Approach to common neurological symptoms

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Approach to Common Neurological Symptoms

- Neurological diagnosis is sometimes easy, sometimes quite challenging, and specialized skills are required
- In all disciplines of medicine, symptomatology and clinical examination are key to achieving an accurate diagnosis
- Particularly true in neurology
- Unique to neurology is emphasis on localization and phenomenology
- Abdominal or chest symptoms, the localization is practically established and etiology is the primary concern

Approach to Common Neurological Symptoms

- In clinical neurological practice, a patient with a weak hand may localize to muscles, neuromuscular junction, nerves in the upper limb, brachial plexus, spinal cord or brain
- First localization is important, then a focused list of potential causes of problems
- Recognizing phenomenology is important
- Tremor and stereotypy both rhythmical movements
- Tics, myoclonus, chorea, all jerk like movements
- History provides the best clues to localization, disease mechanisms and etiology
- Examination is essential for localization confirmation and appropriate disease categorization
- All critical for proper diagnosis and treatment

Approach to Common Neurological Symptoms

Disorders of Motility
- Paralysis and Weakness
- Disorders of Movement and Posture
- Ataxia and Disorders of Cerebellar function
- Disorders of Stance and Gait

Pain and Disorders of Somatic Sensation
- Pain
- Disorders of Non-Painful Somatic Sensation
- Headache and Other Craniofacial Pains
- Pain in the Back, Neck, and Extremities

Disorders of the Special Senses
- Disorders of Smell and Taste
- Disturbances of Vision
- Disorders of Ocular Movement and Pupillary Function
- Deafness, Dizziness, and Disorders of Equilibrium

Epilepsy and Disorders of Consciousness
- Epilepsy and Other Seizure Disorders
- Coma and Related Disorders of Consciousness
- Faintness and Syncope
- Sleep and Its Abnormalities

Derangements of Intellect, Behavior, and Language Caused by Diffuse and Focal Cerebral Disease
- Delirium and Other Acute Confusional States
- Dementia, the Amnesic Syndrome, Neurology of Intelligence and Memory
- Lesions in Specific Parts of the Cerebrum
- Disorders of Speech and Language

Diseases of spinal cord, Peripheral nerve, and Muscle
- Spinal Cord
- Peripheral Nerves
- Cranial Nerves
- Muscle
- Neuromuscular Junction
- Myotonias

Approach to Common Neurological Symptoms

Disorders of Energy, Mood, and Autonomic and Endocrine Functions

Fatigue, Asthenia, Anxiety, and Depression

Limbic Lobes and the Neurology of Emotion

Disorders of the Autonomic Nervous System, Respiration, and Swallowing

Hypothalamus and Neuroendocrine Disorders

MAJOR CATEGORIES OF NEUROLOGIC DISEASE

Disturbances of Cerebrospinal Fluid, Hydrocephalus, Pseudotumor Cerebri, and Low-Pressure Syndromes

