Objectives of Training in Neurology

2011
VERSION 1.0

This document applies to those who begin training on or after July 1st, 2011.

(Please see also the “Policies and Procedures.”)

DEFINITION

Neurology is that branch of medicine concerned with the nervous system in health and disease. The neurologist is an expert in the prevention, diagnosis and management of patients with diseases of the nervous system.

GOALS

Upon completion of training, a resident is expected to be a competent specialist in Neurology.

The resident must acquire a working knowledge of the theoretical basis of the specialty, including its foundations in the basic medical sciences and research.

Residents must demonstrate the requisite knowledge, skills, and attitudes for effective patient-centered care and service to a diverse population. In all aspects of specialist practice, the graduate must be able to address issues of gender, sexual orientation, age, culture, ethnicity and ethics in a professional manner.

During the residency program in Neurology, residents must participate in a wide range of clinical experiences involving the care of inpatients and outpatients with acute and chronic neurological disorders, as well as the prevention and rehabilitation of neurological disorders. They must follow a program of formal educational activities and be exposed to current research activities.

The detailed objectives below describe standards required to achieve competence and in no way exclude the need to obtain additional knowledge, skills or attitudes necessary to ensure the most effective diagnosis and management of patients with nervous system disorders.

For greater clarity, these skills elements are expanded as detailed objectives in the following pages. The terms “effective” and “appropriate” are used frequently in these statements. Within the scope of this document, “effective” is defined as “adequate to the efficient solution of the problem; “appropriate” is defined as “appropriate to the presenting problem(s) and patient attitude and activity.” Throughout this document, the term “nervous system” refers to the central nervous system, the peripheral nervous system, the neuromuscular junction and skeletal muscles.
NEUROLOGY COMPETENCIES

At the completion of training, the resident will have acquired the following competencies and will function effectively as a:

Medical Expert

Definition:

As Medical Experts, Neurologists integrate all of the CanMEDS Roles, applying medical knowledge, clinical skills, and professional attitudes in their provision of patient-centered care. Medical Expert is the central physician Role in the CanMEDS framework.

Key and Enabling Competencies: Neurologists are able to...

1. Function effectively as specialists in their domain, integrating all of the CanMEDS Roles to provide optimal, ethical and patient-centered medical care
   1.1. Perform a consultation, including the presentation of well-documented neurological assessments and recommendations in written and verbal form in response to a request from another health care professional
   1.2. Demonstrate effective management of a patient with a neurological condition, including the assessment and treatment at the level of a consultant Neurologist
   1.3. Demonstrate effective use of all CanMEDS competencies relevant to Neurology
   1.4. Demonstrate the ability to prioritize professional duties when faced with multiple patients and problems
   1.5. Demonstrate compassionate and patient-centered care
   1.6. Identify and appropriately respond to relevant ethical issues arising in medical decision-making and patient care
   1.7. Demonstrate competence in situations other than patient care, such as providing expert legal testimony or advising governments, as needed

2. Establish and maintain clinical knowledge, skills and attitudes appropriate to Neurology
   2.1. Demonstrate the clinical and basic science knowledge required for the practice of Neurology, which includes, but is not limited to:
      2.1.1. Vascular diseases of the central nervous system
         2.1.1.1. Anatomy of cerebral and spinal vascular systems
2.1.1.2. Physiology of cerebral and spinal blood flow

2.1.1.3. Risk factors, prevention, etiology, pathophysiology, clinical features, investigation and management of cerebral ischemia, infarction and related disorders, including:

2.1.1.3.1. Atherothrombotic infarction and carotid stenosis
2.1.1.3.2. Embolic infarction and cardio-embolic disorders
2.1.1.3.3. Lacunar infarction
2.1.1.3.4. Arterial dissection
2.1.1.3.5. Prothrombotic conditions
2.1.1.3.6. Vasculitis
2.1.1.3.7. Thrombosis of cerebral veins and venous sinuses
2.1.1.3.8. Strokes in adolescents, children and neonates
2.1.1.3.9. Management of acute ischemia

2.1.1.4. Risk factors, prevention, etiology, pathophysiology, clinical features, investigation and management of hemorrhagic cerebrovascular disorders and vascular malformations, including but not limited to:

2.1.1.4.1. Intracerebral hematomas
2.1.1.4.2. Subarachnoid hemorrhage and cerebral aneurysms
2.1.1.4.3. Vascular malformations, including arteriovenous fistulas

2.1.1.5. Risk factors, prevention, etiology, pathophysiology, clinical features, investigation and management of vascular diseases of the spinal cord

2.1.2. Neuro-oncology

2.1.2.1. Epidemiology, etiology, pathogenesis, pathology, clinical features (including localization), investigation, management and prognosis of neoplasms of the nervous system in adults and children, including but not limited to:

2.1.2.1.1. Primary neoplasms of brain and spinal cord
2.1.2.1.2. Meningiomas
2.1.2.1.3. Metastatic neoplasms of brain, spinal cord and meninges, including spinal cord compression
2.1.2.1.4. Neoplasms of the skull base and anterior visual pathways, including pituitary adenoma and craniopharyngioma
2.1.2.1.5. Neoplasms of cranial nerves, peripheral nerves and nerve roots

2.1.2.2. Pathogenesis, pathology, clinical features, investigation, management and prognosis of paraneoplastic neurological syndromes
2.1.2.3. Pathogenesis, clinical features and management of intracranial hypertension due to central nervous system (CNS) tumours

