

DM Neurology course curriculum

Department of Neurology

Sree Chitra Tirunal Institute for Medical
Sciences and Technology, Trivandrum, India.

TABLE OF CONTENTS

SL. No	Content	Page number
A	Aims and Objectives of the course	
B	Theoretical/Practical / Clinical/ Laboratory experience to achieve during the programme	
C	Structured programme <ol style="list-style-type: none">1. Syllabus2. Academic schedule3. Minimum required skills4. Clinical postings5. Research and other academic activities6. Important text and journals	
D	Resident evaluation <ol style="list-style-type: none">1. Documentation of academic activities of residents2. Credit-based evaluation of residents3. Periodic review and appraisal	
E	Resident feedback	
F	Departmental DM Neurology Program Committee	

G	Expectations at the end of the program	
H	Assessment forms	

A. AIMS AND OBJECTIVES OF THE TRAINING PROGRAM

Program goals

The mission of the neurology residency-training program is to promote the graduation and success of professional, experienced, and knowledgeable neurologists who will excel in the practice of Neurology. Residents will acquire a thorough understanding of neurological conditions and will learn to provide excellent care, including the appropriate work up and treatment of patients with neurological conditions.

These goals are achieved through a mixture of high quality clinical exposure to the full spectrum of neurological conditions in a wide variety of patient populations balanced with a broad range of sessions provided by the faculty both from the Department of Neurology and also from related disciplines. In addition, the residents learn from interactions with other residents and medical students and are expected to take an active role in teaching. Evaluations of the residents will be based on the following six aspects: -

- Patient care
- Medical knowledge
- Practice-based learning and improvement

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- Interpersonal and communication skills
 - Professionalism
 - System based practice

B. THEORETICAL/PRACTICAL/LABORATORY EXPERIENCE TO ACHIEVE DURING THE PROGRAMME

The resident training programme should be aimed to achieve the following skills in different aspects of patient care: -

Theoretical skills: knowledge based on texts/journals/ departmental academic activities.

Clinical skills: Include the ability to take discerning history, perform relevant clinical examination, decide on the appropriate investigations and derive the management plan.

Technical skills: The candidate should be able to perform and interpret relevant neurological investigations independently and should have a firm grasp on many others.

C. STRUCTURED PROGRAMME

The aim of the programme curriculum is to provide a basic framework for the course of DM Neurology. The candidate is expected to learn to deliver “state of the art” clinical care in a scientific, cost effective, ethical and compassionate manner to an individual and patient, and also develop an attitude of committed learning, teaching, and research for the welfare of the society.

To achieve these objectives, 3-years’ residency programme in accredited centres is currently employed. The training must include both theoretical and practical aspects of core knowledge and skills and must be imparted in a manner that is conducive to learning. It should be supervised and objectively evaluated. The curriculum is to be periodically revised and updated at least once in 5 years.

To achieve and maintain high levels of standards in the training of these prospective Neurologists, the following factors have been identified as the key components of the programme: -

1. Syllabus
2. Academic schedule

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3. Minimum required skills
 4. Clinical postings
 5. Research and other academic activities
 6. Important texts and journals

1. Syllabus DM Neurology

A vast accumulation of medical knowledge is required in order to provide optimal patient care, and acquisition and maintenance of that knowledge requires a vigorous and ongoing review of the medical literature.

The objectives of the knowledge acquisition are as follows: -

- i. Explain the pathophysiology of major neurologic disorders and demonstrate familiarity with the scientific basis (including anatomy, neurophysiology, neurochemistry, pharmacology, neuroimmunology, and genetics) of neurologic diseases.
- ii. For evaluation of patients and formulating treatment. Knowledge is required to elicit appropriate medical history, physical findings and for anatomical localization of neurological dysfunction, arriving at a likely diagnosis and differential diagnosis based on localization.
- iii. Planning for investigations and management of patients.
- iv. Knowing the potential risks and benefits of available therapies, including both medical and surgical procedures.
- v. Residents should demonstrate knowledge of the major neurological disorders, including considerations relating to age, gender, race, and ethnicity, based on the literature and standards of practice, including:

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- The epidemiology of the disorder.
 - The etiology of the disorder, including medical, genetic, and sociocultural factors.
 - The phenomenology of the disorder.
 - The experience, meaning, and explanation of the illness for the patient and family members, including the influence of cultural factors and culture-bound syndromes.
 - Effective treatment strategies, course, and prognosis.

The DM Neurology course is completed in two parts. Part I to be completed in 18 months and part II to be completed in 36 months

Part I includes the following topics: -

Basic Sciences

i. Neuroanatomy

- Embryonic development and structure of central and peripheral nervous system, coverings of the nervous system and blood brain barrier.
- Functions, Connections, applied anatomy including CT and MRI, blood supply and their perturbations in health and disease.

ii. Neurophysiology and Neurochemistry

- Structure and Function of Neural Membranes, including cell membrane structure and function, membrane transport, various types of ion channels, electrical excitability of cell membrane, lipid biochemistry, structure and function of myelin, biochemistry of myelin. Applied aspects like pathogenesis of various diseases involving myelin, various channelopathies etc.

