, candidates may be allowed an academic leave as under across the entire duration of training program to attend the conferences/CMEs/Academic programs/Examination purposes.

DNB COURSE	NO. OF ACADEMIC LEAVE
DNB 3 years Course (Broad & Super Specialty)	14 Days
DNB 2 years Course (Post Diploma)	10 Days
DNB Direct 6 years Course	28 days

6. Under normal circumstances leave of one year should not be carried forward to the next year. However, in exceptional cases such as prolonged illness the leave across the DNB training program may be clubbed together with prior approval of NBE.
7. Any other leave which is beyond the above stated leave is not permissible and shall lead to extension/cancellation of DNB course.
8. Any extension of DNB training for more than 2 months beyond the scheduled completion date of training is permissible only under extraordinary circumstances with prior approval of NBE. Such extension is neither automatic nor shall be granted as a matter of routine. NBE shall consider such requests on merit provided the seat is not carried over and compromise with training of existing trainees in the Department.
9. Unauthorized absence from DNB training for more than 7 days may lead to cancellation of registration and discontinuation of the DNB training and rejoining shall not be permitted.

10. Medical Leave

- a. Leave on medical grounds is permissible only for genuine medical reasons and NBE should be informed by the concerned institute/hospital about the same immediately after the candidate proceeds on leave on medical grounds.
- b. The supporting medical documents have to be certified by the Head of the Institute/hospital where the candidate is undergoing DNB training and have to be sent to NBE.
- c. The medical treatment should be taken from the institute/ hospital where the candidate is undergoing DNB training. Any deviation from this shall be supported with valid grounds and documentation.
- d. In case of medical treatment being sought from some other institute/hospital, the medical documents have to be certified by the Head of the institute/hospital where the candidate is undergoing DNB training.

- e. NBE reserves its rights to verify the authenticity of the documents furnished by the candidate and the institute/hospital regarding Medical illness of the candidate and to take a final decision in such matters.

11.

- a. Total leave period which can be availed by DNB candidates is $120+28 = 148$ days for 6 years course, $60+14=74$ days for 3 years course and $40+10 = 50$ days for 2 years course. This includes all kinds of eligible leave including academic leave. Maternity / Paternity leave can be availed separately by eligible candidates. Any kind of leave including medical leave exceeding the aforementioned limit shall lead to extension of DNB training. It is clarified that prior approval of NBE is necessary for availing any such leave.
- b. The eligibility for DNB Final Examination shall be determined strictly in accordance with the criteria prescribed in the respective information bulletin.

EXAMINATION

FORMATIVE ASSESSMENT

Formative assessment includes various formal and informal assessment procedures by which evaluation of student's learning, comprehension, and academic progress is done by the teachers/ faculty to improve student attainment. Formative assessment test (FAT) is called as "Formative" as it informs the in process teaching and learning modifications. FAT is an integral part of the effective teaching. The goal of the FAT is to collect information which can be used to improve the student learning process.

Formative assessment is essentially positive in intent, directed towards promoting learning; it is therefore part of teaching. Validity and usefulness are paramount in formative assessment and should take precedence over concerns for reliability. The assessment scheme consists of Three Parts which has to be essentially completed by the candidates.

The scheme includes:-

Part I:- Conduction of theory examination

Part-II :- Feedback session on the theory performance

Part-III :- Work place based clinical assessment

Scheme of Formative assessment

PART – I	CONDUCT OF THEORY EXAMINATION	Candidate has to appear for Theory Exam and it will be held for One day.
PART – II	FEEDBACK SESSION ON THE THEORY PERFORMANCE	Candidate has to appear for his/her Theory Exam Assessment Workshop.
PART – III	WORK PLACE BASED CLINICAL ASSESSMENT	After Theory Examination, Candidate has to appear for Clinical Assessment.

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

1. Personal attributes:

- **Behavior and Emotional Stability:** Dependable, disciplined, dedicated, stable in emergency situations, shows positive approach.
- **Motivation and Initiative:** Takes on responsibility, innovative, enterprising, does not shirk duties or leave any work pending.
- **Honesty and Integrity:** Truthful, admits mistakes, does not cook up information, has ethical conduct, exhibits good moral values, loyal to the institution.
- **Interpersonal Skills and Leadership Quality:** Has compassionate attitude towards patients and attendants, gets on well with colleagues and paramedical staff, is respectful to seniors, has good communication skills.

2. Clinical Work:

- **Availability:** Punctual, available continuously on duty, responds promptly on calls and takes proper permission for leave.

