**Neurology**

**Goals:**
A solid understanding of normal neurological development, anatomy and neurophysiology is imperative to the treatment of neurological pathology. The goal is to sensitize the family medicine resident to the role of neurological disease in patients and familiarize residents with its particular place in the overall practice of family medicine. Neurological problems are estimated to comprise 10 to 15 percent of a family physician’s workload. The specialty of family medicine is vitally interested in all aspects of neurological disease. History-taking in neurology and performance of a comprehensive neurological examination are essential skills for all family physicians. Emphasis on good diagnostic and therapeutic skills and the appropriate consideration of bio-psychosocial and cultural factors must be included in the curriculum.

**Knowledge:**
Objective: Upon completion of the training the resident will demonstrate the following competencies.
1. Normal anatomy, physiology and anatomic principles that allow localization of neurological disease. (MK)
2. Normal growth, development and senescence of the nervous system. (MK)
3. Pathologic neurological disorders, including: (MK)
   a. Disorders of motor function
      i. Upper and lower motor neuron disorders
      ii. Coordination
      iii. Movement disorders
         1) Hypokinetic
            a) Parkinson’s disease
            b) Parkinson plus syndrome
         2) Hyperkinetic
            a) Athetosis
            b) Chorea
            c) Dystonia
            d) Tics
            e) Tremors
   b. Disorders of sensation
      i. Central
      ii. Peripheral
   c. Disorders of vision
      i. Visual field defects
      ii. Monocular and binocular blindness
      iii. Diplopia and gaze palsies
      iv. Nystagmus
      v. Pupillary abnormalities
   d. Cerebrovascular diseases
      i. Ischemic stroke
         1) Thrombolytics
a) Indications and use
b) Risks and benefits
   ii. Electroencephalogram
   iii. Visual, brain stem auditory and somatosensory evoked potential
   iv. Nerve conduction study and electromyography (NeuralScan)
   v. Muscle and nerve biopsy
   vi. Computed axial tomography with and without contrast
   vii. Magnetic resonance imaging with and without contrast
   viii. Magnetic resonance angiography
   ix. Angiography
   x. Myelography
   xi. Carotid ultrasound
   xii. Sleep study
   xiii. Genetic testing
   xiv. Positron emission tomography (PET) scanning
   xv. Single-photon emission computed tomography (SPECT) scanning

4. Management skills: (MK, PC)
   a. Formulating a diagnostic and management plan and assessing the need for expert advice with an awareness of the risks, benefits and costs of evaluation
   b. Understanding the role of a neurology specialist and the implications of special testing in patients who have neurologic disease and the implications of the test results for the patient
   c. Managing the prevalent and treatable conditions listed in this curriculum with consultation as appropriate
   d. Managing emergent neurology problems and obtaining urgent consultation when appropriate, including:
      i. Stroke
      ii. Coma
      iii. Meningitis and encephalitis
      iv. Status epilepticus
      v. Central nervous system trauma
      vi. Increased intracranial pressure
      vii. Acute visual loss
      viii. Rapidly progressive neurological deficit
      ix. Neurological respiratory failure
      x. Acute weakness
      xi. Altered mental status

5. Managing the family, cultural and psychosocial issues that accompany the long-term care of patients who have debilitating neurological conditions, including home and community care, the utilization of community resources, the use of a multi-disciplinary team and the primary role of the family physician as coordinator of long-term care. (PC, MK, ICS, SBP)

6. Continuing awareness of potential drug interactions and adverse drug effects, especially in elderly patients. (PC, MK, ICS)
   a. Understand the special needs of an adolescent patient’s issues of confidentiality and transition disorders.
7. Geriatric Issues: (MK, PC, ICS)
   a. Understand the normal clinical and radiological findings in the elderly
   b. Understand the special presentations of neurological disease in the elderly diagnosis, investigation and management of dementia
   c. Understand the effects of drugs in the elderly
   d. Understand the hospital-based and community services for the elderly
   e. Understand how to communicate with relatives and care agencies for the elderly and the importance of assessing, restoring and maintaining their functional capacity.

8. Understand end-of-life issues in neurological disorders, the role of palliative care services and ethical and legal aspects of terminal care.

Skills:

Objective: Upon completion of the training the resident will demonstrate the following competencies.

1. Evaluation skills: (MK, PC)
   a. Recognizing and defining the neurological problem
   b. To be able to take an appropriate focused and comprehensive history (including necessary information from others) and communicate this verbally or in writing and in summary form
   c. To be able to examine the mental and physical state (including a complete neurological and mental status examination, Glasgow coma scale and pediatric developmental exam) and communicate verbally or in writing and in summary form to other providers
   d. Using clinical knowledge to localize the lesion and formulate an ordered differential diagnosis based on an appreciation of the patient, his or her past history, current problems and likely causes
   e. Assessing the acuity and prognosis of the clinical problem as it relates to the need of immediate management and the requirement for expert assistance
   f. Formulating a rational plan for further investigation and management
   g. Knowing the indications, contraindications, risks and significance of ancillary test
      i. Lumbar puncture and its performance
      ii. Hemorrhagic stroke
      iii. Vasculitis
      iv. Transient ischemic attacks
      v. Symptomatic and asymptomatic carotid stenosis
      vi. Aneurismal disease
   a. Head and spinal cord trauma
      i. Evaluation
      ii. Management to include long-term complications
      iii. Consequences and prevention
   b. Multiple sclerosis
      i. Diagnostic criteria
      ii. Laboratory findings
      iii. Management
c. Dizziness and disorders of hearing
   i. Central vs. peripheral hearing loss
      1) Acute
      2) Chronic
   ii. Central vs. peripheral vertigo
      1) Acute
      2) Chronic
      3) Evocative testing (e.g., Dix-Hallpike maneuver)
   iii. Tinnitus

