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Neurologic History Taking, Localization, and Differential Diagnosis 3

James M. Noble

KEY POINTS

1. A high yield neurologic history requires a structured approach, framed around a solid basis of knowledge of disease localization and etiologies.
2. Organization of the neurological history is framed around common diagnoses and can't miss diagnoses, considered with frequently encountered neurologic problems.
3. Universal elements of the history, including past medical history, review of systems, and social and family histories are specifically framed to an appropriate neurologic context.
4. Diagnostic reasoning follows the synthesis of a well-rounded history and the neurologic examination and may lead to rereview of the history to clarify unexpected findings.

INTRODUCTION TO CLINICAL DIAGNOSTIC REASONING

Making a neurologic diagnosis requires a systematic approach to the patient, built on a foundational awareness of neuroanatomy and a broad range of neurologic diseases, and paths toward establishing a diagnosis in each. The history and physical examination provide essential, complementary, and readily accessible data. Together, they comprise the most meaningful information of the initial (and often subsequent) steps of clinical diagnostic reasoning, informing the diagnostic workup, and treatment plans. This chapter discusses the approach to developing a patient-specific neurologic history and should be reviewed in context with the neurologic examination (specifically covered in Chapter 4 and further in Section III: Common Problems in Neurology) and selective use of diagnostic testing (Section IV: Diagnostic Tests).

INTENTIONAL EXPLORATION OF THE PATIENT HISTORY

Fundamental to assessment of any patient presenting with a neurologic problem is development of the history specifically tailored to the patient. In neurology, this task can at first seem challenging and relates to the complexities of nervous system and a broad array of presentations of different kinds of neurologic disorders, as well as potentially subtle differences within each group of disorders. It is therefore necessary to know which diagnostic possibilities are reasonable considerations for a particular patient, best accomplished by starting with a broad approach. A strong determinant of ultimately missing a diagnosis is not considering it early on in the diagnostic search. Furthermore, overreliance on laboratory tests and technology can lead to a scattershot approach that is uninformed by clinical reasoning and appropriate differential diagnosis and most importantly prone to errors and delaying appropriate therapy.

The clinical data obtained by a careful history and physical examination are used to address four questions:

- **What anatomic structures of the nervous system are affected?** It is usually not possible to make a specific etiologic diagnosis without knowing what parts of the nervous system are affected. In addition, knowing the probable anatomic substrate restricts the etiologic possibilities. Thus, making an accurate *anatomic diagnosis* should be the first step in analyzing a neurologic disorder. Clues to identifying the anatomic sites of neurologic disorders are discussed in the following section and later in this chapter.
- **What is the nature of the neurologic disorder?** An individual patient's symptoms usually cluster into broad syndromes or categories of disease: developmental disorder, peripheral neuropathy, acute encephalopathy, progressive dementia, parkinsonian syndrome, cerebrovascular syndrome, and so on. A syndromic diagnosis assists in clarifying the nature of the disease and further focuses on possible specific causes.
- **What are the most likely etiologies for the patient's illness?** These derive from consideration of the anatomic and syndromic diagnoses in light of the tempo (rapid or slow) and course (fixed from onset, steadily progressive, or stepwise) of the illness, relevant past history and family history, and whether there is evidence of systemic involvement. The possible etiologies listed in order of probability constitute the differential diagnosis, and this in turn determines which laboratory tests need to be ordered and the urgency with which the evaluation should proceed.
- **What diagnostic possibility cannot be missed?** As much as it is important to focus on the most likely diagnosis, it is also important to effectively assess and hopefully exclude a "can't miss" diagnosis, which could lead to morbidity or mortality. Of course, sometimes, the most likely diagnosis is the most serious "can't miss" diagnosis.

An experienced clinician will likely deal with these four questions simultaneously and differing orders, patient to patient. To take an obvious example, if a patient suddenly becomes speechless

or awakens with a hemiplegia, the diagnosis of stroke is made. The location and etiology of a large and potentially fatal stroke in the territory of the dominant hemisphere's middle cerebral artery is then deduced from findings made on examination, further confirmed by neuroimaging. If there are no surprises in the imaging study (eg, demonstration of a tumor or vascular malformation), further laboratory tests might be considered to determine the precise cause of an ischemic infarct.