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- Synaptic Transmission, including structure and function of synapse, various types of receptors and signal transduction, G-Proteins and cyclic nucleotides, classes of neurotransmitters, individual neurotransmitters like acetyl choline, catecholamines, serotonin, histamine, opioids, neuropeptides, excitatory amino acids, GABA and glycine, purines, phosphoinositides and eicosanoids, protein phosphorylation and regulation of neuronal function. Applied aspects like neurochemistry of drug abuse, neurotransmitter disorders of basal ganglia, neurochemistry of degenerative diseases like Alzheimer's disease and Parkinson's disease, neurochemistry of epilepsy and anti-epileptic drugs. Biochemistry of vision, olfaction and taste sensations.
 - Muscle Fibre structure, various structural and functional proteins in the muscle fibres. Applied aspects like the genetics and pathogenesis of muscular dystrophies.
 - Axonal transport, neuronal cytoskeleton, development of nervous system, neural plasticity, biochemistry of aging, circulation and energy metabolism in the brain, neuronal hypoxia and ischemia, blood-brain barrier.
 - Disorders of carbohydrate, fatty acid and amino acid metabolism, mitochondrial disorders, urea cycle and its disorders, organic acid disorders, vitamin and other nutritional deficiencies, disorders of lipid, glycoprotein and mucopolysaccharide metabolism, metabolic encephalopathies, biochemistry of psychiatric disorders, biochemistry of learning and memory, relation between endocrine system and nervous system.
 - Neurogenetics: Molecular basis of heredity, structure and function of DNA RNA, polypeptides and proteins, gene structure and organization, processing of RNA, imprinting and X-inactivation, cell cycle, chromosomal basis of heredity, organization of human genome, mitochondrial genome, genetic polymorphism, the human genome project, technology of cytogenetics and molecular genetics, methods of mutation detection / detecting specific sequence changes, DNA methylation analysis, abnormalities of chromosome number and structure, specific types of chromosome rearrangements, cytogenetic nomenclature, mutation and genetic

disorders, types of mutations, effects of mutation on gene function, patterns of inheritance, genetic counselling, genetics of common neurological disorders.

iii. Microbiology and Pathology

- Infectious agents responsible for nervous system diseases, pathogenesis, consequences and applied aspects including diagnostic tools, their applications and limitations.
- Pathology of various central and peripheral nervous system disorders like demyelination, vasculitis, infections, their recognition on gross specimens, basis of tissue preparation, stains, Interpretation of brain, nerve and muscle biopsy specimens, including special studies like immunohistochemistry and electron microscopy.

iv. Neuropharmacology

- Basic pharmacology of drugs used in various neurological disorders like epilepsy, parkinsonism, vascular diseases, myasthenia, migraine, dementia, drugs used in critical care with special emphasis on pathophysiology of disease, mechanism of action, interactions, adverse effects, features of poisoning/overdose.
- Newer drug delivery systems and recent advances.

v. Others

- Fundamentals of Neuropsychology
- Neuro-Ophthalmology: Ocular Motor System and Afferent Visual System
- Neuro-Otology
- Neuro-urology
- Neuroepidemiology
- Neuroimmunology
- Neuroendocrinology

Part II includes the following topics: -

i. Approach to Common Neurological Problems

Model history taking and comprehensive neurological examination- Focus on clinical demonstrations with ideal techniques and bed-side manners. General physical and systemic examination with focussed methodology to evaluate each part of the neuroaxis so as to present the evaluation as Anatomical, Patho-physiological and Clinical diagnosis. Syndromic approach for diagnosis of neurological diseases.

- Familiar with Approach to common and uncommon clinical problems like Episodic Impairment of Consciousness ,Falls and Drop Attacks ,Delirium, Stupor and Coma , Intellectual and Memory Impairments ,Global Developmental Delay and Developmental Regression ,Behavior and Personality Disturbances, Depression and Psychosis in Neurological Practice , Intentional Motor Disorders and the Apraxias, The Agnosias ,Language and Speech Disorder-Aphasia,Dysarthria and Apraxia of Speech ,Neurogenic Dysphagia ,Vision Loss, Abnormalities of the Optic Nerve and Retina ,Eye Movement Disorders: Diplopia, Nystagmus, and Other Ocular Oscillations ,Pupillary and Eyelid Abnormalities ,Dizziness and Vertigo ,Hearing Loss and Tinnitus ,Disturbances of Taste and Smell ,Cranial and Facial Pain ,Brainstem Syndromes,Ataxic Disorders,Movement Disorders: Diagnosis and Assessment ,Gait Disorders Hemiplegia and Monoplegia ,Paraplegia and Spinal Cord Syndromes,Proximal, Distal, and Generalized Weakness,Muscle Pain and Cramps,The Floppy Infant, Sensory Abnormalities of the Limbs, Trunk, and Face,Neurological Causes of Bladder, Bowel, and Sexual Dysfunction ,Arm and Neck Pain,Lower Back and Lower Limb Pain

ii. Neurological Investigations and Related Clinical Neurosciences

- Laboratory Investigations in Diagnosis and Management of Neurological Disease
- Clinical Neurophysiology-their performance and interpretation
- Electroencephalography and Evoked Potentials, Clinical Electroneuromyography

