1. **Introduction**

   Up to 10% of patients seen by family practitioners present with neurologic symptoms and pose neurologic questions to their physicians. Only 16% of the 45 million Americans who visit a physician for a chief complaint referable to the nervous system are ever evaluated by neurologists. Clearly, primary care physicians are routinely called upon to evaluate and manage patients with neurologic disease. Practicing physicians require a firm understand of the general principles of clinical neurology. The most suitable setting in which to lay the foundation for that understanding is in a neurology clerkship in the clinical phase of medical school.

2. **Goals and Objectives of the Clinical Neurology Clerkship**

   A. **Goal**

   To teach the principles and skills underlying the recognition and management of the neurologic diseases a general medical practitioner is likely to encounter in practice.

   B. **Objectives**

   1. To impart or reinforce the following **KNOWLEDGE:**

      a) the ability to recognize symptoms that may signify neurologic disease (including disturbances of consciousness, cognition, language, vision, hearing, equilibrium, motor function, somatic sensation, and autonomic function)

      b) the ability to distinguish normal from abnormal findings on a neurologic examination

      c) the ability to localize the likely site or sites in the nervous system where a lesion could produce a patient’s symptoms and signs

      d) the ability to formulate a differential diagnosis based on lesion localization, time course, and relevant historical and demographic features

      e) an awareness of the use and interpretation of common tests used in diagnosing neurologic disease

      f) an awareness of the principles underlying a systematic approach to the management of common neurologic diseases (including the recognition and management of situations that are potential emergencies)

      g) an awareness of situations in which it is appropriate to request neurologic consultation

   2. To teach or reinforce the following **SKILLS:**

      a) the ability to obtain a complete and reliable history

      b) the ability to perform a focused and reliable neurologic examination [see Appendix 1]

      c) the ability to examine patients with altered level of consciousness or abnormal mental status [see Appendix 3]

      d) the ability to deliver a clear, concise, and thorough oral presentation of a patient’s history and examination
e) the ability to prepare a clear, concise, and thorough written presentation of a patient’s history and examination
f) [Ideally] the ability to perform a lumbar puncture
g) the ability to review and interpret the medical literature (including electronic databases) pertinent to specific issues of patient care

3. To teach or reinforce the following ATTITUDES:
a) treat patients with compassion and respect their privacy and personal dignity at all times
b) exhibit honesty and act with integrity in all patient, collegial, and professional interactions
c) demonstrate an understanding of the roles of other health care professionals and the means of collaboration with those individuals in providing medical care or promoting health
d) demonstrate an understanding of the need to ameliorate the suffering of patients, including but not limited to the relief of pain, and the knowledge of the means to continue to care for dying patients when disease-specific treatment is no longer useful or available

3. Content of subjects to be taught
A. The Neurologic Examination (as an integral component of the general medical examination)
   1. how to perform a focused but thorough neurologic examination [see Appendix 1]
   2. how to perform a screening neurologic examination [see Appendix 2]
   3. how to perform a neurologic examination on patients with an altered level of consciousness [see Appendix 3]
   4. How to recognize and interpret abnormal findings on the neurologic examination

B. Localization - general principles differentiating lesions at the following levels
   1. Cerebral hemisphere
   2. Posterior fossa
   3. Spinal cord
   4. Nerve root/Plexus
   5. Peripheral nerve (mononeuropathy, polyneuropathy, and mononeuropathy multiplex)
   6. Neuromuscular junction
   7. Muscle

C. Symptom Complexes - a systematic approach to the evaluation and differential diagnosis of patients who present with:
   1. Focal weakness
   2. Diffuse weakness
   3. Clumsiness
   4. Involuntary movements
   5. Gait disturbance
   6. Urinary or fecal incontinence
   7. Dizziness
8. Vision loss
9. Diplopia
10. Dysarthria
11. Dysphagia
12. Acute mental status changes
13. Dementia
14. Aphasia
15. Headache
16. Focal pain
   a. facial pain
   b. neck pain
   c. low back pain
   d. neuropathic pain
17. Numbness or paresthesias
18. Transient or episodic focal symptoms
19. Transient or episodic alteration of consciousness
20. Sleep disorders
21. Developmental disorders