Intracranial Neoplasms and Paraneoplastic

Bacterial, Fungal, Spirochetal, and Parasitic

Viral Infections and Prion

Stroke and Cerebrovascular

Multiple Sclerosis and Other Inflammatory Demyelinating

Inherited Metabolic

Developmental

Degenerative

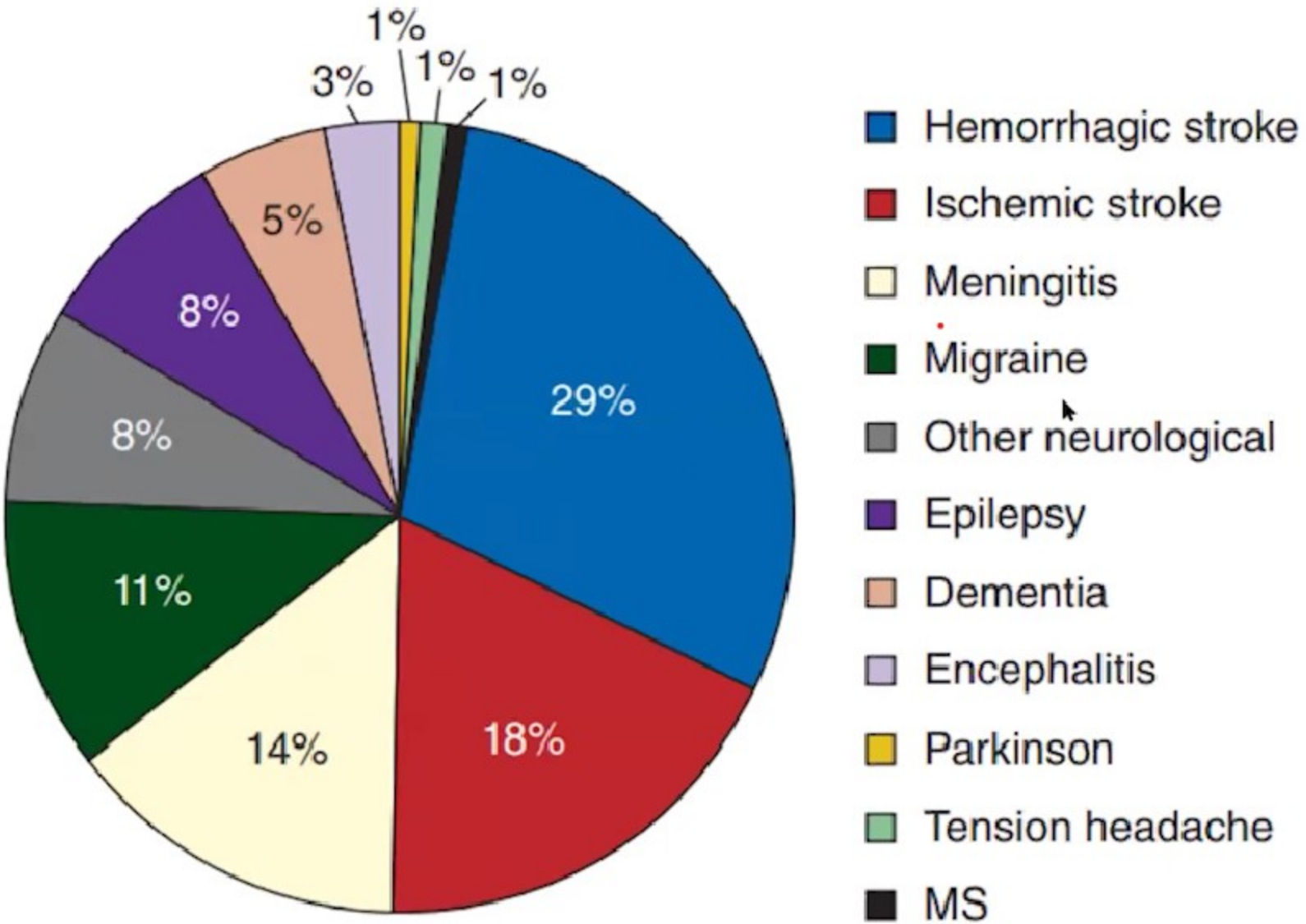
Acquired Metabolic

Nutritional Deficiency

Pathophysiological Mechanisms

- Inflammatory / Demyelinating
- Infectious
- Non-infectious (autoimmune)
- Vascular
    - Arterial
    - Venous
- Compressive / infiltrative
- Neoplastic
- Non-neoplastic
- Degenerative / hereditary
- Toxic / metabolic / nutritional
- Trauma
- Disorders of intracranial pressure