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- Neuroimaging-Structural Neuroimaging-Computed Tomographic and Magnetic Resonance, Vascular Imaging, Neuroangiographic Anatomy and Common Cerebrovascular Diseases
 - Ultrasound Imaging of the Cerebral Vasculature, Functional Neuroimaging

iii. Management of Neurological Disease and recent advances

- Principles of Neuropharmacology and Therapeutics, Principles of Pain Management, Principles of Neuro intensive Care , Principles of Neurosurgery, Principles of Endovascular Surgery, Principles and Practices of Neurological Rehabilitation

iv. Neurological Diseases, clinical features , evaluation and management

- Neurological Complications of Systemic Disease in adults and children
- Trauma of the Nervous System
- Vascular Diseases of the Nervous System-ischemic cerebrovascular disease, Intracerebral Hemorrhage, Intracranial Aneurysms and Subarachnoid Hemorrhage, Arteriovenous Malformations, Stroke in Children, . Spinal Cord Vascular Disease and Central Nervous System Vasculitis and other rare disorders-pathophysiology, features and management.
- Cancer and the Nervous System
- Epidemiology of Primary Brain Tumors
- Clinical Features and Complications , Neuroimaging , Management of Primary Nervous System Tumors in Adults and Infants and Children
- Bacterial Infections , Viral Infections , Fungal Infections, Parasitic Infections, Neurological Manifestations of Human Immunodeficiency Virus Infection in Adults and children, Prion Diseases
- Multiple Sclerosis and Other Inflammatory Demyelinating Diseases of the Central Nervous System
- Hypoxic/Anoxic and Ischemic Encephalopathies

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- Toxic and Metabolic Encephalopathies
 - Deficiency Diseases of the Nervous System
 - Effects of Toxins and Physical Agents on the Nervous System
 - Brain Edema and Disorders of Cerebrospinal Fluid Circulation
 - Developmental Disorders of the Nervous System
 - Developmental Disabilities
 - Inborn Errors of Metabolism of the Nervous System , Mitochondrial Disorders and Channelopathics: Episodic and Electrical Disorders of the Nervous System
 - Neurocutaneous Syndromes
 - The Dementias
 - The Epilepsies
 - Sleep and Its Disorders
 - Headache and Other Craniofacial Pain
 - Cranial Neuropathies
 - Movement Disorders
 - Disorders of the Cerebellum, Including the Degenerative Ataxias
 - Disorders of Bones, Joints, Ligaments, and Meninges
 - Disorders of Upper and Lower Motor Neurons
 - Disorders of Nerve Roots and Plexuses
 - Disorders of Peripheral Nerves
 - Disorders of the Autonomic Nervous System
 - Disorders of Neuromuscular Transmission
 - Disorders of muscle
 - Neurological Problems of the Newborn

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- Neurological Problems of Pregnancy

2. Academic schedule

There would be one seminar (Monday), Journal clubs on alternate Tuesdays, EEG / EMG discussions (Alternate Tuesday), Bedside case discussions (Wednesdays and Fridays), Practice parameter discussion view and reviews and audit / mortality discussions (Thursdays). On Saturdays, there will be a neuroradiology conference and a neuropathology conference.

3. Minimum skills required

i. Patient Care

Objectives

Providing high quality patient care remains the ultimate goal of the practice of neurology. The inpatient and outpatient service responsibilities involve patient care under the supervision of the neurology faculty. In order to assess patient care skills from different points of view, after each clinical rotation, all residents receive evaluations from faculty and others.

Resident should learn the ability to reference and utilize electronic systems to access medical, scientific, and patient information. Recognize limitations in one's own knowledge base and clinical skills and understand and address the need for lifelong learning. Demonstrate appropriate skills for obtaining and evaluating up to date information from scientific and practice literature and other sources to assist in the quality care of patients.

Practice-based learning and improvement

The competent practice of neurology requires a continuous effort to improve patient care skills and knowledge of the medical literature. Residents in our program are expected to learn from each patient they see, to review the medical literature, both printed and from

internet resources, when seeing new or unidentified conditions. We expect improvement in quality of patient care and communication and in fund of knowledge throughout the training program.

ii. Interpersonal and Communication Skills

Interpersonal skills with patients as well as with colleagues are critical to the practice of clinical neurology. History taking skills initially learned in medical school are honed during residency under the supervision of the faculty. The faculty observes interaction with patients during inpatient and outpatient assignments, and residents receive informal feedback on these skills from day to day. Interaction with patients as well as colleagues and coworkers are assessed formally via the monthly evaluation process. The oral evaluations also provide an opportunity for observation and evaluation of communication skills.

The residents are required to make presentations during teaching rounds, while teaching medical students, in daily conferences, and during grand rounds. They receive feedback from faculty as well as formal evaluations at the end of rotations. These assignments are intended to improve communication skills.

Objectives

Resident should be able to present the history and physical examination findings of a case in an orderly and logical fashion. He/she should demonstrate the ability to obtain, interpret, and evaluate consultations from other medical specialties and provide consultants with a diagnostic and management plan. Residents should effectively communicate with patients and their family members with explanations of neurologic disorders and treatment geared to their educational level, while respecting the patient's cultural, ethnic, religious, and economic backgrounds. They should convey information to patients in a clear and meaningful fashion and partner with patients to develop an agreed upon healthcare management plan. Residents should frequently communicate with the relatives of the patient and explain in detail the disease process, prognosis of the disease,

discharge plan, monitoring, adverse effects of the drugs, rehabilitation goals and strategies. Residents should work collaboratively with the multidisciplinary team involved in the inpatient and outpatient care of neurology patients. Develop and maintain a therapeutic alliance with patients by instilling feelings of trust, honesty, openness, rapport, and comfort in the relationship with the physician. Effectively assist neurology faculty and senior residents in education of medical students assigned to neurology services.

Residents should efficiently supervise medical house staff, medical students, and junior neurology residents rotating on the neurology services. Provide leadership, direction, and instruction to junior members of the team in a way that fosters their skills as physicians. Demonstrate effective communication within the team with regard to patients' current or change in neurologic status, anticipated problems, therapeutic regimen, and diagnostic tests to be reviewed. Listen to and understand patients and attend to nonverbal communication. Educate patients and professionals about medical, psychosocial, and behavioral issues. Recognize one's own feelings and behaviors in dealing with difficult situations so that they do not interfere with appropriate treatment.