2.1.2.4. Neurological complications of cancer treatment including chemotherapy and radiation therapy

2.1.3. Disorders of cerebrospinal fluid (CSF) flow and intracranial pressure

2.1.3.1. Physiology and anatomy of CSF production, flow and reabsorption and the blood-brain barrier

2.1.3.2. Etiology, pathophysiology, clinical manifestations, investigation and management of disorders of CSF flow and intracranial pressure, including:

   2.1.3.2.1. Obstructive hydrocephalus
   2.1.3.2.2. Non-obstructive hydrocephalus, including normal pressure hydrocephalus
   2.1.3.2.3. Idiopathic intracranial hypertension (pseudotumour cerebri)
   2.1.3.2.4. Intracranial hypotension
   2.1.3.2.5. Cerebral edema

2.1.4. Infectious and transmissible diseases affecting the CNS

2.1.4.1. Analysis of the CSF and interpretation of the results in CNS infections

2.1.4.2. Etiology, pathogenesis, pathology, epidemiology, clinical manifestations, investigation and management of infectious diseases of the CNS, including:

   2.1.4.2.1. Meningitis, meningoencephalitis and encephalitis due to bacterial or viral pathogens
   2.1.4.2.2. Cerebral abscess
   2.1.4.2.3. Epidural abscess, subdural empyema and intracranial thrombophlebitis
   2.1.4.2.4. CNS tuberculosis
   2.1.4.2.5. Neurosyphilis
   2.1.4.2.6. Lyme disease
   2.1.4.2.7. Fungal infections of the nervous system
   2.1.4.2.8. CNS infections caused by protozoa, Rickettsia species and parasites
   2.1.4.2.9. Neurological complications of human immunodeficiency virus
   2.1.4.2.10. Opportunistic CNS infections in the immunocompromised patient
   2.1.4.2.11. Prion diseases
2.1.5. Demyelinating and inflammatory diseases of the CNS

2.1.5.1. Pathogenesis, genetics, pathology, epidemiology, clinical manifestations, investigation, diagnostic criteria, management and prognosis of multiple sclerosis (MS)

2.1.5.2. Etiology, pathogenesis, pathology, epidemiology, clinical manifestations, investigation, management and prognosis of demyelinating and inflammatory CNS diseases other than MS, including:

  2.1.5.2.1. Acute disseminated encephalomyelitis and its variants
  2.1.5.2.2. Cerebellitis
  2.1.5.2.3. Brainstem encephalitis
  2.1.5.2.4. Transverse myelitis
  2.1.5.2.5. Optic neuritis
  2.1.5.2.6. Neuromyelitis optica
  2.1.5.2.7. Neurosarcoidosis

2.1.5.3. Etiology, pathogenesis, pathology, epidemiology, clinical manifestations, investigation, management and prognosis of diseases that can mimic MS

2.1.6. Epilepsy

2.1.6.1. Basic mechanisms underlying epilepsy and its treatment, including the action potential, ion channels, neurotransmitters and epileptogenesis

2.1.6.2. Classification of epileptic seizures and syndromes

2.1.6.3. Epidemiology, genetics, clinical manifestations, treatment and prognosis of epileptic seizures and syndromes in adults and children

2.1.6.4. Pharmacological principles, complications and teratogenic effects of anti-epileptic drug administration

2.1.6.5. Non-pharmacological treatment of epilepsy, including ketogenic diet, surgery and vagal nerve stimulation

2.1.6.6. Effects of pregnancy on epilepsy and its management

2.1.6.7. Diagnosis and management of status epilepticus

2.1.6.8. Diagnosis and differential diagnosis of non-epileptic seizures
2.1.7. Headache and craniofacial pain

2.1.7.1. Anatomy and physiology of craniofacial pain pathways
2.1.7.2. Classification of headache
2.1.7.3. Pathophysiology, clinical feature and management of headache and craniofacial pain disorders, including but not limited to

2.1.7.3.1. Primary headaches, including:
   2.1.7.3.1.1. Migraine and its variants
   2.1.7.3.1.2. Tension-type headache
   2.1.7.3.1.3. Trigeminal autonomic cephalgias
   2.1.7.3.1.4. Other primary headaches

2.1.7.3.2. Secondary headaches
2.1.7.3.3. Thunderclap headache including reversible cerebral vasoconstriction syndrome
2.1.7.3.4. Cranial neuralgias and primary facial pain

2.1.8. Dementia and amnesia

2.1.8.1. Anatomy and physiology of memory and the limbic system
2.1.8.2. Classification, diagnostic criteria, pathogenesis, pathology, clinical features and management of dementia and disorders of memory, including:
   2.1.8.2.1. Mild cognitive impairment
   2.1.8.2.2. Alzheimer’s disease
   2.1.8.2.3. Frontotemporal degeneration and dementia
   2.1.8.2.4. Dementia with Lewy bodies
   2.1.8.2.5. Vascular dementia
   2.1.8.2.6. Other secondary dementias, including Korsakoff syndrome
   2.1.8.2.7. Pseudodementia
   2.1.8.2.8. Transient global amnesia and epileptic amnesia
   2.1.8.2.9. Amnestic states

2.1.9. Delirium and other acute confusional states

2.1.9.1. Etiology, pathophysiology, clinical features, diagnosis and management of delirium and other acute confusional states

2.1.10. Syndromes caused by focal CNS lesions

2.1.10.1. Anatomy and physiology of cerebral cortical function
2.1.10.2. Pathophysiology and clinical features of syndromes caused by focal cerebral lesions, including:
   2.1.10.2.1. Lesions of frontal, temporal, parietal or occipital lobe
   2.1.10.2.2. Brainstem lesions
   2.1.10.2.3. Cerebellar lesions
   2.1.10.2.4. Lesions of white matter tracts, including disconnection syndromes