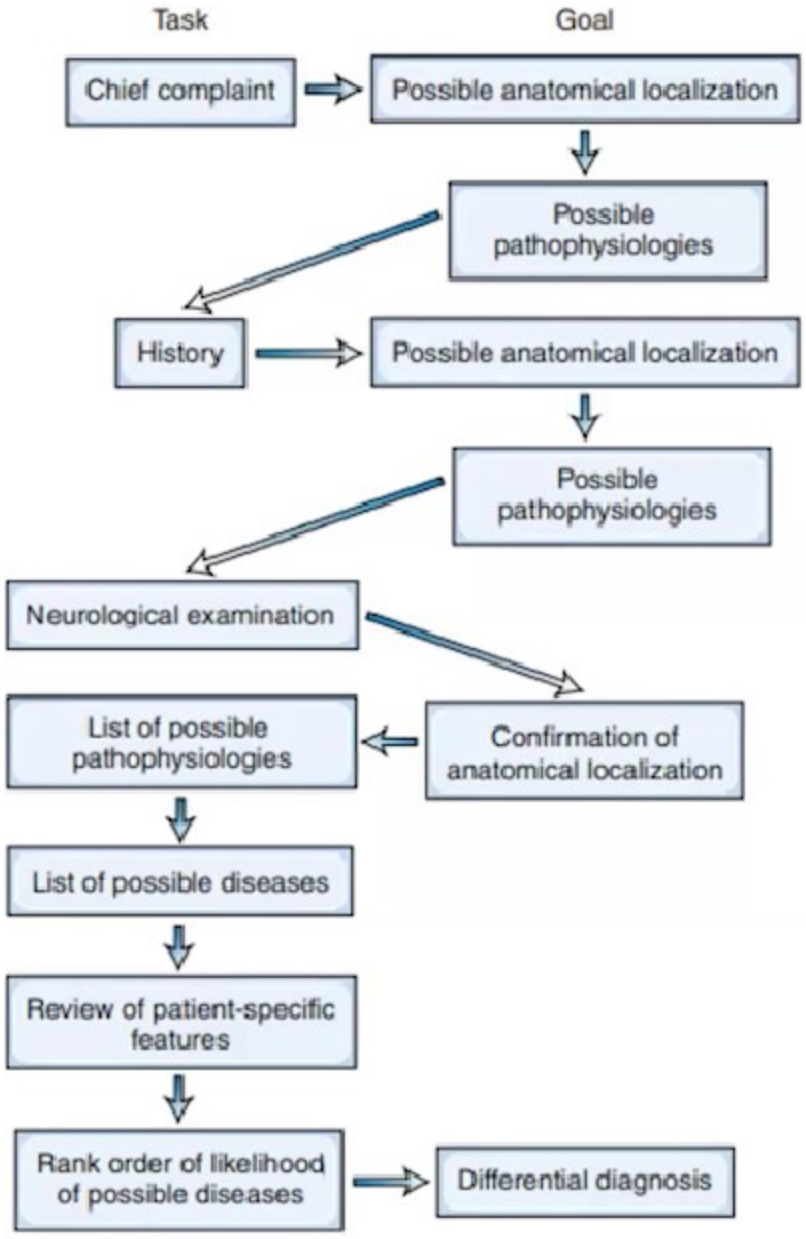
Neurological disorders



Prevalence of major neurologic disorders in USA

	INDIVIDUALS AFFECTED
Degenerative diseases	
Amyotrophic lateral sclerosis	5×10^4
Huntington disease	5×10^4
Parkinson disease	5×10^6
Alzheimer disease	5×10^6
Macular degeneration	5×10^7
Autoimmune neurologic diseases	
Multiple sclerosis	4×10^5
Stroke, all types	5×10^6
Central nervous system trauma	
Head	2×10^6
Spinal cord	2.5×10^5
Metabolic	
Diabetic retinopathy	2×10^6
Headache	3×10^7
Epilepsy	3×10^6
Back pain	5×10^7
Peripheral neuropathy	
Total	2.5×10^7
Inherited	1×10^4
Diabetic neuropathy	2×10^6
Mental retardation	
Severe	1×10^6
Moderate	1×10^7
Schizophrenia	3×10^6
Manic depressive illness	3×10^6

Diagnostic Path



Headache and Other Craniofacial Pains

Pain structures [Dura / arteries / veins/sinuses/periosteum/nerves]

- Migraine
- Chronic sinusitis
- Meningeal disease - Neuroinfection
- Parenchymal – Brain tumour / Demyelination
- Vascular – Temporal Arteritis
- Nerve – Trigeminal Neuralgia
- Tension type Headache

Vertigo / Dizziness

SYNDROME	NEUROLOGIC FINDINGS	DISORDERS OF EQUILIBRIUM	TYPE OF NYSTAGMUS[a]	HEARING
Labyrinths (postural vertigo, trauma, Ménière disease, aminoglycoside toxicity, labyrinthitis)	None	Ipsilateral past pointing and lateral propulsion to side of lesion	Horizontal or rotary to side opposite lesion, positional and position changing, fatigable	Normal or conduction or neurosensory deafness with recruitment
Vestibular nerve and ganglia (vestibular neuronitis, herpes zoster)	Auditory eighth and seventh cranial nerve abnormalities; abnormal head impulse test to affected side	Ipsilateral past pointing and lateral propulsion to side of lesion	Unidirectional positional	Sometimes sensorineural deafness, without recruitment (vestibulolabyrinthitis)
Cerebellopontine angle (acoustic neuroma, glomus and other tumors)	Ipsilateral fifth, seventh, ninth, tenth cranial nerves, cerebellar ataxia Increased intracranial pressure (late)	Ataxia and falling ipsilaterally	Gaze-paretic, positional, coarser to side of lesion	Sensorineural deafness without recruitment
Brainstem and cerebellum (infarcts, tumors, viral infections)	Multiple cranial nerves, brainstem tract signs, cerebellar ataxia	Ataxia present with eyes open	Coarse horizontal and vertical, gaze-paretic	Usually normal
Higher (cerebral) connections	Aphasia, visual field, hemimotor, hemisensory, and other cerebral abnormalities, seizures	No change	Usually absent	Normal

Auditory cause common

BPPV

Meniere's disease

Vestibular neuronitis

CP angle tumor

Brainstem lesions

Syncope

Arrhythmias:
- Bradyarrhythmias
- Tachyarrhythmias
- Reflex arrhythmias (temporary sinus pause or bradycardia)

