The Neurologic System

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Rutgers PANCE/PANRE Review Course
PANCE/PANRE Breakdown

- Neurologic system – 6% of exam content
- PANCE
  - 300 questions x 0.06 = 18
- PANRE
  - 240 questions x 0.06 = 14-15
- NCCPA Blueprint available at http://www.nccpa.net/ExamsContentBlueprint.asp

Content of this presentation follows NCCPA Blueprint
NCCPA Blueprint

- Diseases of Peripheral Nerves
- Headaches
- Infectious Disorders
- Movement Disorders
- Vascular Disorders
- Other Neurologic Disorders
Diseases of Peripheral Nerves

- Complex Regional Pain Syndrome
- Peripheral Neuropathies
Complex Regional Pain Syndrome

- Formerly called Reflex Sympathetic Dystrophy
- Autonomic and vasomotor dysfunction in the extremities
- One extremity affected
  - Pain, swelling, color/temperature changes
    - Pain is burning, exacerbated by light touch
  - Skin and nail dystrophy
  - Muscle atrophy
  - Limited ROM
- Does not follow one peripheral nerve distribution
- No systemic symptoms

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CRPS

- Usually follows trauma to affected limb (may be minor)
  - Most commonly affects hand and ipsilateral shoulder
- Early mobilization can help prevent CRPS
- Increased uptake on bone scan
- In late CRPS, osteopenia seen on x-ray
- Treatment – early intervention is best
  - NSAIDs, corticosteroids, PT/OT, pain management
  - Antidepressants and anticonvulsants (gabapentin) used
  - Regional nerve block and spinal stimulation
Peripheral Neuropathies

- Many possible etiologies
- May be primarily sensory...
  - Inflammatory/immune (vasculitis, paraneoplastic)
  - Metabolic (diabetes)
  - Infectious (HIV, HSV, leprosy)
  - Toxic (chemotherapy, vitamin B6)
  - Deficiency (vitamin B12, vitamin B1, vitamin E)
  - Alcohol-related
- Primarily motor...
  - Inflammatory/immune (Guillian-Barre)
  - Toxic – lead
Peripheral neuropathies – symptoms

- May be motor, sensory, autonomic or combination
- Presentation depends on etiology
  - Acute vs. chronic, symmetric vs. asymmetric
- Motor (weakness)
  - In legs – tripping on carpeting, curbs
  - In hands – difficulty with fine movements (buttons, zippers, keys)
- Sensory loss, loss of proprioception
  - In feet – “walking on pebbles”, “ice cold”
  - Dysesthesias – “on fire”, “stuck with pins”, numbness, tingling
Peripheral neuropathies – exam

- Stocking-glove sensory loss
- Atrophy/muscle wasting (hands, feet, anterior tibialis)
- Diminished deep tendon reflexes (distal first)
- Fasciculations
- Muscle weakness
- Cold, erythematous or bluish hands and feet
- May have impairment of vibration sense, position sense, light touch, pain sense, temperature sense, heel/toe walk, tandem gait
Peripheral neuropathies - diagnosis

- EMG/NCV – primary diagnostic test
- Nerve/skin biopsy
  - Typically for vasculitis-related neuropathy
- Labs – glucose, BUN/Cr, CBC, vitamins B6 and B12, RPR
- Genetic tests if indicated
Diabetic neuropathy

- Most common cause of neuropathy in the Western world

- If the patient has albuminuria or retinopathy – 2x more likely to develop neuropathy

- Typically a distal symmetric polyneuropathy
  - Autonomic neuropathy also common (erectile dysfunction)

- Elevated glucose = increased risk and progression of neuropathy
Diabetic polyneuropathy

- No treatment to halt progression
  - Tight sugar control!
- First line:
  - gabapentin
  - TCA (amitriptyline or nortriptyline)
  - pregabalin (Lyrica)
  - duloxetine
  - Lidoderm patch
Peripheral neuropathies - others

- Charcot-Marie-Tooth disease (inherited)
  - Child or adult with slowly progressive distal weakness
  - Sensory loss and weakness of hands/fingers and legs (anterior tibialis weakness = “drop foot”)
  - Sensory exam worse than sensory complaints
  - High arches, hammertoes
  - No treatment
    - Use ankle-foot orthoses, genetic counseling
Peripheral neuropathies - others

• Vasculitic (nerve ischemia)
  • Painful, acute onset of motor and sensory symptoms
    • Depends on underlying vasculitis
  • Etiologies – rheumatoid arthritis, Churg-Strauss, Wegener’s granulomatosis, polyarteritis nodosa, Sjogren’s, SLE

• Diagnosed with nerve/vessel biopsy, EMG

• Treatment:
  • steroids
  • methotrexate
  • azathioprine
Peripheral neuropathies - more

- Compression/entrapment neuropathies
  - Carpal-tunnel syndrome, radiculopathies
- Trigeminal neuralgia
- Post-herpetic neuralgia
  - Pain persisting >6 weeks after herpes zoster infection
  - Treat with acyclovir (steroids reduce pain but do not prevent onset or severity of neuralgia)
Bell’s Palsy

- Lower motor neuron facial nerve paresis
  - Infection, pregnancy, diabetes
- Abrupt onset of facial paresis
  - Ipsilateral ear pain, restriction of eye closure, difficulty eating
- 60% recover completely without treatment
  - 10% have long term or permanent sequelae
- Steroids must be initiated within 5 days to see benefit
  - Acyclovir has not been shown to provide benefit
- Lubricating drops and/or eye patch
Bell’s Palsy

http://en.wikipedia.org/wiki/Bell's_palsy
Headaches

- Cluster Headaches
- Migraine Headaches
- Tension Headaches
Cluster Headaches

- Primarily affects middle-aged men
- Mechanism not fully understood
- No family history

Symptoms
- Severe unilateral periorbital pain
  - Stabbing/boring quality
- Ipsilateral nasal congestion and rhinorrhea
- Redness of the eye
- Horner syndrome
Cluster Headaches

- **Timing**
  - Episodes often at night
  - Daily for several weeks
  - Last 15 minutes to 3 hours
  - Occur in “clusters”
    - Lasts 4-8 weeks, with weeks to months of remission
    - May be seasonal

- **Triggers** – similar to migraines
Cluster Headaches

- Exam normal except rhinorrhea, lacrimation, maybe Horner syndrome

- Treatment
  - Abortive
    - 100% oxygen
    - Intranasal or SC triptans
    - Corticosteroids
  - Prophylactic
    - Verapamil – first line
      - topiramate, lithium, ergotamine
Migraine Headaches