Practice Based Learning and Improvement

Evaluate the clinical literature applying knowledge of epidemiology, biostatistics, and research study design. Facilitate the learning of medical students. Demonstrate the ability to: review and critically assess scientific literature to determine how quality of care can be improved in relation to one's own practice (e.g., reliable and valid assessment techniques, treatment).

iii. Professionalism

We expect residents in our program to behave in a professional manner. They are given the primary responsibility of caring for their patients and are expected to respond to their patients' needs in a timely manner. Professionalism is evaluated based on attention to patients' needs and day-to-day interactions with patients and their family members, with

colleagues, and with other hospital personnel through the monthly and semi-annual evaluation processes.

Objectives

Interact responsibly with patients, family members, and coworkers, taking into consideration age, disability, culture, and gender issues. Demonstrate appropriate use of the electronic medical record with regard to patient respect and confidentiality. Review one's own professional conduct and remediate when appropriate. Demonstrate ethical behavior, integrity, honesty, compassion, and confidentiality in the delivery of care, including matters of informed consent/assent, professional conduct, and conflict of interest. Demonstrate understanding of and sensitivity to end of life care and issues regarding provision of care. Participate in the review of the professional conduct of one's colleagues. Acknowledge and remediate medical errors, should they occur.

Demonstrate responsibility for one's patients' care, including:

- Responding to communication from patients and health professionals in a timely manner.
- Establishing and communicating backup arrangements, including how to seek emergent and urgent care when necessary.
- Using medical records for appropriate documentation of the course of illness and its treatment. Documentation include a proper written case record, daily progress, plan, investigation, differential diagnosis and main findings. A proper discharge summary with all the patient details, investigations, course in the hospital, treatment and management plan should be adequately prepared.
- Providing coverage if unavailable, e.g., out of town, on vacation.
- Providing for continuity of care, including appropriate consultation, transfer, or referral if necessary.
- Describe the differences among withdrawal of treatment, termination of treatment, and non-initiation of treatment; assist patients and their family members in choosing these options in the appropriate clinical setting.

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- Participate in the review of the professional conduct of one's colleagues. Acknowledge and remediate medical errors, should they occur.

iv. Systems-based practice

Quality, cost-effective care for patients is discussed during daily teaching rounds. Residents are expected to provide high quality care within the limitations of the health care system.

Objectives

Have a working knowledge of the diverse systems involved in treating patients of all ages and understand how to use the systems as part of a comprehensive system of care in general and as part of an individualized treatment plan based on practice guidelines. Access community, national, and allied health professional resources, which may enhance the quality of life of patients with chronic neurologic and psychiatric illnesses. Demonstrate the ability to lead and delegate authority to healthcare teams needed to provide comprehensive care for patients with neurologic and psychiatric diseases. Demonstrate skills for the practice of ambulatory medicine, including time management, clinic scheduling, and efficient communication with referring physicians. Utilize appropriate consultation and referral mechanisms for the optimal clinical management of patients with complicated medical illnesses.

Demonstrate awareness of the importance of adequate cross coverage; use accurate medical data in the communication with and management of patients. Demonstrate knowledge of and interact with managed health systems.

4. Clinical postings

During first and third year of Neurology training, the residents has to spent in the neurology department attending inpatients in wards and ICU and outpatients in general and specialty OPDs. In the second year, the residents are posted in the labs and other inter-related departments.

Frame work of postings in the first and third year

Postings	First	Third year
Inpatient male wards	2 months	2 months
Inpatient female wards	2 months	2 months
Stroke	2 months	1 month
Pediatric neurology	Combined with female ward	2 months
NMICU	2 months	2 months
General neurology OPD	4 months	2 months
Speciality OPDs		
Movement disorder (Monday)	2 months	2 months
Neuromuscular (Tuesday)	2 months	2 months
Epilepsy clinic (Wednesday and Friday)	2 months	2 months
Cognitive neurology (Thursday)	2 months	2 months
Stroke (Friday)	2 months	2 months

Frame work of postings in the second year

Speciality	Duration
EEG/Epilepsy section/Movement disorder	3 months
ENMG/EP lab/TMS	3 months
Neuroradiology	2 weeks in neuroimaging and 2 weeks in interventional radiology
Neurosurgery	11/2 months
Neuropathology	3 weeks
Psychiatry	2 weeks
Neurogenetics	3 weeks
Sleep clinic (Thursday)	2 months
Autism and NDD clinic (Saturday)	2 months

Subspecialty postings in Neurology

EPILEPSY AND EEG

Residents are posted for 3 months in the epilepsy ward during their EEG postings in the second year and also required to attend the epilepsy clinic for 2 months each during their first and third year of residency training. The training emphasizes on recognizing and

diagnosis of various seizure types, epilepsy syndromes and etiological work up. They are expected to gain sufficient clinical expertise in the diagnostic evaluation and treatment of patients with common epilepsy syndrome and status epilepticus. This includes the clinical management of both inpatients and outpatients attending the general OPD, epilepsy clinic and in the Epilepsy monitoring unit (EMU). A proper interpretation of EEGs and video EEG with help of the consultant is expected. Residents on the EEG/Epilepsy rotation will learn to interpret EEGs from patients with a wide variety of neurological conditions and write a detailed EEG report. Training and expectations from residents during Epilepsy postings: -