Identifying Localization

Aspects of the patient's history may suggest the nature of the disorder; specific symptoms, corroborated by signs on examination can suggest the site of the disorder. These are shown further in **Table 3.1**.

TABLE 3.1 Approach to Diagnosis Based on Localizing Features in the History

Probable Localization	Key Features in the History
Cerebral	• Seizures or focal symptoms that may be attributed to a particular area of the brain: hemiplegia, aphasia, or hemianopia are examples. • Generalized manifestations of cerebral disease are seizures, delirium, and dementia.
Brainstem disease	• Cranial nerve palsies, cerebellar signs of ataxia of gait or limbs, tremor, or dysarthria. • Crossed features (eg, contralateral face vs arm and leg weakness) • Dysarthria may be the result from incoordination in disorders of the cerebellum itself or its brainstem connections. • Cranial nerve palsies or the neuromuscular disorder of myasthenia gravis may also impair speech. • Ocular signs have special localizing value.
Basal ganglia	• Involuntary movements including tremor
Spinal cord	• Spastic gait disorder and bilateral corticospinal signs, with or without bladder symptoms • If there is neck or back pain, a compressive lesion should be suspected. • If there is no pain, demyelinating disease is likely. • The level of a spinal compressive lesion is more likely to be indicated by cutaneous sensory loss than by motor signs. • The lesion that causes spastic paraparesis may be anywhere above the lumbar segments.
Peripheral nerve disease	• Usually causes both motor and sensory symptoms (eg, weakness and loss of sensation). The weakness is likely to be more severe distally, and the sensory loss may affect only position or vibration sense. • More specific localization follows segmental or dermatomal loss of sensation.
Neuromuscular junction disorders and myopathic diseases	• Limb or cranial muscle weakness without sensory symptoms • Cramping suggests myopathic disorders but can also be reported in motor neuron and basal ganglia diseases. • Fatigability and/or facilitation of strength with repeated activity suggests a neuromuscular junction disorder.

HISTORY OF PRESENT NEUROLOGIC ILLNESS

Sources of Information

A reliable and accurate history is essential and should be obtained directly from the patient whenever possible. However, in neurologic disorders, it is often necessary to verify the patient's account or obtain additional information by speaking with relatives or close friends. Corroborating and developing the history through collateral sources is particularly important if the illness has compromised the patient's cognitive abilities, especially if memory or language is impacted.

Electronic health systems have enabled rapid discovery and communication of past history, but they have also become prone to plagiarism and riddled with diagnostic inaccuracies carried forward or diagnostic momentum carried in the wrong direction. Whenever possible, obtain information from primary sources and verify them through direct, first-hand means.

Approach to Taking the History

The manner in which questions are asked can have a strong impact on findings and impressions developed from the neurologic history LEVEL 1.[1] Whenever possible, begin with asking open-ended questions and transition to targeted questions based on the differential being formulated around the presenting problem ("chief complaint"). To avoid errors, it is important that the physician avoids leading questions and clarifies what the patient means by ambiguous terms, such as *dizziness* or *weakness*. These more focused questions are intended to refine the likelihood of disorders in the differential diagnosis. Along with confirming questions, questions should be asked to refute unlikely considerations or to explore for potentially similar syndromes or competing causes. For example, in a patient being evaluated for seizure, a series of questions exploring for potential cardiogenic cause of syncope would be necessary, given overlapping features including sudden loss of consciousness as well as observed ictal behavior. Discrepancies and inconsistencies in details obtained by different examiners are often the source of diagnostic confusion and must be resolved.

The initial approach to developing the history is principally informed and shaped by a well-rounded neurologic knowledge and broad-based experience inherent to the interviewing physician. Knowledge gaps are thought to be the primary pitfall in diagnostic reasoning errors. Experience and knowledge can enable generation of *illness scripts*, which are vignettes of prototypical cases of disease against which a clinician can judge the relative fit of the patient being interviewed. Similarly, some experienced clinicians may be able to draw on error scripts, identifying prior pitfalls in diagnostic thinking in order to refine the diagnosis. Depending on the context, inherent cognitive biases, or "cognitive dispositions to error," may further influence how clinicians synthesize a diagnosis.