2.1.11. Movement disorders
   2.1.11.1. Anatomy and physiology of the extrapyramidal motor pathways
   2.1.11.2. Etiology, genetics, pathophysiology, pathology and clinical features of movement disorders, including but not limited to:
      2.1.11.2.1. Primary parkinsonian disorders, including Parkinson’s disease and atypical parkinsonian disorders
      2.1.11.2.2. Secondary parkinsonian disorders
      2.1.11.2.3. Chorea/ballismus
      2.1.11.2.4. Dystonia and related disorders
      2.1.11.2.5. Tremor
      2.1.11.2.6. Tics and Tourette’s syndrome
      2.1.11.2.7. Paroxysmal dyskinesias
      2.1.11.2.8. Drug-induced movement disorders
      2.1.11.2.9. Myoclonus

   2.1.11.3. Management of movement disorders and complications of treatment

2.1.12. Cerebellar and spinocerebellar disorders
   2.1.12.1. Anatomy and physiology of the cerebellum and its pathways
   2.1.12.2. Etiology, genetics, pathophysiology, pathology, clinical features and management of cerebellar and spinocerebellar disorders, including but not limited to:
      2.1.12.2.1. Cerebellar malformations
      2.1.12.2.2. Inherited ataxias and spinocerebellar ataxias
      2.1.12.2.3. Infectious and post-infectious ataxias
      2.1.12.2.4. Cerebellar disorders caused by metabolic dysfunction and inborn errors of metabolism
      2.1.12.2.5. Cerebellar disorders caused by toxins
      2.1.12.2.6. Episodic ataxias
2.1.13. Motor neuron disorders

2.1.13.1. Anatomy and physiology of the pyramidal pathways and reflex arc

2.1.13.2. Mechanisms and management of spasticity

2.1.13.3. Etiology, pathophysiology, clinical features and management of motor neuron disorders:

2.1.13.3.1. Disorders primarily affecting upper motor neurons (UMN), including:

   2.1.13.3.1.1. Cerebral palsy
   2.1.13.3.1.2. Primary lateral sclerosis
   2.1.13.3.1.3. Hereditary spastic paraplegias
   2.1.13.3.1.4. Human T-lymphotrophic virus (HTLV) infections
   2.1.13.3.1.5. UMN disorders caused by toxins

2.1.13.3.2. Disorders primarily affecting lower motor neurons (LMN), including:

   2.1.13.3.2.1. Pediatric and adult-onset spinal muscular atrophies
   2.1.13.3.2.2. Benign focal amyotrophy
   2.1.13.3.2.3. Infectious causes of lower motor neuron disorders
   2.1.13.3.2.4. Post-polio syndrome
   2.1.13.3.2.5. Genetic causes of LMN disorders
   2.1.13.3.2.6. LMN disorders cause by inborn errors of metabolism
   2.1.13.3.2.7. LMN disorders caused by toxins, radiation and neoplasms

2.1.13.3.3. Disorders affecting both upper and lower motor neurons, including:

   2.1.13.3.3.1. Amyotrophic lateral sclerosis (ALS), including sporadic and familial ALS
   2.1.13.3.3.2. ALS syndromes with dementia or parkinsonism
   2.1.13.3.3.3. Disorders caused by inborn errors of metabolism

2.1.14. Peripheral neuropathies

2.1.14.1. Histology and macroscopic anatomy of peripheral nerves, including muscle innervation and sensory dermatomes

2.1.14.2. Physiology of axons and peripheral nerves and their reactions to injury
2.1.14.3. Etiology, genetics, pathophysiology, pathology, clinical features, investigation and management of peripheral nerve disorders, including:

2.1.14.3.1. Hereditary neuropathies
2.1.14.3.2. Traumatic, entrapment and idiopathic mononeuropathies
2.1.14.3.3. Inflammatory and demyelinating polyradiculoneuropathies, including acute and chronic demyelinating polyneuropathies and multifocal motor neuropathy with conduction block
2.1.14.3.4. Neuropathies caused by metabolic, toxic and nutritional disorders, including critical illness polyneuropathy
2.1.14.3.5. Neuropathies caused by systemic inflammatory and vasculitic disorders
2.1.14.3.6. Neuropathies cause by paraproteinemias, monoclonal gammopathies and neoplasms, including paraneoplastic disorders
2.1.14.3.7. Infectious neuropathies

2.1.15. Nerve root and plexus disorders
2.1.15.1. Anatomy of nerve roots and brachial and lumbosacral plexi, including muscle innervation and sensory dermatomes
2.1.15.2. Etiology, pathophysiology, pathology, clinical features, investigation and management of nerve root and plexus disorders, including:

2.1.15.2.1. Traumatic and congenital radiculopathy and plexopathy
2.1.15.2.2. Disc herniation
2.1.15.2.3. Diabetic polyradiculopathy, amyotrophy and other ischemic plexopathies
2.1.15.2.4. Neoplastic and radiation-induced polyradiculopathy and plexopathy
2.1.15.2.5. Idiopathic brachial plexopathy and neuralgic amyotrophy
2.1.15.2.6. Dorsal root ganglion disease

2.1.16. Neuromuscular junction disorders
2.1.16.1. Etiology, pathophysiology, pathology, clinical features, investigation and management of diseases affecting the neuromuscular junction, including:

2.1.16.1.1. Myasthenia gravis
2.1.16.1.2. Congenital myasthenic syndromes
2.1.16.1.3. Lambert-Eaton syndrome
2.1.16.1.4. Botulism
2.1.16.1.5. Disorders caused by drugs and toxins
2.1.17. Muscular disorders and myopathies
   2.1.17.1. Histology and physiology of normal muscle
   2.1.17.2. Etiology, genetics, pathophysiology, pathology, clinical features, investigation and management of diseases affecting muscle, including:
      2.1.17.2.1. Muscular dystrophies
      2.1.17.2.2. Congenital myopathies
      2.1.17.2.3. Muscle disorders caused by channelopathies
      2.1.17.2.4. Metabolic and mitochondrial myopathies
      2.1.17.2.5. Inflammatory myopathies
      2.1.17.2.6. Myopathies caused by endocrinological and electrolyte disorders
      2.1.17.2.7. Myopathies caused by drugs and toxins
      2.1.17.2.8. Critical illness myopathy

2.1.18. Neurological complications of acquired systemic and metabolic disorders
   2.1.18.1. Etiology, pathophysiology, pathology, clinical manifestations, investigation, management and prognosis of neurological disorders caused by acquired systemic and metabolic disorders, including:
      2.1.18.1.1. Hypo- and hyperglycemia
      2.1.18.1.2. Disorders of electrolytes and water balance
      2.1.18.1.3. Vitamin deficiencies
      2.1.18.1.4. Cardiovascular disorders, including syncope and ischemic-hypoxic encephalopathy
      2.1.18.1.5. Respiratory disorders
      2.1.18.1.6. Hematological disorders
      2.1.18.1.7. Hepatic and gastrointestinal disorders
      2.1.18.1.8. Renal disorders and dialysis
      2.1.18.1.9. Rheumatological disorders and vasculitis
      2.1.18.1.10. Endocrinological disorders, including diseases of the thyroid, parathyroid, adrenal and pituitary glands
      2.1.18.1.11. Complications of organ transplantation and immune suppression

2.1.19. Neurological complications of pregnancy and delivery

2.1.20. Neurological disorders caused by drugs and toxins
   2.1.20.1. Pathophysiology, pathology, clinical manifestations, investigation, management and prognosis of neurological disorders caused by drugs and toxins, including:
      2.1.20.1.1. Ethanol and other alcohols, including fetal alcohol syndrome;
2.1.20.1.2. Psychoactive drugs, including opioids, stimulants and hallucinogens
2.1.20.1.3. Dopamine and dopaminergic agents
2.1.20.1.4. Anticonvulsants, including fetal teratogenesis
2.1.20.1.5. Antineoplastic and immunosuppressive agents
2.1.20.1.6. Cardioactive drugs
2.1.20.1.7. Bacterial toxins, including botulism, tetanus and diphtheria
2.1.20.1.8. Environmental and occupational toxins, including metals, organic chemicals and carbon monoxide

2.1.21. Traumatic injury of the nervous system and coma
2.1.21.1. Anatomy and physiology of consciousness
2.1.21.2. Clinical features, classification and management of mild brain injury, including criteria for return to playing sports
2.1.21.3. Clinical features, pathophysiology, pathology and management of moderate-severe traumatic brain injury and brain herniation
2.1.21.4. Prognosis for neurological recovery and seizures after traumatic brain injury
2.1.21.5. Diagnosis of brain death, minimally conscious state and persistent vegetative state
2.1.21.6. Clinical features and management of traumatic spinal cord injury

2.1.22. Inborn errors of metabolism affecting the nervous system
2.1.22.1. Pathophysiology, genetics, clinical manifestations, investigation, management and prognosis of neurological disorders caused by inborn errors of metabolism, including:
2.1.22.1.1. Amino acid disorders
2.1.22.1.2. Organic acidemias
2.1.22.1.3. Galactosemia
2.1.22.1.4. Disorders associated with hyperammonemia
2.1.22.1.5. Pyrimidine disorders
2.1.22.1.6. Disorders of copper and iron metabolism
2.1.22.1.7. Lipoprotein deficiencies
2.1.22.1.8. Mitochondrial and oxidative metabolism disorders
2.1.22.1.9. Peroxisomal and lysosomal disorders
2.1.23. Developmental abnormalities of the nervous system

2.1.23.1. Embryology and clinical, radiological and pathological features of the major developmental abnormalities of the nervous system, including:

2.1.23.1.1. Neural tube defects
2.1.23.1.2. Disorders of segmentation and cleavage, including holoprosencephaly, septo-optic dysplasia and dysgenesis of corpus callosum
2.1.23.1.3. Disorders of proliferation
2.1.23.1.4. Disorders of migration
2.1.23.1.5. Disorders of organization
2.1.23.1.6. Disorders of myelination
2.1.23.1.7. Posterior fossa malformations

2.1.24. Delayed development, developmental regression and behavioural disorders

2.1.24.1. Normal developmental milestones and primitive reflexes
2.1.24.2. Clinical features, differential diagnosis and management of delayed development, developmental regression and behavioural disorders, including:

2.1.24.2.1. Global developmental delay
2.1.24.2.2. Intellectual impairment
2.1.24.2.3. Developmental regression/neurodegenerative disorders
2.1.24.2.4. Motor development disorders
2.1.24.2.5. Language development disorders
2.1.24.2.6. Behavioural and attention disorders
2.1.24.2.7. Autism and pervasive development disorders

2.1.25. Neurogenetic disorders

2.1.25.1. Basic knowledge of genetics as applied to neurological diseases
2.1.25.2. Ethical considerations in neurogenetics
2.1.25.3. Genetics, clinical presentation, management and testing of the major neurogenetic syndromes, including:

2.1.25.3.1. Neurocutaneous syndromes
2.1.25.3.2. Trisomy 21
2.1.25.3.3. Fragile X syndrome
2.1.25.3.4. Turner syndrome
2.1.25.3.5. Noonan syndrome
2.1.25.3.6. Aicardi syndrome
2.1.25.3.7. Angelman and Prader-Willi syndromes
2.1.25.3.8. Cockayne syndrome
2.1.25.3.9. Rett syndrome

2.1.26. Sleep disorders
   2.1.26.1. Anatomy and physiology of sleep and wakefulness
   2.1.26.2. Etiology, pathophysiology, classification, clinical features and management of sleep disorders, including:
      2.1.26.2.1. Intrinsic sleep disorders, including:
         2.1.26.2.1.1. Insomnia
         2.1.26.2.1.2. Narcolepsy
         2.1.26.2.1.3. Hypersomnia
         2.1.26.2.1.4. Central sleep apnea
         2.1.26.2.1.5. Restless legs syndrome
      2.1.26.2.2. Extrinsic sleep disorders
      2.1.26.2.3. Parasomnias
      2.1.26.2.4. Sleep disorders associated with neurological disorders

2.1.27. Somatoform (functional) disorders with neurological manifestations
   2.1.27.1. Clinical manifestations, investigation and management of somatoform disorders with neurological manifestations, including:
      2.1.27.1.1. Conversion disorder, including non-epileptic seizures
      2.1.27.1.2. Somatization disorder

2.1.28. Neurointensive care
   2.1.28.1. Recognize and manage neurological conditions requiring an intensive care unit

2.1.29. Neuro-ophthalmological disorders
   2.1.29.1. Anatomy and physiology of the afferent visual pathways, ocular motor system, pupillary pathways and accommodation
   2.1.29.2. Etiology, genetics, pathophysiology, clinical features (including visual field findings), investigation and management of neuro-ophthalmological disorders, including:
      2.1.29.2.1. Disorders of optic nerve, optic chiasm, retrochiasmal pathways, calcarine cortex and extrastriate visual cortex
      2.1.29.2.2. Neurologically relevant retinal disorders, including retinal ischemia and infarction

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2.1.29.2.3. Papilledema
2.1.29.2.4. Central and peripheral disorders of eye movement, including those causing strabismus, nystagmus and saccadic oscillations
2.1.29.2.5. Pupillary disorders
2.1.29.2.6. Ptosis
2.1.29.2.7. Orbital disorders and proptosis

2.1.30. Neuro-otological disorders
2.1.30.1. Anatomy and physiology of the auditory, vestibular and vestibulo-ocular systems
2.1.30.2. Etiology, pathophysiology, clinical features, investigation and management of neuro-otological disorders, including:
   2.1.30.2.1. Sensorineural hearing loss and tinnitus
   2.1.30.2.2. Vertigo and unilateral loss of vestibular function
   2.1.30.2.3. Bilateral loss of vestibular function

2.1.31. Disorders of other cranial nerves and related disorders
2.1.31.1. Disorders of smell and taste
   2.1.31.1.1. Anatomy and physiology of olfaction and taste sensation
   2.1.31.1.2. Etiology, pathogenesis, clinical features, investigation and management of disorders of smell and taste

2.1.31.2. Anatomy and physiology of cranial nerves V, VII and IX – XII and related brainstem and cerebral pathways
2.1.31.3. Etiology, pathogenesis, clinical features, investigation and management of disorders of other cranial nerves and related disorders, including:
   2.1.31.3.1. Disorders of trigeminal nerve and corneal and facial sensation
   2.1.31.3.2. Disorders of facial nerve and facial movement
   2.1.31.3.3. Glossopharyngeal neuralgia
   2.1.31.3.4. Disorders of the vagus nerve and dysphagia
   2.1.31.3.5. Disorders of the spinal accessory nerve
   2.1.31.3.6. Disorders of the hypoglossal nerve
   2.1.31.3.7. Bulbar and pseudobulbar palsy
   2.1.31.3.8. Multiple cranial nerve palsies

2.1.32. Autonomic nervous system disorders
2.1.32.1. Anatomy and physiology of the autonomic nervous system
2.1.32.2. Etiology, pathophysiology, clinical features, investigation and management of disorders of the autonomic nervous system, including:

2.1.32.2.1. Acute autonomic paralysis (pure pandysautonomia)
2.1.32.2.2. Primary autonomic failure
2.1.32.2.3. Dysautonomia and orthostatic hypotenison caused by peripheral neuropathy
2.1.32.2.4. Autonomic dysfunction in neurodegenerative disorders
2.1.32.2.5. Autonomic dysreflexia after spinal cord lesions
2.1.32.2.6. Neurological disorders of bladder function

2.1.33. Pain disorders

2.1.33.1. Anatomy and physiology of nociception and pain pathways
2.1.33.2. Etiology, pathogenesis, clinical features investigation and management of pain disorders, including:

2.1.33.2.1. Central and peripheral neuropathic pain disorders
2.1.33.2.2. Complex regional pain syndrome
2.1.33.2.3. Post-herpetic neuralgia
2.1.33.2.4. Back pain

2.1.34. Electroencephalography (EEG)

2.1.34.1. Physiological basis of normal EEG and common EEG abnormalities
2.1.34.2. Recognition of normal physiological rhythms in wakefulness, drowsiness and sleep
2.1.34.3. Principal characteristics of neurophysiological maturation in children
2.1.34.4. EEG indications and limitations, including sleep-deprived, video, intensive care monitoring and ambulatory EEG
2.1.34.5. Recognition of common EEG abnormalities and their significance