- Clinical history taking with special focus on the description of seizure semiology
- Description of common seizures types and epilepsy syndromes
- Etiological work up and management of common epilepsy disorders
- Interpretation of EEG- normal, artifacts, Benign epileptiform variants, epileptic encephalopathy, metabolic encephalopathy etc.
- Residents on the EEG/Epilepsy rotation are also expected to join the Epilepsy Monitoring Unit and also weekly patient management meetings
- Knowledge of presurgical evaluation of medically refractory epilepsy patients

MOVEMENT DISORDER

Senior Residents should have posting in the weekly Movement Disorders Review Clinic for 2 months in their first year and two months in the final year of the three-year DM course. They should also be participating in the care of in-patients admitted for Movement Disorder Surgeries and similar procedures, for three months during their second year of posting.

Expertise in the following areas are expected of the senior residents after they complete the training:

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- A good understanding of the anatomy, physiology and the pathophysiology of basal ganglia circuits and the pathogenesis of various movement disorders
 - History taking and proper physical examination of movement disorders
 - Phenomenology and classification of various movement disorders, their proper identification and arriving at a syndromic diagnosis
 - Etiological and diagnostic work-up of movement disorder syndromes
 - Genetics of common movement disorders
 - Pharmacological management of movement disorders
 - Indications, patient selection and pre-surgical evaluation for Deep Brain stimulation surgery and other functional neurosurgical procedures
 - Pharmacology of Botulinum Toxin and its indications for movement disorders

The senior residents should actively participate in the pre-operative and peri-operative management of in-patients undergoing movement disorder surgeries and out-patients with all sorts of movement disorders (including Parkinson's disease in its various stages, atypical and secondary Parkinsonian syndromes, patients with various types of dystonia and other movement disorders like choreatic disorders, myoclonus, tics etc.), during their posting

NEUROMUSCULAR DISORDERS

Neurology residents are exposed to diseases of the peripheral nervous system, anterior horn cells, neuromuscular junction and muscles regularly during their rotations in the wards, intensive care units and general outpatient and neuromuscular clinics. The residents will also frequently encounter multiple sclerosis, neuromyelitis optica and other related demyelinating diseases of the central nervous system. During the second year of their training, residents are posted exclusively in the electromyography lab for three months when they are expected to learn nerve conduction techniques and electromyography procedures as well as to derive a strategy for electrophysiological evaluation in each patient.

Expertise in the following areas are expected of the senior residents after they complete the training:

- The focus of clinical examination is to localize the disease process to the appropriate structure in the neuraxis and to arrive at a diagnosis or list of differential diagnosis.
- Ability to do a proper motor examination with correct techniques of examination of individual muscles and muscle groups, to identify patterns of muscle atrophy and hypertrophy, to identify abnormal muscle phenomena like fasciculations and myotonia are crucial in arriving at a proper diagnosis. They should be able to formulate investigations and management strategies based on their clinical examination.
- Management of patients in the intensive care unit myasthenic crisis and Guillain Barre syndrome.
- Techniques of Nerve conduction study and electromyography and the interpretation of results of NCS, EMG, VEP and SSEP.
- The ability to chronologically elucidate the events in demyelinating disorders of CNS and to arrive at precise diagnosis from a wide array of differential diagnoses is crucial. The training will also include the interpretation of the brain images to differentiate between the disorders especially between multiple sclerosis and Neuromyelitis optica spectrum disorders.
- During the three years of training, the residents should familiarize themselves with the management protocols and rehabilitation of these patients.
- The neuropharmacology of medicine used in the management of patients with immune mediated disorders including the side effects profiles, contraindications, and monitoring.

Neuromuscular journal discussion and neurorehabilitation meetings are held regularly in the division which further increase their exposure to these diseases. Their postings in neuropathology and neuroradiology should also help in deeper understanding of these diseases.

PEDIATRIC NEUROLOGY

Residents are posted in the pediatric neurology for 2 months each in the first and third year of DM training program. In the second year, residents are required to attend the autism and neurodevelopmental clinic. During their postings, they are exposed to different childhood neurological disorders like global developmental delay, inherited metabolic disorders, neurodevelopmental disorders including autism and cerebral palsy, progressive encephalopathy, childhood headache syndromes, movement disorders, ataxia, stroke, epilepsy etc.

Training and expectations from residents during pediatric neurology postings: -

- Residents are expected to do a proper clinical evaluation of children with various neurological disorders.
- A proper history taking focusing on developmental milestones, antenatal, post-natal complications, dietary habits and family history is required.
- The residents should be well versed with drawing a good pedigree chart.
- A detailed clinical examination including the presence of dysmorphism, neurocutaneous markers and an appropriate neurological examination should be conducted.
- The residents should learn the investigative and management approaches in common childhood neurological disorders
- Basic interpretation of various investigations such as MRI brain, amino-acid analysis reports, metabolic parameters and genetic analysis should be developed.

The residents during the three-year postings are expected to acquire clinical skills in diagnosis of childhood neurological disorders as well as management of these cases. In addition, at Comprehensive care Centre for Neurodevelopmental disorders (CCCND) they learn about the comprehensive rehabilitation of these children.

STROKE

Residents are posted in their first and third year in the Comprehensive Care Centre for Stroke for a total period of 3 months. Stroke unit has a separate intensive care unit, step down ICU, and stroke wards. A dedicated stroke clinic for seeing patients with cerebrovascular diseases is conducted every Friday. The residents get an opportunity to get clinical training and management of patients with stroke during their postings in above areas.