- Headache of neurovascular dysfunction
  - Pathogenesis not fully understood
- Classic and variant forms
- Onset typically in teens – early thirties
- More common in women
- Often a family history of migraine-like headaches
Migraine Headache

- Classic symptoms:
  - Unilateral throbbing/pulsatile headache (severe)
  - Nausea, vomiting, photophobia, phonophobia
- May also include:
  - Cognitive impairment, blurred vision
  - Focal neurologic dysfunction
    - Aphasia, numbness/paresthesias, focal weakness, dysarthria, disequilibrium
  - Visual field defects (aura)
    - “Zigzags” or “flashes” of light, visual hallucinations, scintillating scotomas
Migraine Headache

- “Migraine equivalent” or acephalgic migraine
  - Somatic symptoms without headache
- Variants
  - Ophthalmoplegic (ophthalmic) migraine
    - 3rd and/or 6th nerve palsy
  - Basilar artery migraine
Migraine Headache

- Common triggers
  - Stress
  - Foods (chocolate, alcohol)
  - Smells (perfume)
  - Bright lights, loud noises
  - Menstruation
Migraine Headaches

- Clinical diagnosis
  - Imaging generally not warranted
- Treatment
  - Avoid triggers!
  - Stay in dark, quiet room
  - Abortive medication
  - Preventive therapy
Migraine Headaches

- Abortive medications
  - Analgesics (ASA, APAP, NSAIDs)
  - Ergotamine + caffeine = Cafergot
  - Triptans (sumatriptan) – mainstay of treatment
    - Contraindicated in CVD, PVD
    - Avoid in pregnancy
    - May cause nausea/vomiting
    - Combine with naproxen for greater benefit
  - Droperidol, metoclopramide, prochlorperazine
  - Opioids
Migraine Headaches

- **Preventive Therapy**
  - **Antiepileptics**
    - Topiramate, valproic acid
  - **Antihypertensives**
    - Propranolol
    - Verapamil – not FDA approved, limited evidence
  - **Amitriptyline, gabapentin**
  - **Botox**
Tension Headaches

- Most common primary headache
- Generalized, constant/daily headache
- Vise-like, gripping, tightness, squeezing
  - NOT typically pulsatile
  - Non-specific, non-focal
  - Poor concentration
  - Head and neck tenderness
- Exacerbated by stress, fatigue, glare, loud noise
Tension Headache

- Treatment
  - Stress reduction
  - Improve sleep hygiene
  - ASA, APAP, NSAIDs
    - Caution: rebound headaches
  - Caffeine, butalbital used (not recommended in practice)

- Amitriptyline for prophylaxis
## Headaches

<table>
<thead>
<tr>
<th></th>
<th>Who</th>
<th>Timing</th>
<th>Duration</th>
<th>Location</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Migraine</strong></td>
<td>women&gt;men</td>
<td>monthly/yearly</td>
<td>hours-days</td>
<td>unilateral</td>
<td>throbbing/pulsatile</td>
</tr>
<tr>
<td><strong>Cluster</strong></td>
<td>men&gt;women</td>
<td>nights/clusters</td>
<td>minutes-hours</td>
<td>periorbital unilateral</td>
<td>stabbing/boring</td>
</tr>
<tr>
<td><strong>Tension</strong></td>
<td>men=women</td>
<td>daily</td>
<td>days-weeks</td>
<td>bilateral band-like</td>
<td>gripping/vise-like</td>
</tr>
</tbody>
</table>
Infectious Disorders

- Encephalitis
- Meningitis
Encephalitis

- Inflammation/infection of brain parenchyma

- Viral, amebic, tick-borne
  - Hundreds of possible viral etiologies

- Often occurs with concomitant meningitis = meningoencephalitis
Encephalitis - etiologies

- Seasonal
  - West Nile, equine encephalitis virus, enteroviruses (Coxsackie)
- HSV-1 is most common non-epidemic cause in US
- West Nile is most common epidemic cause in US
- If immunosuppressed:
  - HIV, Varicella/Zoster, CMV, EBV
- Others
  - HSV-2, measles, mumps, rubella, Dengue fever, rabies
Encephalitis – signs/symptoms

- Prodrome…
  - Fever, malaise, myalgia, nausea, vomiting, diarrhea, rash
- As disease progresses…
  - Headache, photophobia, altered sensorium, seizures
- May exhibit…
  - Meningeal signs, hemiparesis, aphasia, behavioral changes (depending on area(s) of brain affected)
Encephalitis – diagnosis

- Lumbar puncture (unless elevated ICP)
  - Similar to viral meningitis
  - Elevated opening pressure, elevated protein and lymphocytes, normal glucose
  - CT head prior to LP if risk factors for cerebral herniation present...
  - CSF PCR is primary diagnostic test

- MRI, EEG helpful to rule out other diagnoses
Encephalitis - treatment

• Treat causative agent
  • If HSV – acyclovir (often empirically)
• Supportive
  • ICU, treat seizures, monitor ICP
• No specific treatment for WNV
  • α-interferon, ribavirin, humanized monoclonal antibodies

• Prognosis is variable
  • Depends on status upon initial presentation
  • HSV-1 mortality is 20%
  • Takes weeks to months for recovery
Meningitis

- Inflammation/infection of arachnoid membrane, pia mater and intervening CSF
- Bacterial, viral and other
- Decreased incidence due to vaccines for Haemophilus influenzae, Streptococcus pneumoniae and Neisseria meningitidis
- Predisposing factors
  - Otitis media, pneumonia, sinusitis, head injury, cirrhosis/alcoholism, immunodeficiency
Bacterial Meningitis - etiologies

- **Haemophilus influenzae**
  - Primarily affects children

- **Streptococcus pneumoniae**
  - Predominantly adults (>50 years old) with comorbidities (20% mortality rate)

- **Neisseria meningitidis**
  - Outbreaks (dorms, barracks, jails)
  - Meningococcal vaccine 85% effective

- **Listeria monocytogenes**
  - Emerging in developed countries as an important cause of bacterial meningitis
Bacterial Meningitis - presentation

- Acute onset of fever, headache, vomiting, stiff neck, myalgia, backache, generalized weakness
  - Rapidly progresses to confusion, obtundation, loss of consciousness, focal neurologic deficit
- Kernig and Brudzinski signs
- Petechiae or ecchymotic rash = meningococcal
  - Rapidly progressive
- Seizures, hydrocephalus, CN abnormalities, hearing loss, visual field defects, coma
Bacterial Meningitis - diagnosis