2.1.35. Electromyography and nerve conduction studies (EMG/NCS)

2.1.35.1. Physiological basis of normal EMG/NCS and common EMG/NCS abnormalities
2.1.35.2. Indications for, and limitations of, EMG/NCS in neurological disorders
2.1.35.3. Recognition of common EMG/NCS abnormalities and their significance

2.1.36. Neuroimaging

2.1.36.1. Neuroradiological anatomy and pathophysiology
2.1.36.2. Normal and abnormal neuroimaging findings
2.1.36.3. Indications, contraindications and limitations for neuroimaging, including the selection of appropriate magnetic resonance studies and indications for functional neuroimaging

2.1.36.4. Differential diagnosis of common neuroimaging abnormalities

2.1.37. Other laboratory investigations

2.1.37.1. Anatomic and physiologic basis, indications, contraindications and interpretation of results, of:

2.1.37.1.1. Lumbar puncture
2.1.37.1.2. Visual field testing, including Goldmann and automated perimetry
2.1.37.1.3. Visual evoked responses
2.1.37.1.4. Auditory brainstem evoked responses
2.1.37.1.5. Somatosensory evoked responses
2.1.37.1.6. Vestibular and caloric testing
2.1.37.1.7. Apnea testing for brain death
2.1.37.1.8. Edrophonium (Tensilon) test or equivalent test

2.1.38. Classification of, and clinical approach to, manifestations of neurological diseases, including

2.1.38.1. Muscle weakness, paralysis and cramps
2.1.38.2. Sensory disturbances
2.1.38.3. Autonomic disturbances
2.1.38.4. Regional pain
2.1.38.5. Seizures and syncope
2.1.38.6. Headache and facial pain
2.1.38.7. Movement disorders
2.1.38.8. Ataxia, inco-ordination and disturbances of gait
2.1.38.9. Disturbances of vision, eye movement and pupillary and eyelid function
2.1.38.10. Dizziness and vertigo
2.1.38.11. Altered hearing
2.1.38.12. Dysphagia
2.1.38.13. Disturbances of speech and language
2.1.38.14. Impaired consciousness and acute confusion
2.1.38.15. Sleep disturbances
2.1.38.16. Disturbances of memory, cognitive function and behaviour
2.1.38.17. Disturbances of smell and taste
2.1.38.18. Developmental delay and regression
2.1.38.19. Dysmorphic features

2.2. Describe the CanMEDS competencies relevant to Neurology
2.3. Apply lifelong learning skills of the Scholar Role and implement a personal learning program to keep up-to-date and enhance areas of professional competence
2.4. Contribute to the enhancement of quality care and patient safety in Neurology, integrating the available best evidence and best practices

3. Perform a complete and appropriate assessment of a patient
   3.1. Identify and explore problems to be addressed in a patient encounter effectively
   3.2. Elicit a history that is relevant, concise and accurate, including the patient’s context and preferences
   3.3. Perform a relevant physical examination that is efficient and accurate
   3.4. Order appropriate laboratory tests and imaging, identify normal and abnormal results and evaluate their significance
   3.5. Demonstrate effective clinical problem solving and judgement, including interpreting available data and integrating information to generate differential diagnoses and management plans

4. Use preventive and therapeutic interventions effectively
   4.1. Implement a management plan in collaboration with patients and families
   4.2. Demonstrate appropriate and timely application of preventive and therapeutic interventions relevant to Neurology, including thrombolysis in acute stroke
   4.3. Ensure appropriate informed consent is obtained for therapies
   4.4. Ensure patients receive appropriate end-of-life care

5. Demonstrate proficient and appropriate use of procedural skills, both diagnostic and therapeutic
   5.1. Demonstrate effective, appropriate and timely performance of diagnostic and therapeutic procedures relevant to Neurology, including:
      5.1.1. Lumbar puncture
      5.1.2. Edrophonium test or equivalent
      5.1.3. Apnea testing for brain death
      5.1.4. Caloric test
      5.1.5. Dix-Hallpike and particle repositioning maneuvers
   5.2. Ensure appropriate informed consent is obtained for procedures
5.3. Document and disseminate information related to procedures performed and their outcomes
5.4. Ensure adequate follow-up is arranged for procedures performed

6. **Seek appropriate consultation from other health professionals, recognizing the limits of their expertise**

6.1. Demonstrate insight into their own limitations of expertise
6.2. Demonstrate effective, appropriate, and timely consultation of another health professional as needed for optimal patient care
6.3. Arrange appropriate follow-up care services for patients and their families

**Communicator**

**Definition:**

As *Communicators*, Neurologists effectively facilitate the doctor-patient relationship and the dynamic exchanges that occur before, during, and after the medical encounter.