Expertise in the following areas are expected of the senior residents after they complete the training: -

- A proper clinical history taking and examination of stroke patients emphasizing on the onset of the stroke and vascular risk factors.
- Scoring the stroke severity using National Institute of Health Stroke Scale (NIHSS) and Modified Rankin Scale (mRS)
- Interpretation of CT-ASPECTS scoring, MRI brain and vascular imaging like CT angiogram and DSA
- Acute stroke management- The residents should be competent to manage acute stroke cases, indications and contraindications of Intravenous thrombolysis and selection of candidates for mechanical thrombectomy.
- Aetiological evaluation ischemic stroke, TIA and intracranial hemorrhage and critically ill patients in stroke ICU
- Indication for selecting patients for various surgeries related to stroke such as hemicraniectomy, STA-MCA bypass, carotid stenting and carotid endarterectomy.

Residents are also encouraged to work with the multidisciplinary team of interventional neurologist and neurosurgeons for the optimal management of the patients. Patient management conferences are conducted regularly, in which residents have to present cases pertaining to management issues. Residents should also involve in with

rehabilitation team of speech therapist, physiotherapist and occupational therapist for the providing an optimal rehabilitation plan to the patient. Residents should frequently counsel the patients regarding the prognosis and further plan of management.

SLEEP MEDICINE

A separate sleep clinic is conducted every Thursday and SR2 are posted in the sleep clinic. We have a dedicated sleep lab with facilities for Polysomnography, CPAP titrations and Multiple sleep latency tests.

During the postings in sleep medicine the residents are expected to gain expertise in the following aspects: -

- An adequate history taking, arriving at a specific diagnosis for sleep disorder and ordering for appropriate investigations.
- Basics of interpretation of PSG and CPAP titration
- Evaluation and treatment of common sleep disorders like sleep apnea, insomnia, hypersomnia, narcolepsy, restless leg syndrome and parasomnias.

Interdisciplinary Approach- Postings in allied specialities of Neurology

Cohesive interdepartmental interaction has been identified as a key component for optimal clinical, academic and research excellence of the students. To facilitate this at personal and departmental levels, the residents should have

- Regular postings in department of Neuroradiology, Neurosurgery, neuro pathology, and Neuropsychiatry
- Participation in Interdepartmental academic meetings involving departments of Neuro surgery and Neuroradiology meetings on Saturdays,

IMAGING SCIENCES AND INTERVENTIONAL RADIOLOGY

Residents will learn to evaluate MRI's, CT scans, Angiograms and other radiographs used to examine outpatients and inpatients with a wide variety of common and uncommon neurological conditions. Residents will also learn the appropriate uses and limitations of such testing and will interact in a professional manner with the radiologists as well as with the technologists assisting with the studies. In the one month posting in the department of imaging sciences and interventional radiology, two weeks will be devoted to training in the radiology cath lab where they will get exposure to various neurovascular procedures such as 4- vessel cerebral angiogram, stroke interventions, vascular imaging etc.

NEUROPATHOLOGY

The candidate is expected to familiarize with the neuropathology techniques, staining procedures and its application in clinical diagnostics. The neuropathology postings include adequate exposure in our Institute and also at National Institute of Mental Health and Neurosciences, Bengaluru. The resident should acquire basic skills in deciding the site of biopsy, various transport medium for specimens, stains to be ordered, immunohistochemistry, interpretation of histopathology of muscle, brain and nerve.

NEUROSURGERY

Resident is expected to familiarize with the common neurosurgical syndromes and disorders, surgical management of tumours, stroke, epilepsy and movement disorders.

NEUROPSYCHIATRY

Resident is expected to familiarize with the borderland between neurology and psychiatry, classical psychiatric disorders, approach to mental state examination, and neuropsychopharmacology.

Neurogenetics

Resident is expected to familiarize with the recent advances in neurogenetic evaluations such as karyotyping, FISH, SNP studies, Microarray, Exome sequencing and genome sequencing and interpretation of the results from genetic labs.

To assure that the resident achieves the theoretical, clinical and technical skills mentioned above, a minimum number of procedures are made mandatory as given below in the table

EEG independent reading and interpretation	200
EMG independent performance and interpretation	100
Evoked potential	25
Nerve biopsy	10
Muscle biopsy	10
Neuroradiology presentation	25

5. Research and other academic activities

Research is required for all residents in neurology. This requirement has been implemented with the vision of training neurologists who understand the processes and pitfalls of medical research and are therefore better able to evaluate critically the published research that guides clinical decision-making.

The research curriculum is designed to advance residents' knowledge of the basic principles of research, including how research is conducted, evaluated, explained to patients, and applied to patient care. The research curriculum includes introductory lectures in the summertime, monthly journal club conferences, a web-based human

subjects training course, and at least one research project to be completed by each resident.

All residents are expected to attend the biostatistics course during their first year of training and also attend to the special program on biomedical engineering held at the BMT wing

All residents would have to carry out a thesis work during their training program.

Thesis work

Dissertation is mandatory for the completion of DM course. The topics and the guides will be allowed to the SR1 in the month of February. SR1 and the guides should discuss the research topic and present in the department meeting. All SR1 should, in consultation with their thesis guides, discuss the statistical aspects of their study with Dr. P SankaraSarma, at AMC, before finalizing their study. All SR1 need to present the preliminary outline of their work in the department by April 30th of each year. All research topics should be submitted for Technical advisory committee and Institute ethical committee clearance in the month of June. The study can be initiated only after the TAC and IEC clearance. All SR3 need to submit the final version of their dissertation (thesis) to the Academic office, through the HOD Neurology by 31st July each year.