- Lumbar puncture
  - Elevated opening pressure
  - CSF - elevated protein, decreased glucose, elevated cell count (PMN cells)
  - CSF – gram stain, culture and PCR
- Blood cultures
- CT/MRI brain and spine
- X-ray chest, sinus, mastoid
Bacterial Meningitis – treatment

- Bacterial meningitis is a medical emergency!
  - Rapid initiation of IV antibiotics and dexamethasone
    - Empiric – vancomycin and 3rd generation cephalosporin or ampicillin
      - Trimethoprim-sulfa if PCN-allergic
    - Pneumococcal – PCN and vancomycin or chloramphenicol
      - 3rd generation cephalosporin if resistant
    - Meningococcal – Penicillin G and ampicillin
      - 3rd generation cephalosporin if resistant
    - H. flu – 3rd generation cephalosporin or chloramphenicol and ampicillin

- 3rd generation cephalosporin = ceftriaxone or cefotaxime
Bacterial Meningitis – more treatment

- Re-examine CSF 24-48 hours later if poor response
- Mannitol if elevated intracranial pressure
- Chemoprophylaxis of close contacts

- Mortality rate
  - Strep pneumo: 20%
  - Listeria mono: 15%
  - Others: 3-7%
Meningitis – viral

- 60% are enteroviruses (echovirus, Coxsackie)
  - Fecal-oral transmission > respiratory (seasonal)

- Abrupt onset of fever, headache, stiff neck, nausea, vomiting, myalgia, photophobia, +/- rash

- CSF – lymphocytic pleocytosis, normal glucose, normal or slightly elevated protein, normal or slightly elevated opening pressures

- run PCR and culture
- negative Gram stain
Meningitis - viral

- Benign clinical course
  - supportive treatment
    - antipyretics, analgesics, antiemetics
    - acyclovir if HSV
  - recovery in 1 – 3 weeks
  - can be treated as outpatient

- Prevention is key (prior to vaccine mumps was #1 cause)
# CNS Infections

<table>
<thead>
<tr>
<th></th>
<th>Opening pressure</th>
<th>Cells</th>
<th>Protein</th>
<th>Glucose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encephalitis</td>
<td>elevated</td>
<td>lymphocytic</td>
<td>elevated</td>
<td>normal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>pleocytosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viral Meningitis</td>
<td>normal/slightly</td>
<td>lymphocytic</td>
<td>normal/slightly elevated</td>
<td>normal</td>
</tr>
<tr>
<td></td>
<td>elevated</td>
<td>pleocytosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacterial Meningitis</td>
<td>elevated</td>
<td>PMNs</td>
<td>elevated</td>
<td>decreased</td>
</tr>
</tbody>
</table>

UMDNJ PANCE/PANRE Review Course  
(becoming Rutgers University July 1, 2013)
Movement Disorders

- Essential Tremor
- Huntington Disease
- Parkinson Disease
Essential Tremor

- Postural (sustention) tremor of hands, head and/or voice
  - Etiology unclear
- Often a family history (familial tremor)
  - Autosomal dominant
- May begin at any age
  - Exacerbated by stress
  - Alcohol tends to relieve symptoms
- No other associated neurologic abnormalities
Essential Tremor - treatment

- Usually not disabling
- If treatment necessary:
  - Start with propranolol if possible
    - 60 – 240 mg/day
  - Primidone next – patients tend to be sensitive to this drug
  - Other options include alprazolam, topiramate, gabapentin
Huntington Disease

- Autosomal dominant inheritance (chromosome 4)
  - Worldwide, all ethnic groups
- Gradual onset of chorea, dementia and behavioral changes
  - Progressive disease
- Onset between 30-50 years old
  - Typically fatal within 15-20 years
- CT or MRI reveals cerebral atrophy
- Genetic test available for definitive diagnosis

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(becoming Rutgers University July 1, 2013)
Huntington Disease - treatment

- Treatment is symptomatic
  - No halting progression or reversal of disease

- Tetrabenazine for dyskinesias
  - Also consider reserpine for dyskinesias, atypical neuroleptics for psychosis.

- Genetic counseling for children
Parkinson Disease

- Dopaminergic nigrostriatal system degenerates
  - Imbalance of dopamine and acetylcholine in corpus striatum
- Sporadic, typically not inherited
- Onset usually between 45-65 years old
- Diagnosis based on clinical findings
- Lies on a spectrum of disorders called Parkinsonism
Parkinson - presentation

- Cardinal features:
  - Resting tremor
  - Rigidity
  - Bradykinesia
  - Gait impairment/postural instability

- Also masked faces, reduced eye blink, micrographia

- Typically no muscle weakness or reflex changes
Parkinson Disease - treatment

- Levodopa
  - Converted in body to dopamine
  - Side effects: nausea, vomiting, hypotension, dyskinesias, restlessness, confusion
  - Avoid in patients with psychosis, narrow angle glaucoma
- Carbidopa
  - Inhibits enzyme that breaks down levodopa
  - Does not cross blood-brain barrier
  - Combine with levodopa = lower effective dose of levodopa to diminish side effects (Sinemet)
Parkinson Disease - treatment

- Other medications:
  - Amantadine may be effective early
  - Anticholinergics
    - Benztropine mesylate (Cogentin), Trihexyphenidyl (Artane), orphenadrine (Norflex)
  - Dopamine agonists
    - Pramipexole (Mirapex) and ropinirole (Requip)
  - Selective MAOI – rasagiline and selegiline
- Deep brain stimulation
Vascular Disorders

- Cerebral aneurysm
- Intracranial hemorrhage
- Stroke
- Transient Ischemic Attack
Cerebral aneurysm

- Saccular ("berry") aneurysms
  - Arterial bifurcations, often multiple
  - Typically asymptomatic until rupture
  - Most found in anterior Circle of Willis
- Risk factors
  - Smoking, hypertension, hyperlipidemia
- Major complication is subarachnoid hemorrhage
- Angiography is gold standard for diagnosis
  - CT or MRA often used but less sensitive
- Monitor if <10mm
- Surgical or endovascular intervention
Stroke

- Ischemic – 85%
  - Thrombotic
  - Embolic
  - Small vessel disease
- Hemorrhagic – 15%
  - Intracerebral
  - Subarachnoid
- 2nd leading cause of death worldwide
  - 3rd in developed countries
Stroke Risk Factors

- Black/Hispanic:White = 2:1
- Men 40% more likely than women
- Hypertension = 4X risk
- Diabetes = 2-6X risk
- Smoking = 2X risk
- Carotid stenosis
- Atrial fibrillation
- Others: obesity, hyperlipidemia, elevated homocysteine, EtOH, OCP
Ischemic Stroke