Primary Components of the History

Localization

In evaluating most patients with neurologic symptoms, determining localization is the most essential component of the neurologic history. To a patient, *location* can describe where in the

TABLE 3.2 Neurologic Histories Based on Common Neurologic Problems *(continued)*

Neurologic Problem	Common Features to Explore	Concerning Features
Movement disorders	• Age at onset and progression • Changes in handwriting, cutting food, and impairment with other dexterous movements • Slowness • Gait changes and tripping/falling hazards (slower pace, imbalance, and falls) • Tremors, fidgeting (chorea), jerking (myoclonus), and other observable adventitious movements • Voice changes • Dream enactment and other sleep disorders • Cognitive impairment • Autonomic dysfunction • Medication history and responses • Medical history for hepatic and renal disease, parathyroid disorders, diabetes, HIV, cardiac disease, and syncope • Explore for potential exposure to agricultural pesticides, heavy metals, and substance abuse. • Detailed family history for movement disorders and other neurodegenerative disorders • Identify social support network.	• Young onset • Rapid progression • Poor medication responsiveness • Gait instability and falls • Dysphagia and choking • Cognitive impairment or behavioral changes • Incomplete monitoring and support suggesting emerging risk for catastrophic injury • Constitutional symptoms, toxic exposure, or recent febrile illness immediately preceding onset
Peripheral neuropathy and neuromuscular disorders	• Localization and pattern of primary features: laterality, proximal vs distal, diffuse vs focal/segmental • Age at onset • Onset, progression, and course • Recovery vs cumulative burden • Determination of presence and severity of sensory and motor symptoms • Spontaneous sensory symptom review: paresthesias, allodynia, dysesthesia, hyperalgesia, hyperpathia, spontaneous pain • Motor symptoms: weakness, speech, swallowing, diplopia, diurnal variability, influence of activity, fasciculations, cramps/pain, balance • Medical history for systemic disease: cardiac and other autonomic symptoms, recent infections, vaccinations, rash, and travel	• Constitutional symptoms • Rapidly progressive symptoms • Dysphagia or dysarthria suggesting motor neuron disease
Diseases of the spinal cord	• Onset, course, and precipitating factors • Precipitating factors, including trauma or repetitive physically demanding activities • Aggravating/alleviating factors or positions leading to motor, sensory, and pain symptoms • With pain, explore quality, radiating and radicular features, and provocative factors • Location, severity, and functional impact • Bowel, bladder, and sexual function • Perineal sensation • Medical history including malignancy, infection, immunosuppression, and recent spinal instrumentation	• Acute presentation for any disorder • Any presentation suggesting spinal cord localization • Urinary retention or loss of bowel/bladder function • Pain suggesting central spinal, cauda equina, or conus medullaris localization • Respiratory compromise suggesting diaphragmatic weakness • Autonomic dysregulation
Central nervous system tumor	• New-onset headache, seizures, cognitive decline (as reviewed in this table) • Loss of consciousness • Focal or multifocal neurologic symptoms	• New headache or unusual headaches for patient • Positional component suggesting increased intracranial pressure • Constitutional or general symptoms suggesting metastatic disease
Infections of the nervous system	• Onset, progression, and duration • Headache • Fever • Neck pain • Change in alertness • Focal neurologic deficits • Worsening or new back pain • Chronic risk factors for neurologic infection: immunosuppression, head trauma, recent ENT or neurosurgical instrumentation, sick contacts or travel to endemic areas of suspected infection, IV drug abuse, ongoing systemic infection	• Fever • Rapid onset of symptoms • Decreased or decreasing level of alertness • Possible or obvious seizures • Hypotension

(table continues on page 22)