d. Disorders of higher cognitive function and communication
   i. Dementia
      1) Differential diagnosis
      2) Evaluation
      3) Management
   ii. Encephalopathy (acute, chronic)
      1) Toxic
      2) Metabolic
   iii. Aphasia and apraxia

e. Disorders of consciousness
   i. Syncope
   ii. Epilepsy
      1) Generalized at onset seizures
      2) Simple partial seizures
      3) Complex partial seizures
      4) Treatment
         a) Medical management with anticonvulsant medications
         b) Surgical management
         c) Vagal nerve stimulation
   iii. Recognition and treatment of increased intracranial pressure
   iv. Stupor and coma
      1) Toxic and metabolic
      2) Structural disease
      3) Herniation syndromes
   v. Brain death

f. Headache
   i. Migraine and variants
   ii. Cluster headache
   iii. Tension-type headache
   iv. Headache associated with a structural lesion
   v. Benign intracranial hypertension (pseudotumor cerebri)
   vi. Chronic daily headache
   vii. Emergent headaches
      1) Subarachnoid hemorrhage
      2) Meningitis
      3) Giant cell arteritis and temporal arteritis
g. Brain tumors
   i. Anterior or posterior fossa
      1) Primary
         a) Benign
         b) Malignant
      2) Metastatic
h. Infections (e.g., meningitis, encephalitis)
   i. Bacterial
   ii. Viral or retroviral (human immunodeficiency virus)
   iii. Fungal
   iv. Tuberculosis
   v. Prion disease
   vi. Parasitic (especially cysterciosis)
i. Spinal cord disorders
   i. Anatomy and localization
   ii. Extrinsic compressive lesions
   iii. Intrinsic lesions
j. Sleep disorders (e.g. central and peripheral sleep apnea, periodic limb movement disorder)
k. Disorders of peripheral nerve, neuromuscular junction and muscle
   i. Muscular dystrophy
   ii. Peripheral neuropathy
   iii. Mononeuritis multiplex
   iv. Myopathy
   v. Guillain-Barre syndrome
   vi. Myasthenia gravis
   vii. Plexopathy
   viii. Radiculopathy
   ix. Diagnostic studies (e.g., nerve conduction velocity, electromyography, neural scan, muscle biopsy)
l. Congenital disorders
   i. Brain and spinal cord malformations
      1) Arnold-Chiari malformation
      2) Meningomyelocele
      3) Cortical malformations
m. Chromosomal abnormalities (e.g., Down’s syndrome)
n. Abnormal head growth
   i. Microcephaly
   ii. Macrocephaly (including hydrocephalus)
o. Aberrant development
   i. Development delay
   ii. Mental retardation
   iii. Neurodegenerative diseases
p. Developmental disorders of higher cerebral function
   i. Mental retardation
   ii. Developmental language disorders
   iii. Learning disabilities (e.g., dyslexia)
   iv. Attention deficit disorder, with or without hyperactivity
   v. Pervasive developmental disorders (e.g., autism)
q. Psychiatric disorders mimicking neurological disease
   i. Non-epileptic spells (e.g., pseudoseizures)
   ii. Dementia of depression (e.g., pseudodementia)
   iii. Conversion disorder
   iv. Malingering
   v. Disorders of somatization and hypochondriasis

2. Principles of pain management: (MK, PC)
   a. Pharmacologic agents
   b. Surgical management
   c. Cognitive and behavioral techniques
   d. Interventions such as injections, nerve stimulation and nerve root ablation

3. The psychological and rehabilitation aspects of patient management, especially for chronic or long-term neurological conditions. The use of other specialties including physical/manipulation, massage, occupational therapy and integrative medicine adjuncts to patient management. (MK, PC, ICS)

4. An understanding of the neurological disabilities of elderly patients and the importance of assessing, restoring and maintaining their functional capacity. (MK, PC)

5. Neurological complications of systemic illness especially zoonotic diseases (such as cystercicosis) that affect the nervous system. (MK, PC)

6. Prevention of neurological disease. (MK, PC, SBP)

7. Special Situations:
   a. Understand the effect of pregnancy on existing neurological disorders and neurological disorders as complications of pregnancy

Attitudes:

Objective: Upon completion of the training the resident will demonstrate the following competencies.

1. A compassionate approach to the care of the patient who has a neurological disease in context of the patient's who have chronic disorders. (P, PC, ICS)
2. The recognition of the importance of family, home and social support in the overall life of patients who have neurological disease. (P, PC, ICS)
3. The recognition of the physician’s own level of competence in handling neurological problems and the need for further consultation as appropriate. (ICS, PC, SBP)
4. The utilization of self-directed learning toward further knowledge and competence in neurology. (P, MK, SBP)
5. An understanding of the role played by the neurology consultant and the concept of shared care for certain neurological conditions. (One example is the progressive disease of multiple sclerosis, where the patient may be stable and managed routinely
by a family physician, but may also need periodic consultation by a neurology specialist.) (PC, P, MK, SBP)

6. Support of the patient through the process of consultation, neurological evaluation, treatment, rehabilitation and possible long-term neurological degeneration. (P, PC)