- Thrombotic
  - Atherosclerotic plaque
- Embolic
  - Piece of mural thrombus breaks off and lodges in cerebral vasculature (afib)
- Lacunar infarct
  - Smaller arterioles occluded
Ischemic stroke vs. TIA

- **TIA**
  - Symptoms <24 hours
  - No infarction = no permanent damage

- **Stroke**
  - Symptoms >24 hours
  - Brain infarction = permanent damage

- **But…**
  - If sxs >1-2 hours, possibly infarction/stroke and generally worse outcome
  - 1/3 of patients who experience a TIA eventually have a stroke
Ischemic stroke - presentation

- History - time at onset of symptoms
- Usually painless

- Exam to localize lesion
  - Focal neurologic deficit
    - Mental status, speech, cranial nerves, strength, sensation, reflexes
    - Findings depend on the occluded vessel
## Ischemic Stroke - presentation

<table>
<thead>
<tr>
<th>Occluded artery</th>
<th>Common symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal carotid artery</td>
<td>ipsilateral blindness, other symptoms similar to MCA stroke</td>
</tr>
<tr>
<td><strong>Middle cerebral artery</strong></td>
<td>contralateral hemiparesis, arm/face &gt; leg sensory loss, expressive aphasia</td>
</tr>
<tr>
<td>Anterior cerebral artery</td>
<td>contralateral hemiparesis, leg &gt; arm/face sensory loss</td>
</tr>
<tr>
<td>Posterior cerebral artery</td>
<td>contralateral homonymous hemianopia, memory impairment</td>
</tr>
<tr>
<td>Basilar artery</td>
<td>contralateral hemiparesis and sensory loss, ipsilateral bulbar or cerebellar signs</td>
</tr>
<tr>
<td>Vertebral artery</td>
<td>ipsilateral sensory loss in face, ataxia, contralateral hemiparesis and sensory loss</td>
</tr>
<tr>
<td>superior cerebellar artery</td>
<td>gait ataxia, nausea/dizziness, dysarthria, gaze paresis, contralateral hemiparesis</td>
</tr>
</tbody>
</table>
Bell’s Palsy vs. Stroke

http://en.wikipedia.org/wiki/Bell's_palsy
Bell’s Palsy vs. Stroke
Ischemic stroke - diagnosis

- CT-brain!!
- Investigate etiology of the stroke
  - CBC
    - Polycythemia vera, anemia, thrombocytosis, infection
  - ESR
    - Hypercoaguable states
    - Giant cell arteritis
- Glucose, electrolytes, LFTs
- PT/PTT/INR
- Cardiac investigation
  - EKG, cardiac enzymes
CT scan – ischemic stroke

http://radiographics.rsna.org/content/23/3/565/F10.expansion.html
Acute Ischemic Stroke Treatment

- ABCs
- Correct glucose
- Thrombolytic therapy
  - Tissue plasminogen activator (t-PA)
  - Must be given within 3 hours of onset
    - use of t-PA between 3-4.5 hours controversial
    - endovascular administration possible for large vessels
- CT first!!!
- Monitor CBC
- Aspirin also effective for acute ischemic stroke treatment
t-PA contraindications

- BP >185/110
- Major surgery (especially intracranial) or trauma in previous 2 weeks
- GI bleeding
- Evidence or history of ICH
- Recent anticoagulation/bleeding diathesis
- No anticoagulants or platelet-inhibitors for at least 24 hours after administration of t-PA
Prevention

- Anti-platelet therapy
  - ASA
  - Plavix
- Control lipids
  - statins
- Control BP – antihypertensives
  - ACE-I in diabetics
- Smoking cessation
- Anticoagulation for afib patients
- Carotid endarterectomy or stenting
Intracranial Hemorrhage (ICH)

- Most common – intraparenchymal hemorrhage
  - 10% of all strokes, 50% mortality if due to HTN
  - HTN, trauma, drugs are common causes
    - Anticoagulants too
  - More common in Asians and African Americans
- HTN-induced ICH develops in 30-90 minutes
  - Anticoagulant-induced develops over 1-2 days
- Abrupt onset of focal neurologic deficit
  - Commonly contralateral hemiparesis, slurred speech, facial droop, diminishing consciousness
  - Elevated ICP – nausea/vomiting
ICH – evaluation

- CT – brain

- Investigate for coagulopathy
  - PT/PTT/INR

- CT angiography may be necessary to find site of bleeding
ICH - treatment

- Manage HTN
  - Nicardipine

- Monitor and control ICP
  - Mannitol, fluid restriction

- Reverse coagulopathy
  - FFP, vitamin K

- Surgical evacuation of hematoma
Subarachnoid Hemorrhage (SAH)

- Ruptured vessel in subarachnoid space
- Etiology
  - Trauma is most common, followed by ruptured saccular (Berry) aneurysm (usually in anterior Circle of Willis)
    - also arteriovenous malformation (AVM)

- If saccular aneurysm...
  - 25% die within 24 hours
  - 50% die within 6 months
SAH - Symptoms

- Rapid onset, severe headache
  - “Thunderclap”
  - “Worst headache of my life”
- Prodromal less severe headaches
- Nausea/vomiting
- Altered mental status/loss of consciousness
- Neck stiffness
SAH - Diagnosis

- CT – initial test
- Lumbar puncture – blood in CSF
- Cerebral angiography
  - Definitive study to define source of bleeding
- CBC, PT/PTT/INR, electrolytes

- Delayed problems include re-rupture, hydrocephalus, vasospasm and hyponatremia
SAH - Treatment

- BP control
  - Beta-blockers
- Clipping or coiling
- Nimodipine
  - CCB to reduce vascular spasm
- Reduce ICP – prevent hydrocephalus
  - Mannitol
  - Diuretics
- Supportive
  - Ventilation, seizure prophylaxis, nutritional support
Subdural Hematoma (SDH)

- Hemorrhage/hematoma beneath dura
- Typically due to…
  - Trauma (may be minor)
  - Anticoagulation
  - EtOH
  - Frequent falls
- More common in very young and very old
SDH - presentation

- Lucid interval of minutes-hours before altered mental status
  - In slowly evolving SDH, interval can be several days
  - Most are drowsy or comatose from time of injury