Decreased cardiac output:
- Outflow obstruction
- Inflow obstruction
- Cardiomyopathy
- Hypovolemic

Hypotensive:
- Vasovagal attack
- Drugs
- Dysautonomia

Cerebrovascular:
- Carotid disease
- Vertebrobasilar disease
- Vasospasm
- Takayasu disease

Metabolic:
- Hypoglycemia
- Anemia
- Anoxia

Hyperventilation

Multifactorial:
- Vasovagal (vasodepressor) attack
- Cardiac syncope
- Situational: cough, micturition, defecation, swallowing, diving, Valsalva maneuver

- Cardiac causes commonest
- Cerebrovascular disorders
- Seizures
- Metabolic causes
- Micturition

Syncope vs. seizure

Features	Syncope	Seizure
Relation to posture	Common	No
Time of day	Diurnal	Diurnal or nocturnal
Precipitating factors	Emotion, injury, pain, crowds, heat, exercise, fear, dehydration, coughing, micturition, venipuncture, prolonged standing	Sleep deprivation, drug/alcohol withdrawal, illness, medication nonadherence
Skin color	Pallor	Cyanosis or normal
Diaphoresis	Common	Rare
Aura or premonitory symptoms	Often minutes or longer, but can be very brief	Brief
Convulsion	Rare	Common
Other abnormal movements	Minor irregular twitching	Rhythmic jerks
Injury	Rare	Common (with convulsive seizures)
Urinary incontinence	Rare	Common
Tongue biting	No	Common with convulsive seizures
Postictal confusion	Rare	Common
Postictal headache	No	Common
Focal neurological signs	No	Occasional
Cardiovascular signs	Common to have low blood pressure and heart rate during event; cardiovascular exam may be completely normal after event unless there is an underlying cardiac disorder	Rare
Abnormal findings on EEG	Rare (generalized slowing may occur during the event)	Common

Falls and drops

Drop Attacks

With loss of consciousness:
- Syncope
- Seizures

Without loss of consciousness:
- Transient ischemic attacks:
  - Vertebrobasilar insufficiency
  - Anterior cerebral artery ischemia
- Third ventricular and posterior fossa tumors
- Chiari malformation
- Otolithic crisis
  - Cataplexy

Falls

Neuromuscular disorders (neuropathy, radiculopathy, and myopathy)

Cerebral or cerebellar disorders

Cryptogenic falls in the middle-aged

Aging, neurodegeneration, and the neural substrate of gait and balance:
- Fear of falling
- Basal ganglia disorders:
  - Parkinson disease
  - Progressive supranuclear palsy and other parkinsonian syndromes
- The aged state

- Syncope
- Seizures
- Cerebral Ischemia
- Third ventricular tumors
- Auditory causes

- Weakness (buckling)
- Cerebellar ataxia
- Pyramidal weakness (Tripping)
- Postural instability

Pain in the Back, Neck, and Extremities

- Cervical and Lumbosacral spondylosis
- Spondolytic lumbar radiculopathy
- Facet joint Arthropathy
- Congenital anomalies of spine
- Degenerative osteoarthritis
- Bone infection and Metastases in spine

Causes of episodic visual loss

Adolescence and young adulthood

- Migraine
- Optic neuritis
- Papilledema
- Antiphospholipid antibody syndrome and systemic lupus erythematosus
- Early tumor compression of the optic nerve
- Takayasu aortic arteritis
- Viral neuroretinitis
- Idiopathic

Adulthood

- Carotid stenosis or dissection
- Embolism to the retina
- Intrinsic central retinal artery atherosclerotic disease
- Temporal arteritis (generally over age 55)
- Glaucoma
- Papilledema

Causes for episodic / progressive Visual impairment

I. Demyelinative (optic neuritis)
Multiple sclerosis
Postinfectious and viral neuroretinitis
II. Ischemic
Arteriosclerotic (usually in-situ occlusion; occasionally carotid artery disease)
Granulomatous (giant cell) arteritis
Syphilitic arteritis
III. Parainfectious
Cavernous sinus thrombosis
Paranasal sinus infection
IV. Toxins and drugs
Methanol
Ethambutol
Chloroquine
Streptomycin
Chlorpropamide
Chloramphenicol
Tiagabine
Linezolid
Infliximab
Sildenafil
Ergot compounds