TABLE 3.2 Neurologic Histories Based on Common Neurologic Problems *(continued)*

Neurologic Problem	Common Features to Explore	Concerning Features
Seizures	• Age at onset • Semiology of seizures (localization/onset including "aura," progression of observable features, subtle features) • Timing, frequency, and duration of seizures • Symptoms known to be associated with various epilepsy syndromes • Associated cognitive and other neurologic disorders. • Explore for seizure mimics (headache, stroke, syncope). • Anticonvulsant medication history including responses (control, side effects, and compliance) • Precipitating factors (fever, medication, sleep deprivation, photic stimulation) • Risk factors for focal brain injury throughout a lifespan • Chronic medical problems (metabolic, psychiatric, malignant, infections) • Psychosocial impact of recurrent seizures • Family history	• New-onset seizures • Worsening seizure control with established epilepsy • Constitutional symptoms • Interictal features to suggest structural brain disease (headaches, focal symptoms, cognitive, or personality change)
Stroke	• Timing and duration, including last observed normal point in time • Contraindications to acute thrombolytic care and/or thrombectomy • Etiology and risk factors for cardioembolic, thromboembolic, small vessel, venous, inflammatory, and genetic syndromes, including compliance with therapy for known risk factors • Localization based on syndromes with known vascular territory • Stroke mimics or other neurologic features (headache, stroke, seizures, known recent history of severe hypoglycemia)	• Suggestion of large territory or posterior fossa localization, suggesting risk for immediate worsening • Rapid clinical worsening • Hemodynamic instability
Stupor and coma	• Last known normal • Potential precipitating factors or any known subtle recent symptoms • History of loss of consciousness • Constitutional symptoms • History of alcohol abuse • Family history, particularly for aneurysms, polycystic kidney disease, or connective tissue disease	• Recurrent seizures or status epilepticus • Suggestion of herniation syndrome or other indicators of critical intracranial pressure • Apnea

Abbreviations: ENT, ear, nose, and throat; HIV, human immunodeficiency virus; IV, intravenous.

of health and likely serve as surrogates for a complex and highly variable life experiences tied to income, employment, job and food security, diet, systemic racism and other sources of stress, physical health, and access to health care. Many of these factors interrelate. Often, many of these elements are challenging to discover or are not revealed in brief encounters.

Although alcohol, tobacco, and substance use/abuse are often recorded within the social history, their inclusion may be more relevant in the medical history, particularly if it has been chronically present or likely causal to various health conditions. Accurate identification of acute/recent use may be particularly relevant in neurologic patients presenting with acute cognitive disorders such as delirium, stroke, and ataxia. Some synthetic substances abused may not be detectable and require a definitively derived history.

Travel and Occupational History

A review of recent travel can be instructive for potential exposure to potentially rare or uncommon infections. It may also be the case that infections acquired while traveling are common yet uncommonly seen by the evaluating physician once the patient has returned home. Travel can also lead to preventative therapies used in advance of exposure to endemic infections, and these treatments may be associated with neurologic or psychiatric side effects. Travel can also be important in exploring for exposures to prolonged positions, such as deep vein thrombosis associated with long airline travel (and a risk factor in paradoxical stroke). Travel can also reveal subtle or unrecognized cognitive disorders, when a patient is placed in unfamiliar or confined locations, or subject to circadian disturbances leading to unexpected or severe symptoms of jetlag.

Occupational and vocational exposures as well as hobbies are important to explore given potential relevance to neurologic disorders. Toxic exposures are found in some occupations or hobbies (welders and chemists among others). Adverse ergonomics may be common with some hobbies (video gaming), occupations (computer use, manual laborers), or habituations (assumed posture while seated) and lead to a host of problems due to focal compression, including sciatica and lumbar spondylosis, fibular neuropathy, carpal tunnel syndrome, cervicalgia and cervical spinal stenosis, and ulnar neuropathy at the olecranon.

Dietary and Nutritional History

Diet and nutrition are infrequently explored in practice but can be informative in revealing nutritional deficiencies and food avoidant behaviors. Patients with developmental disorders and autism may be especially susceptible to unrecognized progressive restriction in diet and may further manifest with atypical or challenging symptoms. Persons subject to displacement, famine, or marginalization are especially susceptible to extrinsically narrowed diets due to access, due to finances, or general access food in order to satisfy caloric needs as well as a full array of micronutrients including vitamins with known neurologic micronutrient deficiency syndromes. Persons at risk for malabsorption or malnutrition including anorexia/bulimia, cystic fibrosis, ulcerative colitis/Crohn disease, and irritable bowel disease may be especially susceptible to vitamin deficiencies. Although uncommon, persons having undergone bariatric surgery may develop