- Unilateral headache and ipsilateral enlarged pupil

- Other symptoms are variable
SDH – presentation

- Symptoms are variable
  - Confused speech
  - Difficulty with balance or walking
  - Headache
  - Lethargy or confusion
  - Loss of consciousness
  - Nausea and vomiting
  - Numbness
  - Seizures
  - Slurred speech
  - Visual disturbances
  - Weakness
SDH – workup and treatment

- CT – brain
  - Crescent-shaped collection over one or both hemispheres, most commonly in the frontotemporal region
  - Concave

- Treatment varies with severity
  - Watch and wait, treat supportively if mild
  - Craniotomy or burr hole if elevated ICP for larger bleeds
    - Diuretics and steroids to reduce brain swelling/ICP
  - Seizure prophylaxis
Epidural hematoma (EDH)

- Blood accumulates below skull but above dura
  - Convex-shaped collection on CT

- Evolves more rapidly than SDH
  - Patient more likely to recall head trauma than SDH
  - A “lucid” period lasting minutes-to hours before loss of consciousness is characteristic but not common

- Rapid surgical evacuation and ligation or cautery of the damaged vessel is indicated, usually the middle meningeal artery that has been lacerated by an overlying skull fracture.
Other Neurologic Disorders

- Altered level of consciousness
- Concussion
- Post-concussion Syndrome
- Cerebral Palsy
- Dementias
- Delirium
- Guillain-Barre Syndrome
- Multiple Sclerosis
- Myasthenia Gravis
Other Neurologic Disorder (cont’d)

- Seizure disorders
- Status epilepticus
- Syncope
- Tourette disorder
Altered level of consciousness

- Stupor, coma, vegetative state, brain death
- Stupor = transient arousal by vigorous stimuli
- Comatose = unarousable, no response to external events
  - Reflex movements and posturing may be intact
- Vegetative state = wakefulness is retained but awareness of self and environment is absent (unresponsive)
- Results from serious CNS disorder
  - Seizure, structural lesion, hypothermia, metabolic disorder, toxic/drug-induced
Stupor and Coma

- **Stupor**
  - Stimuli can temporarily arouse patient
  - In the absence of stimuli patient returns to unresponsive state
  - Lies on continuum with coma

- **Coma**
  - “Eyes-closed unresponsiveness”
  - Neither aware nor wakeful
  - Reflex movements and posturing may be intact
ALC - History

- Structural causes
  - Abrupt onset of unconsciousness
  - Sudden headache
  - Vomiting
- Metabolic or toxic
  - Gradual onset
  - Prodromal state of confusion
  - Seizures
  - Medication/drug history
- Meningitis
  - Worsening headache
  - Neck stiffness
  - Fever, chills
Altered level of consciousness

- Exam
  - Response to painful stimuli, pupil reaction to light, eye position and response to passive movement of head, respiration (GCS)
  - Ice water caloric stimulation, “doll’s head response”
- Oximetry and fingerstick glucose STAT
- EKG
- Serum glucose, electrolytes, calcium, LFTs, BUN/Cr, toxicology studies
- EEG, brain imaging (CT, MRI), lumbar puncture
# Glasgow Coma Scale

<table>
<thead>
<tr>
<th>Eye Opening Response</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Spontaneous--open with blinking at baseline 4 points</td>
<td></td>
</tr>
<tr>
<td>To verbal stimuli, command, speech 3 points</td>
<td></td>
</tr>
<tr>
<td>To pain only (not applied to face) 2 points</td>
<td></td>
</tr>
<tr>
<td>No response 1 point</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Verbal Response</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Oriented 5 points</td>
<td></td>
</tr>
<tr>
<td>Confused conversation, but able to answer questions 4 points</td>
<td></td>
</tr>
<tr>
<td>Inappropriate words 3 points</td>
<td></td>
</tr>
<tr>
<td>Incomprehensible speech 2 points</td>
<td></td>
</tr>
<tr>
<td>No response 1 point</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Motor Response</th>
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</thead>
<tbody>
<tr>
<td>Obeys commands for movement 6 points</td>
<td></td>
</tr>
<tr>
<td>Purposeful movement to painful stimulus 5 points</td>
<td></td>
</tr>
<tr>
<td>Withdraws in response to pain 4 points</td>
<td></td>
</tr>
<tr>
<td>Flexion in response to pain (decorticate posturing) 3 points</td>
<td></td>
</tr>
<tr>
<td>Extension response in response to pain (decerebrate posturing) 2 points</td>
<td></td>
</tr>
<tr>
<td>No response 1 point</td>
<td></td>
</tr>
</tbody>
</table>

**Head Injury Classification:**
- Severe Head Injury----GCS score of 8 or less
- Moderate Head Injury----GCS score of 9 to 12
- Mild Head Injury----GCS score of 13 to 15
ALC - Treatment

- Depends on etiology
  - Correct the underlying disorder

- Supportive treatment
  - Stabilize C-spine, maintain ventilation and circulation
  - Control seizures if present
  - Empiric ABX if meningitis suspected
  - Lower elevated ICP
    - Mannitol, surgical decompression
  - Coma cocktail:
    - Dextrose, naloxone, thiamine IV, flumazenil
Concussion

- Transient trauma-induced change in mental status
  - May or may not involve loss of consciousness
- Primary (coup-contracoup injury) and secondary (inflammation, diffuse axonal injury) phases
- Vigilance necessary to detect hematoma or edema
  - Symptoms may appear several days later
Concussion - presentation

- Headache, nausea/vomiting, disorientation, impaired concentration, irritability, amnesia, clumsiness, visual disturbance, focal neurologic deficits
- Anterograde and retrograde amnesia
- Glasgow Coma Scale and thorough neurologic exam
- CT brain
- Treatment depends on severity of injury
Concussion - classification

- Grade I (mild) – transient confusion, symptoms last <15 minutes, no loss of consciousness
- Grade II (moderate) moderate transient confusion >15 minutes, no loss of consciousness
- Grade III (severe) – loss of consciousness
  - ER evaluation, consider admission
Concussion in sports - guidelines

- **Grade I**
  - Remove from contest, examine immediately and q5 minutes
  - Return to play if sx resolved in 15 minutes
  - Repeat grade I concussion = out at least 1 week

- **Grade II**
  - Remove at least 1 week, formal neuro exam following day
  - CT/MRI if sx last >1 week
  - Repeat grade II concussion = out at least 2 weeks

- **Grade III**
  - To ED, CT/MRI, daily exams
  - Return to play in 1-2 weeks depending on duration of LOC
  - Repeat grade III concussion = out at least 1 month
Post-concussion syndrome