D. Approach to Specific Diseases - general principles for recognizing, evaluating and managing the following neurologic conditions (either because they are important prototypes, or because they are potentially life-threatening):
   1. Potential emergencies
      a. Increased intracranial pressure
      b. Toxic-metabolic encephalopathy
      c. Subarachnoid hemorrhage
      d. Meningitis/Encephalitis
      e. Status epilepticus
      f. Acute stroke (ischemic or hemorrhagic)
      g. Spinal cord or cauda equina compression
      h. Head trauma
      i. Acute respiratory distress due to neuromuscular disease (e.g., myasthenic crisis or acute inflammatory demyelinating polyradiculoneuropathy)
      j. Temporal arteritis
   2. Strokes
   3. Seizures
   4. Alzheimer’s disease
   5. Parkinson’s disease
   6. Essential tremor
   7. Multiple sclerosis
   8. Migraine
   9. Bell’s palsy
   10. Carpal tunnel syndrome
   11. Diabetic polyneuropathy
   12. Brain death
Appendix 1: Guidelines for a Comprehensive Neurologic Examination

All medical students should be able to perform the following parts of the neurologic examination.

A. Mental Status
   1. Level of alertness
   2. Language function (fluency, comprehension, repetition, and naming)
   3. Memory (short-term and long-term)
   4. Calculation
   5. Visuospatial processing
   6. Abstract reasoning

B. Cranial Nerves
   1. Vision (visual fields, visual acuity, and funduscopic examination)
   2. Pupillary light reflex
   3. Eye movements
   4. Facial sensation
   5. Facial strength (muscles of facial expression and muscles of facial expression)
   6. Hearing
   7. Palatal movement
   8. Speech
   9. Neck movements (head rotation, shoulder elevation)
   10. Tongue movements

C. Motor Function
   1. Gait (casual, on toes, on heels, and tandem gait)
   2. Coordination (fine finger movements, rapid alternating movements, finger-to-nose, and heel-to-shin)
   3. Involuntary movements
   4. Pronator drift
   5. Tone (resistance to passive manipulation)
   6. Bulk
   7. Strength (shoulder abduction, elbow flexion/extension, wrist flexion/extension, finger flexion/extension/abduction, hip flexion/extension, knee flexion/extension, ankle dorsiflexion/plantar flexion)

D. Reflexes
   1. Deep tendon reflexes (biceps, triceps, brachioradialis, patellar, Achilles)
   2. Plantar responses

E. Sensation
   1. Light touch
   2. Pain or temperature
   3. Proprioception
   4. Vibration
Appendix 2: Guidelines for a Screening Neurologic Examination

All medical students should be able to perform a brief, screening neurologic examination that is sufficient to detect significant neurologic disease even in patients with no neurologic complaints. Although the exact format of such a screening examination may vary, it should contain at least some assessment of mental status, cranial nerves, gait, coordination, strength, reflexes, and sensation. One example of a screening examination is given here.

A. Mental status (level of alertness, appropriateness of responses, orientation to date and place)

B. Cranial nerves
   1. Visual acuity
   2. Pupillary light reflex
   3. Eye movements
   4. Hearing
   5. Facial strength (smile, eye closure)

C. Motor function
   1. Gait (casual, tandem)
   2. Coordination (fine finger movements, finger-to-nose)
   3. Strength (shoulder abduction, elbow extension, wrist extension, finger abduction, hip flexion, knee flexion, ankle dorsiflexion)

D. Reflexes
   1. Deep tendon reflexes (biceps, patellar, Achilles)
   2. Plantar responses

E. Sensation (one modality at toes-can be light touch, pain/temperature, or proprioception)

Note: If there is a reason to suspect neurologic disease based on the patient’s history or the results of any components of the screening examination, a more complete neurologic examination may be necessary.

Appendix 3: Guidelines for the Neurologic Examination in Patients with Altered Level of Consciousness

A. Mental Status
   1. Level of arousal
   2. Response to auditory stimuli (including voice)
   3. Response to visual stimuli
   4. Response to noxious stimuli (applied centrally and to each limb individually)

B. Cranial Nerves
   1. Response to visual threat
   2. Pupillary light reflex
3. Oculocephalic (doll’s eyes) reflex
4. Vestibulo-ocular (cold caloric) reflex
5. Corneal reflex
6. Gag reflex

C. Motor Function
   1. Voluntary movements
   2. Reflex withdrawal
   3. Spontaneous, involuntary movements
   4. Tone (resistance to passive manipulation)

D. Reflexes
   1. Deep tendon reflexes
   2. Plantar responses

E. Sensation (to noxious stimuli)