V. Deficiency states
Vitamin B_{12}
Thiamine or possibly several B vitamins ("tobacco-alcohol" amblyopia)
Epidemic nutritional types (Cuban, Jamaican)
VI. Heredofamilial and developmental
Dominant juvenile optic atrophy
Leber optic atrophy
Developmental failure of disc or papillomacular bundle
Progressive hyaline body encroachment
VII. Compressive and infiltrative
Meningioma of sphenoid wing or olfactory groove
Metastasis to optic nerve or chiasm
Glioma of optic nerve (neurofibromatosis type I)
Optic atrophy following long-standing papilledema
Pituitary tumor and apoplexy
Thyroid ophthalmopathy
Sarcoidosis
Giant aneurysms
Lymphoma
Wegener granulomatosis
VIII. Radiation-induced optic neuropathy

Demyelination	Neuroinfection	Inflammatory / Granulomatous	Nutritional	Sinuses	Drugs / Heredita
Multiple Sclerosis	Tuberculous	Connective tissue disorders	Vit B12	Cavernous sinus thrombosis	Ethambutol / Methanol
Neuro myelitis optica / MOG related ON	Cryptococcal	Sarcoidosis	Tobacco Alcohol Amblyopia	Orbital Apex syndrome	Mitochondrial disorders

Diplopia

Lesions of the Third (Oculomotor) Nerve

Nuclear and intramedullary (fascicular)
- Infarction (midbrain stroke)
- Demyelination
- Tumor
- Trauma
- Wernicke disease

Radicular (subarachnoid space and tentorial edge)
- Aneurysm (posterior communicating or basilar)
- Meningitis (infectious, neoplastic, granulomatous)
- Diabetic infarction
- Tumor
- Raised intracranial pressure (shift and herniation of medial temporal lobe, hydrocephalus, pseudotumor cerebri)

Cavernous sinus and superior orbital fissure
- Diabetic infarction of nerve
- Aneurysm of internal carotid artery
- Carotid-cavernous fistula
- Cavernous thrombosis (septic and bland)
- Tumor (pituitary, meningioma, nasopharyngeal carcinoma, metastasis)
- Pituitary apoplexy
- Sphenoid sinusitis and mucocele
- Herpes zoster
- Tolosa-Hunt syndrome

Orbit
- Trauma
- Fungal infection (mucormycosis, etc.)
- Tumor and granuloma
- Orbital pseudotumor

Uncertain localization
- Migraine
- Postinfectious cranial mono- and polyneuropathy

Lesions of the Fourth (Trochlear) Nerve

Nuclear and intramedullary (fascicular)
- Midbrain hemorrhage and infarction
- Tumor
- Arteriovenous malformation
- Demyelination

Radicular (subarachnoid space)
- Traumatic
- Tumor (pineal, meningioma, metastasis, etc.)
- Hydrocephalus
- Pseudotumor cerebri and other causes of increased intracranial pressure
- Meningitis (infectious, neoplastic, granulomatous)

Cavernous sinus and superior orbital fissure
- Tumor
- Tolosa-Hunt syndrome
- Internal carotid aneurysm
- Herpes zoster
- Diabetic infarction

Orbit
- Trauma
- Tumor and granuloma

Lesions of the Sixth (Abducens) Nerve

Nuclear (characterized by gaze palsy) and intramedullary (fascicular)
- Möbius syndrome
- Wernicke syndrome
- Infarction (pontine stroke)
- Demyelination
- Tumor
- Lupus

Radicular (subarachnoid)
- Aneurysm
- Trauma
- Meningitis
- Tumor (clivus, fifth- and eighth-nerve schwannoma, meningioma)

Petrous
- Infection of mastoid and petrous bone
- Thrombosis of inferior petrosal vein
- Trauma

Cavernous sinus and superior orbital fissure
- Carotid aneurysm
- Cavernous sinus thrombosis
- Tumor (pituitary, nasopharyngeal, meningioma)
- Tolosa-Hunt syndrome
- Diabetic or arteritic infarction
- Herpes zoster

Orbit
- Tumor and granulomas

Uncertain localization
- Migraine
- Viral and postviral
- Transient in newborns

Diabetic cranial neuropathy

NMJ – Myas Gravis

Raised ICT

Demyelination

Basal meningitis

Weakness

DIFFERENCES BETWEEN UPPER AND LOWER MOTOR NEURON PARALYSIS

UPPER MOTOR NEURON OR SUPRANUCLEAR PARALYSIS	LOWER MOTOR NEURON OR NUCLEAR-INFRANUCLEAR PARALYSIS
Muscles affected in groups; never individual muscles	Individual muscles may be affected
Atrophy slight and the result of disuse	Atrophy pronounced; up to 70% of total bulk
Spasticity with hyperactivity of the tendon reflexes and extensor plantar reflex (Babinski sign)	Flaccidity and hypotonia of affected muscles with loss of tendon reflexes
Fasciculations absent	Plantar reflex, if present, is of normal flexor type
Normal nerve conduction studies; no denervation potentials in EMG	Fasciculations may be present
	Abnormal nerve conduction studies; denervation potentials (fibrillations, fasciculations, positive sharp waves) in EMG