- May last several weeks to > 1 year
- Headache is primary symptom
  - Difficulty concentrating, fatigue, dizziness, changes in appetite, sleep abnormalities, irritability
- Neuropsychology evaluation and treatment
- NSAIDs, acetaminophen or triptans for headache
- Vestibular maneuvers for dizziness
- Greater risk for Alzheimer, Parkinsonism, ALS, CTE
Cerebral Palsy

- Chronic, static impairment of muscle tone, strength, coordination and/or movement
  - Non-progressive
- Likely results from cerebral injury prior to, during or soon after birth
  - Genetic etiologies less common
- Higher incidence with extreme prematurity and small for gestational age
  - Intrauterine hypoxia is frequent cause
  - Bleeding, infection, birth hypoxia and many more…
Cerebral Palsy

- Spasticity is common (75%)
  - Variable number of limbs affected
  - Ataxia, chorea/dystonia and hypotonia less common
- Associated disorders
  - Seizures (50%)
  - Mental retardation (may be mild or severe)
  - Language, speech, vision, hearing, sensation disorders
- Exam:
  - Spasticity (hyperreflexia), ataxia, microcephaly
Cerebral Palsy

- MRI brain, genetic studies may help determine etiology
- Treatment to maintain maximal physical function
  - PT/OT, speech therapy
  - Counseling and education for child and parents
- Medications for spasticity as needed
  - Baclofen, botox injections
- Prognosis depends on severity of physical/cognitive deficits
  - Aspiration, pneumonia and other concurrent infections most common causes of death
  - In mild cases motor deficits may resolve by age 7
Dementia

- Progressive decline in intellectual/cognitive function that compromises social or occupational function and leads to loss of independence.
  - Not due to delirium or psychiatric illness
- Typically >60 years old
  - Age is #1 risk factor for Alzheimer Disease
- Risk factors
  - Stroke/vascular disease
  - Family history
  - Diabetes
  - Head injury
Dementia

- Alzheimer Disease
- Reversible dementia
  - hypothyroidism
  - B12 deficiency
  - thiamine deficiency
  - NPH
- Vascular Dementia
- Lewy body Dementia
- Frontotemporal Lobar Degeneration
Alzheimer Disease

- Anterograde amnesia first and most intense symptom
  - 60-80% of dementias
  - Accumulation of β-amyloid = neuritic plaques and neurofibrillary tangles
- Early – difficulty managing finances, independent travel, meal preparation
- Late – difficulty with ADLs
  - Bathing, dressing, toileting, feeding
- Typically no motor deficits
Alzheimer Disease

- Collateral history necessary
- Symptoms depend on region(s) of brain affected
  - Short term memory loss
  - Language difficulty
    - Word finding, then comprehension
  - Visuospatial dysfunction
  - Executive dysfunction
  - Apathy/indifference
  - Apraxia
  - Loss of insight

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Alzheimer Disease

- Exam to rule out other medical or psychiatric illness
  - May identify reversible conditions
  - B12, folate, free T4, TSH, RPR, CBC, electrolytes, glucose, lipids
  - MRI brain (CT if MRI contraindicated)
- Mini Mental State Exam
  - Early deficits are episodic memory, category generation, visuoconstructive ability
- Neuropsychology evaluation
- Screen for depression!
Alzheimer Disease

- Typically sporadic, not genetic
- Mild dementia to death: 2-3 years to >10 years
- If rapid onset, fluctuating course or systemic symptoms consider alternate diagnosis
- Death from infections (pneumonia), nutrition/eating problems, PE, cardiovascular disease
- At greater risk for delirium
- Need assistance, possibly 24/7 care
  - Cease driving
  - Financial planning

Rutgers PANCE/PANRE Review Course
Alzheimer Disease - treatment

- Aerobic exercise, “mental stimulation”
- Cholinesterase inhibitors
  - Donepezil (Aricept), rivastigmine (Exelon), galantamine
    - Side effects – nausea/vomiting, syncope, dysrhythmia
- Memantine (Namenda)
- Mood/behavior: SSRIs (except paroxetine – anticholinergic)
- Insomnia: Trazodone (avoid antihistamines and benzos)
- Agitation: behavioral exercise, address sleep disorder
  - Rule out delirium
- Last resort – low does quetiapine (atypical antipsychotic)
Dementia – other than AD

- Vascular Dementia
  - “Multiple infarct dementia” - lacunar infarcts
  - If after stroke – onset of dementia within 3 months
- Lewy body Dementia
  - Parkinsonism, visual hallucinations, fluctuating alertness, antipsychotic drugs worsen condition
- Frontotemporal Lobar Degeneration
  - Disorder of behavior and personal relationships
  - Rude, irresponsible, sexually explicit, impulsive, poor judgment, poor hygiene/grooming, binging, loss of empathy
# Dementia - differentiation

<table>
<thead>
<tr>
<th>Disease</th>
<th>First Symptom</th>
<th>Mental Status</th>
<th>Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD</td>
<td>Memory loss</td>
<td>Episodic memory loss</td>
<td>Initially normal</td>
</tr>
<tr>
<td>FTD</td>
<td>Apathy; poor judgment/insight, speech/language</td>
<td>Frontal/executive, language; spares drawing</td>
<td>May have vertical gaze palsy, axial rigidity, dystonia</td>
</tr>
<tr>
<td>DLB</td>
<td>Visual hallucinations, REM sleep disorder, delirium, parkinsonism</td>
<td>Drawing and frontal/executive; spares memory; delirium prone</td>
<td>Parkinsonism</td>
</tr>
<tr>
<td>Vascular</td>
<td>Often sudden onset; variable; apathy, falls, focal weakness</td>
<td>Frontal/executive, cognitive slowing; can spare memory</td>
<td>Usually motor slowing, spasticity, gait disorder; can be normal</td>
</tr>
</tbody>
</table>
Delirium

- Acute state of confusion
- Transient global disorder of attention
- Clouding of consciousness
- Usually result of systemic problem with identifiable trigger
- Rapid onset, fluctuating course (may improve in AM)
  - Sundowning – PM onset of delirium in demented patient
- Risk factors – age, dementia, sleep deprivation, immobilization, psychiatric meds, impaired vision/hearing, dehydration
Delirium – etiologies (many!)