- **Diligence:** Dedicated, hardworking, does not shirk duties, leaves no work pending, does not sit idle, competent in clinical case work up and management.
- **Academic ability:** Intelligent, shows sound knowledge and skills, participates adequately in academic activities, and performs well in oral presentation and departmental tests.
- **Clinical Performance:** Proficient in clinical presentations and case discussion during rounds and OPD work up. Preparing Documents of the case history/examination and progress notes in the file (daily notes, round discussion, investigations and management) Skill of performing bed side procedures and handling emergencies.

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

FINAL EXAMINATION

The summative assessment of competence will be done in the form of DNB Final Examination leading to the award of the degree of Diplomate of National Board in Neurosurgery. The DNB final is a two-stage examination comprising the theory and practical part. An eligible candidate who has qualified the theory exam is permitted to appear in the practical examination.

Theory Examination

1. The theory examination comprises of **Three/ Four** papers, maximum marks 100 each.

2. There are 10 short notes of 10 marks each, in each of the papers. The number of short notes and their respective marks weightage may vary in some subjects/some papers.
3. Maximum time permitted is 3 hours.
4. Candidate must score at least 50% in the aggregate of **Three/ Four** papers to qualify the theory examination.
5. Candidates who have qualified the theory examination are permitted to take up the practical examination.
6. The paper wise distribution of the Theory Examination shall be as follows:

PAPER 1: Basic sciences applied to the specialty, General and critical care in neurosurgery, Tumors, Trauma & Research methodology

Paper 2: Vascular disorders, Spinal disorders, Congenital And developmental anomalies, Cranial peripheral and autonomic nervous system disorders

**Paper 3: Pain and infection, Stereotactic and functional neurosurgery
Recent advances and investigations**

a) Practical Examination:

1. Maximum Marks: 300.
2. Comprises of Clinical Examination and Viva.
3. Candidate must obtain a minimum of 50% marks in the Clinical Examination (including Viva) to qualify for the Practical Examination.
4. There are a maximum of three attempts that can be availed by a candidate for Practical Examination.
5. First attempt is the practical examination following immediately after the declaration of theory results.
6. Second and Third attempt in practical examination shall be permitted out of the next three sessions of practical examinations placed alongwith the

next three successive theory examination sessions; after payment of full examination fees as may be prescribed by NBE.

7. Absentation from Practical Examination is counted as an attempt.
8. Appearance in first practical examination is compulsory;
9. Requests for Change in center of examination are not entertained, as the same is not permissible.
10. Candidates are required not to canvass with NBE for above.

Declaration of DNB Final Results

1. DNB final is a qualifying examination.
2. Results of DNB final examinations (theory & practical) are declared as PASS/FAIL.
3. DNB degree is awarded to a DNB trainee in the convocation of NBE.

RECOMMENDED BOOKS & JOURNALS

SUGGESTED BOOKS

- Brain Surgery: Complication avoidance and management - Michael, L.J. Apuzzo. 2vol, Elsevier,
- Neurological Examination Part A - De Jong's, Lippincott,
- Principals of Neurology – Adams, MGH,
- Localization in Clinical Neurology – Brazis., Lippincott,
- Neurological Surgery – Youmans., Elsevier,
- Operative Neurosurgery techniques - Schmidek/Sweet. Elsevier,
- Microneurosurgery - Yasargil. 4 Volume, Thieme, New youk,
- Principal Of Neurosurgery Rengachary, , Elsevier,
- Neuropathology - Greenfield, Holdder, . Apuzzo
- Brain Surgery: Complication avoidance and management
- De Jong's Neurological Examination Part A
- Brazis Localization in Clinical Neurology
- Youmans Neurological Surgery
- Schmidek/Sweet Operative Neurosurgery techniques
- Wilkins/Rengachary Neurosurgery
- Ramamurthi Text Book Of Neurology & Neurosurgery Greenfield Neuropathology

SUGGESTED JOURNALS

- J Neurotrauma

- Neurosurgery Spine
- J Neurosurgery
- J Neurosurgery Spine
- Acta Neurochirurgica
- Surgical Neurology
- Paediatric Neurosurgery
- Neurosurgical Clinics of North America
- Neurosurgical Focus
- Journal of Neurosurgery: Paediatrics
- J Neurotrauma Neurosurgery
- Spine
- J Neurosurgery
- J Neurosurgery Spine Acta Neurochirurgica
- Surgical Neurology
- Pediatric neurosurgery