Classification of Confusional states

I. Acute global confusion with psychomotor underactivity
   A. Associated with a medical or surgical disease (no focal or lateralizing neurologic signs; imaging and cerebrospinal fluid [CSF] normal)
      1. Metabolic disorders (hepatic stupor, uremia, hypo- and hypernatremia, hypercalcemia, hypo- and hyperglycemia, hypoxia, hypercapnia, porphyria, and some endocrinopathies including steroid-responsive Hashimoto encephalopathy)
      2. Infectious illnesses (pneumonia, endocarditis, urosepsis, peritonitis, and other illnesses causing bacteremia and sepsis—septic encephalopathy)
      3. Congestive heart failure or pulmonary failure
      4. Postoperative and posttraumatic states
   B. Associated with drug and medication effects or intoxication (no focal or lateralizing signs; brain imaging and CSF normal): opiates, anticholinergics, sedatives, trihexyphenidyl, corticosteroids, high-potency cannabinoids, anticonvulsants, L-dopa, dopaminergic agonists, serotonergic antidepressants, certain antibiotics and cancer chemotherapies
   C. Associated with diseases of the nervous system (with focal or lateralizing neurologic signs or CSF changes)
      1. Cerebrovascular disease, tumor, abscess (especially of the right parietal, left temporal and occipital, and inferofrontal lobes)
      2. Subdural hematoma
      3. Meningitis
      4. Encephalitis
      5. Cerebral vasculitis (e.g., granulomatous, lupus)
      6. Hypertensive encephalopathy, toxemia of pregnancy
      7. Nonconvulsive status epilepticus and postseizure state
II. Delirium with motor, mental, or autonomic hyperactivity
   A. In a medical or surgical illness (no focal or lateralizing neurologic signs; CSF usually clear): pneumonia, sepsis and bacteremia (septic encephalopathy), postoperative period(especially cardiac surgery), postconcussive states, thyrotoxicosis and corticosteroid excess (exogenous or endogenous), certain special infectious fevers such as typhoid and malaria
   B. In neurologic disease that causes focal or lateralizing signs or changes in the CSF
      1. Confusional states caused by focal cerebral lesions (see Chap. 21); vascular, neoplastic, or other diseases, particularly those involving the temporal lobes and upper part of the brainstem
      2. Concussion and contusion (posttraumatic delirium)
      3. Meningitis of acute purulent, fungal, tuberculous, and neoplastic types (Chap. 31)
      4. Encephalitis from viral (e.g., herpes simplex, infectious mononucleosis), bacterial (mycoplasma, legionnaires), and other causes (Chaps. 30 and 31)
      5. Acute disseminated encephalomyelitis (ADEM)
      6. Auto-antibody disorders (anti-NMDA, paraneoplastic limbic encephalitis; Hashimoto encephalopathy)
      7. Subarachnoid hemorrhage
   C. Abstinence/withdrawal states, especially withdrawal of alcohol (delirium tremens) or of sedative drugs following chronic use
III. Psychosis, particularly with manic features
IV. Dementia or other brain disease in combination with infectious fevers, medication reactions, trauma, heart failure, or other medical or surgical diseases

Clinical characteristics of delirium

Acute onset of mental status change with fluctuating course
Attentional deficits
Confusion or disorganized thinking
Altered level of consciousness
Perceptual disturbances
Disturbed sleep/wake cycle
Altered psychomotor activity
Disorientation and memory impairment
Other cognitive deficits
Behavioral and emotional abnormalities