- Intoxication/drug withdrawal/long-term alcohol use
- Infection
- Endocrine disorder
- Respiratory disorder
- Metabolic disorder/nutritional deficiency
- Trauma
- Cardiovascular disorder
- Neoplasm
- Seizures
- Medications
Delirium - presentation

- Anterograde AND retrograde amnesia
  - impaired short-term memory and recall
- Disorientation, altered perception, visual hallucinations, insomnia
- Autonomic changes
  - Tachycardia, dilated pupils, sweating
- Typically lasts <1 week with full recovery
- DSM-IV and CAM diagnostic criteria
Delirium – evaluation

- History – pay attention to medications, drugs
- Detailed physical exam
- CBC, electrolytes, liver/renal function labs
  - Consider ammonia level, thyroid, B12/thiamine, ESR
- Screen for infections
- EKG
- ABG
- Toxicology screen
- Brain imaging
- LP
Delirium - treatment

- Identify and treat underlying disorder(s)
  - Consider d/c anticholinergics, analgesics, steroids, CNS depressants
- If alcohol withdrawal – meds only if necessary
  - Benzos, β-blockers, haloperidol

- PREVENTION is key!
Guillain-Barre Syndrome

- Acute or subacute progressive polyradiculoneuropathy
  - Follows infection, vaccine, surgery
    - Campylobacter jejuni has been implicated
  - Weakness > sensory disturbance ("rubbery legs")
    - Typically begins in legs and spreads proximally
    - Areflexic motor paralysis, face involved in 50%
    - Deep, achy pain in neck, shoulders, back
  - Autonomic disturbances may be severe
    - Cardiopulmonary dysfunction
  - CSF = ↑ protein and normal cell count
  - Rule out other neuropathies
Guillain-Barre Syndrome

- Treatment
  - Plasmapheresis early
  - IVIG 400mg/kg/day x 5days
  - ICU/ventilatory support if necessary
  - Volume replacement and pressors may be required
  - STEROIDS ARE INEFFECTIVE

- Recovery takes months
  - 15-20% left with persisting disability
  - Mortality rate ~5%
Multiple Sclerosis

- Diagnosis most common in young adults, especially women
  - Western European lineage
  - Temperate climate
  - Likely autoimmune
- Focal areas of demyelination
  - Reactive gliosis – scattered white matter changes in central nervous system
    - Periventricular
    - Spinal cord
Multiple Sclerosis - presentation

- Symptoms
  - Weakness, numbness, tingling, optic neuritis, spasticity, diplopia, disequilibrium/vertigo, urinary urgency/hesitancy
  - Fatigue
  - Symptoms can migrate from limb to limb
  - May be triggered by stress (i.e. infection)

- Signs
  - Nystagmus, optic atrophy, UMN findings (i.e. hyperreflexia), sensory and/or cerebellar deficits

- Pregnancy reduces relapses, but they are more likely 2-3 months postpartum
Multiple Sclerosis

- Relapsing-remitting (most common)
  - Period of remission after initial episode
  - Over time periods of remission are shorter and incomplete
  - Progressively deteriorating
- Secondary progressive
  - Initially relapsing-remitting, then course changes to a steady deterioration
- Primary progressive (least common)
  - Steady deterioration from the onset
Multiple Sclerosis - diagnosis

- Diagnostic criteria change frequently
  - Dissemination in time and space is important

- Diagnostic criteria
  - two or more episodes of symptoms lasting >24 hours and at least one month apart
  - two or more signs that reflect pathology in anatomically noncontiguous white matter tracts of the CNS
    - at least one of the two required signs must be present on neurologic examination
Multiple Sclerosis - diagnosis

- MRI brain and spinal cord
  - Multi-focal white matter disease
  - “Black holes” – areas of axonal damage
  - “Dawson’s fingers” in periventricular area

- Lumbar puncture
  - Oligoclonal bands (IgG)
  - Myelin basic protein
  - Mildly elevated protein and lymphocytosis

- Electrodiagnostic studies (EMG + NCV)
Multiple Sclerosis - treatment

- Acute attacks treated with corticosteroids
  - Methylprednisolone IV 1g/day x 3 days
  - Then oral prednisone 60-80mg/day x 1 week followed by taper
- Steroids improve symptoms but do not prevent progression
- Progressive disease - indefinite treatment with B-interferon or glatiramer
  - Natalizumab – progressive multifocal leukoencephalopathy
  - Immune modulators
- Treat fatigue, depression, spasticity also
Myasthenia Gravis

- Fluctuating weakness of voluntary muscles
- Autoantibodies to acetylcholine receptors
  - Women>men (HLA-DR3)
  - All ages
  - Often associated with thymus dysfunction (thymoma) and other autoimmune disorders (SLE, rheumatoid arthritis)
- Insidious onset
  - Exacerbated by illness, pregnancy, menstruation
- Slow, progressive course
  - Aspiration pneumonia may prove fatal
Myasthenia gravis - presentation

- Symptoms
  - Ptosis, diplopia, difficulty chewing/swallowing, limb weakness
  - Ocular muscles more commonly affected
  - Activity increases the weakness

- Diagnosis
  - Weakness on exam
    - Peak sign, tensilon test
  - Repetitive nerve stimulation, single fiber EMG (jitter)
  - Serum acetylcholine receptor antibodies
  - CXR or CT to investigate for thymoma
Myasthenia gravis - Treatment

- Acetylcholinesterase inhibitors
  - Pyridostigmine (Mestinon), neostigmine (Prostigmin)
  - Symptomatic benefits but does not change course of disease
- Avoid aminoglycosides
- Thymectomy should be considered if <60 years old
- Steroids, IVIG, plasmapheresis also considered
Seizure Disorders

- Epilepsy – recurrent, unprovoked seizures
- Transient disturbance of cerebral function due to neuronal hyperexcitability
- Etiology may be:
  - Genetic
  - Structural/metabolic
    - Congenital anomaly, trauma, tumors/lesions, vascular abnormalities (AVM), degenerative disorders (Alzheimer), infectious diseases
  - Unknown
Seizure classification - focal

- With (complex partial) or without (simple partial) impaired consciousness (former often with preceding aura)
  - Focal part of one cerebral hemisphere activated
  - May evolve to generalized seizure
- Motor (jerking) or somatosensory (paresthesias) symptoms may spread along limb or other parts of body
  - Jacksonian March
  - Visual, olfactory, auditory and gustatory regions of brain may be involved
  - Autonomic symptoms possible (sweating, flushing)
Seizure classification - generalized

- Absence (petit mal)
  - Brief impairment of consciousness – patient often unaware
  - May include tonic/clonic movements
  - Atonic component
  - Automatisms possible
  - Autonomic component possible (enuresis)
  - Occurs almost exclusively in childhood
Seizure classification - generalized