All SR3 are mandatorily required to present their thesis work (either in part or full) at the Indian Academy of Neurology or the Neurological Society of India or other national subsection meetings. One scientific paper to be submitted to any reputed journal before December when they complete the course. SR2 are encouraged to participate in the IAN, NSI or other important meetings. They should inform about this in April (for IAN) and in August (for NSI). All SRs are encouraged to submit papers to international conferences. They need to discuss their papers with the respective consultants and seek the approval from the Director through HOD before submitting any papers.

Papers and Publications

All SRs are required to participate in publications (original articles, case reports or review articles). It is recommended that they have 2 publications by the time they complete the course. Residents should consider writing their seminar presentations as review papers and part of their thesis work as original papers.

6. Texts and journals considered important in curriculum

Residents are expected to read standard text books of Neurology (Bradley, Adams and Victor) and related subspecialties. In addition, they are to remain familiar with the latest advances in Medicine via national and international journals like Brain, Annals of Neurology, Archives of Neurology, Neurology, JNNP etc. List of text books to be referred as a part of syllabus is given at the end of title-Curriculum.

D. ASSESSMENT AND EVALUATION OF RESIDENTS

From 2012, this Institute is introducing a continuous and comprehensive evaluation of the residents in terms of their performance. The residents will be assessed on

- Their clinical skills of history taking, physical examination, ability to synthesize the clinical findings in to a tangible hypothesis, ability to plan out the investigations and carry them out effectively and in an economic manner.
- The candidates' capability to communicate the problems with the patients and their family, taking them in to confidence, providing all the requisite information, and being kind and empathetic to patients will be given due importance.
- The candidates also should demonstrate their ability to work as a team interacting with faculty, colleagues, researchers, other staff and personnel in the department, wards and outpatient services will be given specific importance, as these are very important skills in practice.

1. Documentation of the academic activities of the residents

The residents will have to get the evaluation forms completed by the supervising faculty in the wards, OPD, specialty clinics, EEG/EMG labs, external departments and other stations where they are posted on a monthly basis. These evaluation forms will have to be deposited with the Department Secretary, who will be compiling them and putting it for discussion every six months.

The resident's performance in the formal teaching programs also will be evaluated by the supervising consultant and forwarded to the department secretary for filing. These documents are very important and will be summed up in the final internal assessment.

2. Internal Evaluation Credits allowed for various educational / training programs

The credit points for the various activities for the residents are as follows:

	SR1	SR2	SR3	Total
Seminar	2	2	2	6
Journal Club	2	1	2	6
Case discussion	10	6	10	30
Outpatient services	7	0	8	15
In patient services including log	15	0	15	30

book for procedures				
Specialty clinics & services	5	1	6	12
EEG		10		10
EEG log book		2		2
EMG		10		10
EMG log book		2		2
Neuroradiology			10	10
Neuropathology		4		4
Clinical examination	5		5	15
Theory examination	5	5	5	15
BMT	3			3
biostatistics	5			5
Papers publication		2	3	5
Conference presentation		1	1	2

Conference award paper		1	2	3
Attendance	2	1	2	5
Thesis			20	20
Total	61	48	91	200

Examination

Regular internal/external examination is conducted for the residents to assess the theoretical knowledge and skills and the schedule is as follows: -

Month	Duration of course	External/Internal	Syllabus
August	6 months	Internal	Part 1 (Basic Sciences)
January	1year	Internal	Part 1
July	1 1/2 years	External	Part 1
January	2 year	Internal	Part 2 (Clinical Sciences)
August	2 ½ year	Internal	Part 2
December	3 years	External	Part 2

External (Final) evaluation

Evaluation	Max	Pass		Grade	Mark equivalent
Internal examination including thesis	200			A	81 - 100
External theory 1	100			B	61 - 80
External theory 2	100			C	41 - 60
Clinical examination	0			D	21 - 40
case 1	200			E	0 - 20
case 2	100				
case 3	100				
Viva	200				
Total	1000				

The final evaluation would be internal and external with 40% coming from internal exam and 60% coming from external examination. The breakup of the marks for each are given in the table. The grade equivalents are given in table. A candidate should score minimum of 500 marks or more to secure a pass. The grade equivalents would be there should not be any G or more than one F in the grades.

3. Periodic review and appraisal and Personal Development plan

Mid-term appraisal and appraisal report card will be introduced. The primary aim of this periodic (6-monthly) appraisal is to help the resident to identify their academic deficits if any, and to help the residents to improve on those aspects. A copy of the periodic appraisal card signed by the programme-in-charge and the resident will be handed over to the resident, and a copy will be kept in the departmental copy of the clinical dossier. The department will also try to identify and facilitate the specific academic interest of the residents during these periodic appraisals. The residents will be encouraged to communicate their special interest to the head of the department and every possible step will be done to facilitate special training and research in those areas.

E. RESIDENTS' FEEDBACK

Residents' feedback about the academic curriculum is an integral component of the programme. The feedback form will be given to the resident during the periodic appraisal. This will be kept as a document in the clinical dossier and all possible steps will be taken to improve the academic programme based on the suggestions, if they are found appropriate by the department. The confidentiality of the resident's feedback will be maintained by the head, and only the anonymous suggestions will be presented before the department.