Major causes of Delirium

TABLE 4.1 Major Causes of Delirium

Metabolic	Electrolytes: hypo/hypernatremia, hypo/hypercalcemia, hypo/hypermagnesemia, hypo/hyperphosphatemia
	Endocrine: hypo/hyperthyroidism, hypo/hypercortisolism, hypo/hyperglycemia
	Cardiac encephalopathy, hepatic encephalopathy, uremic encephalopathy
	Hypoxia and hypercarbia
	Vitamin deficiencies: vitamin B_{12}, nicotinic acid, folic acid. Most notably Wernicke encephalopathy from thiamine deficiency
	Toxic and industrial exposures: carbon monoxide, organic solvent, lead, manganese, mercury, carbon disulfide, heavy metals
	Porphyria
Toxic	Intoxication and overdose
	Serotonin syndrome
	Malignant neuroleptic syndrome
	Withdrawal: alcohol, benzodiazepines, barbiturates, amphetamines, cocaine, coffee, phencyclidine, hallucinogens, inhalants, meperidine, and other narcotics
	Drugs: anticholinergic, benzodiazepines, opiates, antihistamines, antiepileptics, muscle relaxants, dopamine agonists, monoamine oxidase inhibitors, levodopa, corticosteroids, fluoroquinolone and cephalosporin antibiotics, beta-blockers, digitalis, lithium, clozapine, tricyclic antidepressants, calcineurin inhibitors
Infectious	Urinary tract infection, pneumonia, sepsis, meningitis, encephalitis, Creutzfeldt-Jakob and other prion diseases
Neurological	Vascular: ischemic stroke, intracerebral or subarachnoid hemorrhage, vasculitis
	Autoimmune and paraneoplastic encephalitides
	Neoplastic: brain tumors, carcinomatous meningitis
	Seizure related: postictal state, nonconvulsive status epilepticus
	Trauma: concussion, subdural hematoma
Perioperative	Surgery: thoracic (cardiac and noncardiac), vascular, and hip replacement, anesthetic and drug effects, hypoxia and anemia, hyperventilation, fluid and electrolyte disturbances, hypotension, embolism, infection or sepsis, untreated pain, fragmented sleep, sensory deprivation or overload
Miscellaneous	Hyperviscosity syndromes

- Electrolyte imbalance (Hyponatremia)
- Uremia / Hepatic / Hypoglycemia
- Vitamin deficiency (Thiamine – Wernike's encephalopathy)
- Alcohol withdrawal
- Urosepsis / Pneumonia
- Pyogenic / Viral / Fungal meningitis
- Stroke
- Seizure with postictal state
- Autoimmune encephalitis
- Head injury

Predisposing and Precipitating factors of Delirium

- Elderly, especially 80 years or older
- Dementia, cognitive impairment, or other brain disorder
- Fluid and electrolyte disturbances and dehydration
- Other metabolic disturbance, especially elevated BUN level or hepatic insufficiency
- Number and severity of medical illnesses, including cancer
- Infections, especially urinary tract, pulmonary, and AIDS
- Malnutrition, low serum albumin level
- Cardiorespiratory failure or hypoxemia
- Prior stroke or other nondementia brain disorder
- Polypharmacy and use of analgesics, psychoactive drugs, or anticholinergics
- Drug abuse, alcohol or sedative dependency
- Sensory impairment, especially visual
- Sensory overstimulation and "ICU psychosis"
- Sensory deprivation
- Sleep disturbance
- Functional impairment
- Fever, hypothermia
- Physical trauma or severe burns
- Fractures
- Male gender
- Depression
- Specific surgeries:
  - Cardiac, especially open heart surgery
  - Orthopedic, especially femoral neck and hip fractures, bilateral knee replacements
  - Ophthalmological, especially cataract surgery
  - Noncardiac thoracic surgery and aortic aneurysmal repairs
  - Transurethral resection of the prostate

- Elderly individuals
- Dementia
- Electrolyte imbalance
- Metabolic Encephalopathy
- Systemic Infections
- Neuroinfection
- Cerebral ischemia
- Fever
- Depression
- Drug abuse
- Fractures, severe pain

Altered sensorium

GENERAL GROUP	SPECIFIC DISORDER	IMPORTANT CLINICAL FINDINGS
Coma *with* focal or lateralizing signs	Cerebral hemorrhage	Hemiplegia, hypertension, cyclic breathing, specific ocular signs (See Chap. 13)
	Basilar artery occlusion (thrombotic or embolic)	Extensor posturing and bilateral Babinski signs; early loss of oculocephalic responses; ocular bobbing
	Territorial infarction in internal carotid territory	Hemiplegia, unilateral unresponsive, or enlarged pupil
	Subdural hematoma	Slow or cyclic respiration, rising blood pressure, hemiparesis, unilateral enlarged pupil
	Trauma	Signs of cranial and facial injury
	Brain abscess	Neurologic signs depending on location
	Hypertensive encephalopathy; eclampsia	Blood pressure >210/110 mm Hg (lower in eclampsia and in children), headache, seizures, hypertensive retinal changes
	Thrombotic thrombocytopenic purpura (TTP)	Petechiae, seizures shifting focal signs
Coma *without* focal or lateralizing signs, *with* signs of meningeal irritation	Meningitis and encephalitis	Stiff neck, Kernig sign, fever, headache
	Subarachnoid hemorrhage	Stertorous breathing, hypertension, stiff neck, Kernig sign
Coma *without* focal neurologic signs or meningeal irritation; CT scan and CSF normal	Alcohol intoxication	Hypothermia, hypotension, flushed skin, alcohol breath
	Sedative intoxication	Hypothermia, hypotension
	Opioid intoxication	Slow respiration, cyanosis, constricted pupils
	Carbon monoxide intoxication	Cherry-red skin
	Global ischemia-anoxia	Rigidity, decerebrate postures, fever, seizures, myoclonus
	Hypoglycemia	Same as in anoxia
	Diabetic coma	Signs of extracellular fluid deficit, hyperventilation with Kussmaul respiration, "fruity" breath
	Uremia	Hypertension; sallow, dry skin, uriniferous breath, twitch-convulsive syndrome
	Hepatic coma	Jaundice, ascites, and other signs of portal hypertension; asterixis
	Hypercapnia	Papilledema, diffuse myoclonus, asterixis
	Severe infections (septic shock); heat stroke	Extreme hyperthermia, rapid respiration
	Seizures	Episodic disturbance of behavior or convulsive movements