**Key and Enabling Competencies: Neurologists are able to...**

1. **Develop rapport, trust, and ethical therapeutic relationships with patients and families**

   1.1. Recognize that being a good communicator is a core clinical skill for Neurologists, and that effective physician-patient communication fosters diagnostic accuracy, patient and physician satisfaction, adherence to medical advice and improved clinical outcomes
   1.2. Establish positive therapeutic relationships with patients and families that are characterized by understanding, trust, respect, honesty and empathy
   1.3. Respect patient confidentiality, privacy and autonomy
   1.4. Listen effectively
   1.5. Recognize and respond to non-verbal cues
   1.6. Use nonverbal communication such as eye contact, smiling and nodding appropriately
   1.7. Disclose medical errors and adverse events promptly and accurately

2. **Accurately elicit and synthesize relevant information and perspectives of patients and families, colleagues, and other professionals**

   2.1. Gather accurate histories effectively and efficiently from patients with neurological symptoms, including patients’ beliefs and expectations about their illnesses
   2.2. Seek out and synthesize relevant information from other sources, such as a patient’s family, caregivers and other professionals
3. **Convey relevant information and explanations accurately to patients and families, colleagues and other professionals**

   3.1. Deliver information to patients and families in a humane and understandable manner

      3.1.1. Explain neurological diagnosis, prognosis and treatment

      3.1.2. Explain relevant genetic aspects of neurological diseases

      3.1.3. Convey restrictions on activities, including driving, that are mandated medically or legally because of neurological disorders

      3.1.4. Explain issues of competency

   3.2. Deliver information to colleagues and other professionals in a concise and respectful manner

4. **Develop a common understanding on issues, problems and plans with patients, families and other professionals to develop a shared plan of care**

   4.1. Identify and explore problems to be addressed from a patient encounter effectively, including the patient’s and family’s context, responses, concerns, and preferences

      4.1.1. Counsel patients and families regarding genetic concerns

   4.2. Respect diversity and differences, including the impact of gender, religion and cultural beliefs on decision-making, with the knowledge that this varies from one individual to the next and needs open-ended discussion

   4.3. Encourage discussion, questions, and interaction in the encounter

   4.4. Engage patients, families, and relevant health professionals in shared decision-making to develop a plan of care

      4.4.1. Obtain informed consent effectively for diagnostic and therapeutic procedures employed in neurological conditions

      4.4.2. Lead discussions about prognosis of neurological disorders, level of care and transition to end-of-life care

      4.4.3. Lead discussions on brain death and organ donation

   4.5. Address other challenging communication issues effectively, such as diagnostic uncertainty, delivering bad news and addressing anger, confusion and misunderstanding

5. **Convey effective oral and written information about a medical encounter**

   5.1. Maintain clear, accurate and appropriate records (written or electronic) of clinical encounters and plans
5.2. Present verbal reports of clinical encounters and plans
5.3. Produce clear, accurate and appropriate neurological consultation notes and letters
5.4. Present medical information to the public or media about a neurological issue

Collaborator

Definition:
As Collaborators, Neurologists effectively work within a health care team to achieve optimal patient care.

Key and Enabling Competencies: Neurologists are able to...

1. Participate effectively and appropriately in an interprofessional health care team
   1.1. Describe the Neurologist’s roles and responsibilities to other professionals
   1.2. Recognize and respect the diversity of roles, responsibilities and competencies of other professionals within the neurological care team
   1.3. Work with others to assess, plan, provide and integrate care for individual patients or groups of patients with neurological disorders
   1.4. Work with others to assess, plan, provide and review other tasks, such as research problems, educational work, program review or administrative responsibilities
   1.5. Participate in interprofessional team meetings, discharge planning and transfer of care
   1.6. Collaborate with other professions for the provision of quality care
   1.7. Describe the principles of team dynamics
   1.8. Respect team ethics, including confidentiality, resource allocation and professionalism
   1.9. Demonstrate leadership in a health care team, as appropriate

2. Work with other health professionals effectively to prevent, negotiate and resolve interprofessional conflict
   2.1. Demonstrate a respectful attitude towards other colleagues and members of an interprofessional team
   2.2. Work with other professionals to prevent conflicts
   2.3. Employ collaborative negotiation to resolve conflicts
   2.4. Respect differences and address misunderstandings and limitations in other professionals
   2.5. Recognize one’s own differences, misunderstandings and limitations that may contribute to interprofessional tension
2.6. Reflect on interprofessional team function

Manager

Definition:

As Managers, Neurologists are integral participants in health care organizations, organizing sustainable practices, making decisions about allocating resources, and contributing to the effectiveness of the health care system.

Key and Enabling Competencies: Neurologists are able to...

1. Participate in activities that contribute to the effectiveness of their health care organizations and systems
   1.1. Participate in systemic quality process evaluation and improvement, such as patient safety initiatives
   1.2. Describe the structure and function of the health care system as it relates to Neurology
   1.3. Describe principles of health care financing, including physician remuneration, budgeting and organizational funding

2. Manage their practices and careers effectively
   2.1. Set priorities and manage time efficiently to balance patient care, practice requirements, outside activities and personal life
   2.2. Manage a practice in Neurology or a subspecialty of Neurology, including finances and human resources
   2.3. Implement processes to ensure personal practice improvement
   2.4. Employ information technology appropriately for patient care

3. Allocate finite health care resources appropriately
   3.1. Describe the importance of just allocation of health care resources, balancing effectiveness, efficiency and access with optimal patient care
      3.1.1. Prioritize laboratory tests and neuroimaging effectively within the context of limited resources
      3.1.2. Choose the appropriate setting for assessment and care of patients with neurological disorders
   3.2. Apply evidence and management processes for cost-appropriate care
4. **Serve in administration and leadership roles, as appropriate**
   4.1. Chair or participate effectively in committees and meetings
   4.2. Lead or implement changes in health care
   4.3. Plan relevant elements of health care delivery (e.g., work schedules)

**Health Advocate**

*Definition:*

As *Health Advocates*, Neurologists responsibly use their expertise and influence to advance the health and well-being of individual patients, communities, and populations.