F. DEPARTMENTAL POST-GRADUATE PROGRAM COMMITTEE

This academic committee is set up to ensure smooth functioning of the resident training, and evaluation. The committee will have a chair, coordinator and a core group for program implementation, monitoring, improvisation, interdisciplinary collaboration in teaching/research.

Chair: Professor & Head of the Department

Program in charge: Additional Professor/Professor

Program Co-ordinator: Associate/Assistant Professor

Core Committee:

Program implementation: Professor (1), Additional Professor (2)

Monitoring: Associate Professor (1), Assistant Professor (1)

Improvisation: Additional professor (1), Resident representative (1)

Interdisciplinary collaboration: Professor (1), Assistant Professor (1)

G. COMPETENCE EXPECTED AT THE END OF THE PROGRAMME

At the end of this training, the resident should be able to;

1. Demonstrate sufficient understanding of knowledge in the field of Neurology
2. Develop the ability to take discerning history from the patient, perform relevant clinical examination, decide the appropriate investigations and derive the management plan.
3. Should be able to perform and interpret relevant investigations pertaining to Neurology (Eg:- Nerve conduction study, EEG and muscle biopsy) independently.
4. Interpretation of neuroimaging such as CT scan, MRI, CTA, DSA etc.
5. Should be well versed and confident in performing the common procedures in Neurology like lumbar puncture, nerve and muscle biopsy, independently and other procedures (eg: - Transcranial doppler) under limited supervision at the end of three years.
6. Develop into an effective communicator to the patients, their family, colleagues and students.
7. Develop teaching skills and able to disseminate the knowledge in the field of Neurology.

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8. Develop essential skills in conducting medical research, and to get them presented in scientific forums and publish in peer-reviewed journals.

PROPOSED SCHEDULE OF ACTIVITIES INVOLVING SRs.*

Month	Activity	Participants	Remarks/ Issues
February	Guide allotment	SR1	Meeting of SR1 with PC and PIC for allotment of guides for thesis
April	Meeting	SR1	Presentation of thesis in the department Brief background, objectives/ hypothesis, and methods. Presentation for 12 min. and discussion for 18 min.
June	TAC submission	SR1	Submission of proposal for TAC
July	IEC	SR1	Submission to IEC clearance after TAC approval
July	Theory examination SR1		Topic
Before July 31st	Submission of dissertation	SR3	Submission of final dissertation to the academic division
Before Nov 30	Paper publication	SR3	SR3 should submit a scientific paper to a reputed journal and the proof of the submission to be given to the academic division
December	Final exam	SR3	Theory and practical examination

* Since there will be no reminders given, residents are advised to plan their time as per this schedule and not miss out on any activity without prior intimation. Any change in this schedule will be intimated in advance.

#1st year residents making their proposed thesis presentation should ensure to invite Dr.SankaraSarma, AMC (Please give him an intimation in advance and a reminder) and any other consultant from any other department who will be serving as a co-guide on their thesis.

TRIVANDRUM, KERALA

EVALUATION
CLINICAL PRESENTATION/ CASE DISCUSSION

FORM

FOR

Name of the resident:

Name of the Faculty / Observer:

Date:

Sl. No.	Items of observation during Presentation	Poor	Below average	Average	Good	Verygood
		0	1	2	3	4
1	Completeness of history					
2	Accuracy of clinical signs					
3	Clarity of Presentation					
4	Assessment of problem and investigational plan					
5	Treatment plan					
6	Ability to defend diagnosis and plan					
7	Knowledge of the current and past literature					
	Grand Total (out of 10)					

EVALUATION OF JOURNAL REVIEW PRESENTATIONS

Name of the Resident:

Name of the Faculty / Observer:

Date:

Sl. No.	Items of observation during Presentation	Poor	Below average	Average	Good	Verygood
		0	1	2	3	4
1	Extent of understanding of scope & objectives of the paper of the candidate					
2	To critically evaluate methods, analysis and interpretations of study					
3	Whether cross references have been consulted					
4	Whether other relevant publications consulted					
5	Ability to respond to questions on the paper / subject					
6	Ability to defend the paper					
7	Clarity of Presentation					
8	Audio - Visual aids used					
9	Ability to propose new research ideas based on study discussed					
	Total Score (out of 10)					

EVALUATION OF SEMINAR PRESENTATIONS

Name of the resident:

Name of the Faculty / Observer:

Date:

Sl. No.	Items of observation during Presentation	Poor	Below average	Average	Good	Verygood
		0	1	2	3	4
1	Whether all relevant publications consulted					
2	Understanding of the subject					
3	Completeness of the preparation					
4	Clarity of presentation					
5	Current concepts coverage					
6	Ability to answer the questions					
7	Time scheduling					
8	Appropriate use of Audio - Visual aids					
9	Overall performance					
10	Any other observation					
	Total Score (out of ten)					

EVALUATION OF CLINICAL WORK IN WARD / OPD/SPECIALTY

Name of the resident:

Name of the Faculty / Observer:

Assessment month and year

Date:(This evaluation has to be completed on the last working day of each month)

Sl. No.	Items of observation during Presentation	Poor	Below average	Average	Good	Verygood
		0	1	2	3	4
1	Regularity of attendance and punctuality					
2	Presentations of cases during rounds					
3	Maintenance of case records					
4	Investigations work up					
5	Interaction with colleagues and supporting staff					
6	Teaching and training junior colleagues					
7	Bedside Manners					
8	Rapport with patients and family					
9	Counseling Patient's relatives for blood donation or postmortem and case follow up					
10	Overall quality of clinical work					
	Total Score (out of ten)					