Movement and Posture

CLINICAL DIFFERENCES BETWEEN CORTICOSPINAL AND EXTRAPYRAMIDAL SYNDROMES

	CORTICOSPINAL	EXTRAPYRAMIDAL
Character of the alteration of muscle tone	Clasp-knife effect (spasticity)	Plastic, equal throughout passive movement (rigidity), or intermittent (cogwheel rigidity)
Distribution of hypertonus	Flexors of arms, extensors of legs	Generalized but predominates in flexors of limbs and of trunk
Involuntary movements	Absent	Presence of tremor, chorea, athetosis, dystonia
Tendon reflexes	Increased	Normal or slightly increased
Babinski sign	Present	Absent
Paralysis of voluntary movement	Present	Absent or slight

Cerebellar Ataxia

DIAGNOSIS OF CEREBELLAR DISEASE

PACE	CAUSES
Acute and transitory	Intoxication with alcohol, lithium, barbiturate, phenytoin, or other antiepileptics (Chap. 41) Diamox-responsive episodic ataxia (Chap. 36) Childhood hyperammonemias (Chap. 36) Cytarabine (Ara-C) chemotherapy
Acute and usually reversible	Postinfectious (Chap. 35) Viral cerebellitis (Chap. 32) Myxedema
Acute and enduring	Postanoxic cerebellar degeneration Extreme hyperthermia (Chap. 16) Intoxication with mercury compounds or toluene (glue sniffing; spray painting; Chap. 41) Adulterated heroin ("chasing the dragon")
Subacute (over days to weeks)	Posterior fossa tumors such as medulloblastoma, astrocytoma, hemangioblastoma, and metastasis (Chap. 30) Alcoholic-nutritional (Chaps. 40 and 41) Paraneoplastic cerebellar degeneration (Chap. 30) Autoimmune damage such as from anti-GAD and anti-VGKC antibody Creutzfeldt-Jakob (prion) disease (Chap. 32) Cerebellar abscess (Chap. 31) Whipple disease (Chap. 31) Sprue (gluten enteropathy) Multiple sclerosis (Chap. 35)
Chronic (over months to years)	Friedreich ataxia and other spinocerebellar degenerations (Chap. 38) Hereditary cerebellar degenerations (olivopontocerebellar degenerations; cerebellar cortical degenerations [Chap. 38]) Multiple system atrophy (Chap. 38) Adult form of fragile X premutation syndrome (Chaps. 37 and 38) Hereditary metabolic diseases (Chap. 36) Childhood ataxias, including ataxia telangiectasia, cerebellar agenesis

Gait abnormalities

	CADENCE	STEP LENGTH	BASE	OTHER ASSOCIATED SIGNS
Cerebellar	Irregular	Slightly short	Wide	Erratic shifting of weight and step
Sensory ataxic (tabetic)	Normal	Short	Slightly wide	Excessive force in step resulting in stamping of feet; Romberg sign
Steppage	Normal	Normal	Normal	Overlifting and slapping of feet
Plegic	Slow	Short	Narrow	Circumduction and scraping of affected leg(s)
Dystonic	Slow	Normal	Erratic	Twisting athetoid movements interrupt walking
Parkinsonian-festinating	Slow until festination	Short	Normal	Quickening step, forward leaning, shuffling, may have trouble with gait initiation
Waddling-myopathic	Normal	Normal	Slightly wide	Overlifting of hip(s)
Toppling	Slow until fall	Short	Widened (protective)	Sudden loss of balance
Normal pressure hydrocephalus	Slow	Short	Slightly wide	Numerous problems with axial body movement
Frontal lobe	Slow	Greatly shortened	Slightly wide (protective)	Difficulty starting and stopping; tendency for feet to "stick" to floor
Aging and marche à petit pas	Slow	Slightly shortened	Slightly widened	Cautious, slight forward lean

THANK YOU