**Key and Enabling Competencies: Neurologists are able to...**

1. **Respond to individual patient health needs and issues as part of patient care**
   1.1. Identify the health needs and issues of individual patients
       1.1.1. Identify at-risk patients that may have neurological diseases
       1.1.2. Identify complications of neurological diseases
       1.1.3. Advocate for appropriate lifestyle and workplace accommodation and benefits for those with neurological related disability
       1.1.4. Identify and discuss the need for advance care plans
   1.2. Identify the need for advocacy, health promotion and disease prevention for individual patients with neurological disorders, and respond appropriately
       1.2.1. Facilitate appropriate access to health and social services, including neuroimaging, required by individual patients
       1.2.2. Promote primary and secondary disease prevention for at-risk patients

2. **Respond to the health needs of the communities that they serve**
   2.1. Identify the need for advocacy, health promotion and disease prevention in the communities that Neurologists serve, and respond appropriately
       2.1.1. Identify deficiencies in resources, including equipment and medications, required for appropriate care of patients with neurological disorders, and advocate to have them addressed
       2.1.2. Describe community resources and related patient support groups
       2.1.3. Facilitate access to community resource programs (including home care, occupational and physiotherapy, drug plans and application for nursing homes)
2.2. Identify instances of competing interests between the communities served and other populations

3. **Identify the determinants of health for the populations that they serve**
   3.1. Identify the determinants of health of the various groups of patients that Neurologists serve, including barriers to access to care and resources
      3.1.1. Identify the biological, psychosocial, environmental and economic factors affecting neurological health
   3.2. Identify vulnerable or marginalized neurological patients within those served, including those without a family doctor, poor access to expensive medications, those of low socioeconomic status or with poor social supports and respond appropriately
   3.3. Promote primary and secondary disease prevention for at-risk patient groups, including patients with cerebral ischemia

4. **Promote the health of individual patients, communities and populations**
   4.1. Describe an approach to implementing a change in a determinant of health of the populations they serve
   4.2. Describe how public policy impacts on the health of the populations served
   4.3. Identify points of influence in the health care system and its structure
   4.4. Describe the ethical and professional issues inherent in health advocacy, including altruism, social justice, autonomy, integrity and idealism
   4.5. Appreciate the possibility of conflict inherent in their role as a health advocate for a patient or community with that of manager or gatekeeper
   4.6. Describe the role of the medical profession in advocating collectively for health and patient safety

**Scholar**

**Definition:**

As Scholars, Neurologists demonstrate a lifelong commitment to reflective learning, as well as the creation, dissemination, application and translation of medical knowledge.

**Key and Enabling Competencies: Neurologists are able to...**

1. **Maintain and enhance professional activities through ongoing learning**
   1.1. Describe the principles and strategies for implementing a personal knowledge management system
   1.2. Recognize and address learning issues in practice
1.3. Conduct a personal practice audit
1.4. Pose an appropriate learning question
1.5. Access and interpret the relevant evidence regarding diagnosis, pathogenesis, prognosis and management of neurological disorders
1.6. Integrate new learning into practice
1.7. Evaluate the impact of any change in practice
1.8. Document the learning process

2. Critically evaluate medical information and its sources, and apply this appropriately to practice decisions
2.1. Describe the principles of critical appraisal
2.2. Critically appraise retrieved evidence in order to address a neurological question
2.3. Integrate critical appraisal conclusions into clinical care

3. Facilitate the learning of patients, families, students, residents, other health professionals, the public and others
3.1. Describe principles of learning relevant to medical education
3.2. Identify collaboratively the learning needs and desired learning outcomes of others
3.3. Select effective teaching strategies and content to facilitate others’ learning
3.4. Demonstrate an effective lecture or presentation
3.5. Assess and reflect on a teaching encounter
3.6. Provide effective feedback
3.7. Describe the principles of ethics with respect to teaching

4. Contribute to the development, dissemination, and translation of new knowledge and practices
4.1. Describe the principles of research and scholarly inquiry
4.2. Describe the principles of research ethics
4.3. Pose a scholarly question
4.4. Conduct a systematic search for evidence
4.5. Select and apply appropriate methods to address the question
4.6. Disseminate the findings of a study
Professional

Definition:

As Professionals, Neurologists are committed to the health and well-being of individuals and society through ethical practice, profession-led regulation, and high personal standards of behaviour.

Key and Enabling Competencies: Neurologists are able to...

1. Demonstrate a commitment to their patients, profession, and society through ethical practice
   1.1. Exhibit appropriate professional behaviors in practice, including honesty, integrity, commitment, compassion, respect and altruism
   1.2. Demonstrate a commitment to delivering the highest quality care and maintenance of competence, including regular scanning of current neurological literature and attendance at relevant rounds and conferences
   1.3. Recognize and appropriately respond to ethical issues encountered in practice
   1.4. Manage conflicts of interest
   1.5. Recognize the principles and limits of patient confidentiality as defined by professional practice standards and the law
   1.6. Maintain appropriate relations with patients
   1.7. Demonstrate knowledge of one’s own limitations and regularly evaluate one’s own knowledge and skills

2. Demonstrate a commitment to their patients, profession and society through participation in profession-led regulation
   2.1. Demonstrate knowledge and an understanding of the professional, legal and ethical codes of neurological practice
   2.2. Fulfill the regulatory and legal obligations required of current practice
   2.3. Demonstrate accountability to professional regulatory bodies
   2.4. Recognize and respond to others’ unprofessional behaviours in practice
   2.5. Participate in peer review

3. Demonstrate a commitment to physician health and sustainable practice
   3.1. Balance personal and professional priorities to ensure personal health and a sustainable practice
   3.2. Strive to heighten personal and professional awareness and insight
   3.3. Recognize other professionals in need and respond appropriately