- Tonic-clonic (grand mal)
  - Sudden loss of consciousness with rigidity (tonic)
    - Respiratory arrest lasting <1 minute
  - Jerking, convulsive movements (clonic)
    - 2-3 minutes
  - Urinary/fecal incontinence, tongue biting, aspiration
  - Followed by a flaccid coma and possibly a postictal state of confusion
    - Upgoing toes on plantar reflex testing may indicate postictal state
Seizures - prodrome

- Headache, myoclonic jerks, lethargy, mood changes may occur hours before attack

- Most occur unpredictably
  - Triggers may include lack of sleep, stress, missed meals, menstruation, alcohol (consumption or withdrawal), flashing lights, music.
Seizures - evaluation

- MRI brain (CT if MRI contraindicated)
  - MRA may be necessary to view vascular anomaly
- EEG
- Labs
  - CBC, glucose, electrolytes, calcium, magnesium, LFTs
- Lumbar puncture to r/o infection
Seizures - treatment

- Medications
  - Alcohol-withdrawal seizures treated with benzodiazepines

- Avoid triggers

- Avoid dangerous situations
  - Driving, operating machinery, roofing, etc.
  - Comply with state laws
Seizures - medication

- Generalized or focal
  - Classics
    - Valproic acid, phenytoin, carbamazepine, phenobarbital, topiramate, primidone, lamotrigine
  - Levetiracetam (Keppra)
  - Others
    - Zonisamide, pregabalin, gabapentin
- Lacosamide
  - Adjunct therapy for complex partial seizures only
- Absence
  - Ethosuximide, valproic acid, clonazepam
# Seizures – first line medications

<table>
<thead>
<tr>
<th>Generalized-onset Tonic-Clonic</th>
<th>Focal</th>
<th>Typical Absence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valproic acid</td>
<td>Lamotrigine</td>
<td>Valproic acid</td>
</tr>
<tr>
<td>Lamotrigine</td>
<td>Carbamazepine</td>
<td>Ethosuximide</td>
</tr>
<tr>
<td>Topiramate</td>
<td>Oxcarbazepine</td>
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<tr>
<td></td>
<td>Phenytoin</td>
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<tr>
<td></td>
<td>Levetiracetam</td>
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</tr>
</tbody>
</table>
Seizure medication considerations

- Pregnancy
  - Valproic acid is significantly teratogenic
  - Topiramate, phenobarbital, topiramate, carbamazepine – cat. D

- Dosing frequency

- Side effects/interactions

- Monitoring
  - Serum levels for most drugs
    - Not levetiracetam
  - CBC (anemia, blood dyscrasia)
  - Hepatic function

- Discontinuation – wait at least 2 years seizure-free.
Status epilepticus

- Medical emergency!
  - Repeated seizures without recovery between
  - Fixed epileptic condition lasting >30 minutes
- Maintain airway
- 50% dextrose IV for potential hypoglycemia
- Benzodiazepines initially
  - Phenytoin, fosphenytoin for maintenance
    - Precipitates in glucose-containing solutions
    - Phenobarbital, midazolam may be required
- Respiratory depression and hypotension possible
  - May require intubation
Syncope

- Transient loss of consciousness
  - Global impairment of cerebral blood flow
  - Usually leads to fall if patient is standing
- May be cardiogenic (arrhythmias, aortic stenosis), orthostatic hypotension, or neurally-mediated (vasovagal/common faint)
  - More likely in elderly
- Autonomic neuropathy/dysautonomia
  - Impaired regulation of BP, HR, etc. in response to stress, posture, heat, exercise (carotid mechanoreceptors)
  - May be central or peripheral
  - Diabetes mellitus II is a common cause
  - Carotid stenosis
Vasovagal syncope

- Provoked by fear, emotion/anxiety, pain, site of blood or orthostatic stress

- Often preceded by diaphoresis, pallor, palpitations, nausea, hyperventilation, and yawning
  - Pre-syncopal sensation of lightheadedness/dizziness

- Reassurance, avoidance of triggers
Syncope

- Evaluate for head injury from fall
- Cardiac workup
- Carotid imaging

Treatment
- Midodrine (vasoconstrictor)
- Fludrocortisone (volume expander)
  - maintain adequate hydration
- Treat cardiac abnormalities
- Caution with driving
Tourette Syndrome

- Full name: Gilles de la Tourette syndrome
- Frequent motor and/or phonic tics for at least one year
- Symptoms begin before age 21
- Etiology not completely understood
  - Likely chromosomal abnormality
- Chronic course, but may be relapsing/remitting
- Often associated with obsessive/compulsive behaviors
Tourette Syndrome

- Motor tics (80%) – face, head, shoulder
  - Sniffing, blinking, frowning, shrugging, head thrusting, etc.
  - Echopraxia (imitating movement of others)
- Phonic tics (20%)
  - Grunt, bark, hiss, throat-clearing, cough
    - Coprolalia (obscenities)
    - Echolalia (repetition of others)
    - Palilalia (repeating words or phrases)
- Tics may be self-mutilating
- Ultimately a combination of motor and phonic tics develops
Tourette Syndrome

- Treatment is symptomatic
  - Cognitive behavioral therapy
  - $\alpha$-adrenergic agents (clonidine)
  - Typical antipsychotics are the only FDA-approved meds
    - Haloperidol
    - Unfavorable side-effect profile
References

- McPhee S, Papadakis M, Rabow M. *Current Medical Diagnosis & Treatment, 52nd ed.* USA: McGraw-Hill; 2013
A 45-year-old man presents with episodes of left-sided retro orbital pain, tearing and rhinorrhea nightly x several weeks. What is the most appropriate initial treatment?

1. 100% oxygen
2. ibuprofen
3. amitriptyline
4. verapamil
5. propranolol
An 80 year old man presents with symptoms suggestive of Alzheimer Disease. What is the most appropriate initial medication?

1. quetiapine
2. paroxetine
3. donepezil
4. alprazolam
A patient with a history of AD presents with disorientation and visual hallucinations x 3 hours. What is the most appropriate treatment?

1. initiate alprazolam
2. initiate haloperidol
3. increase dose of donepezil
4. discontinue anticholinergic meds
37 year old woman presents with intermittent weakness, paresthesias, diplopia and fatigue. MRI brain reveals multifocal white matter disease. CSF shows oligoclonal bands. What is the diagnosis?

1. Guillian-Barre
2. Myasthenia Gravis
3. Huntington Disease
4. Multiple Sclerosis
A 64 year old diabetic patient presents with bilateral, symmetric burning pain and paresthesias in the distal lower extremities. Which is the most appropriate initial medication?

1. gabapentin
2. ibuprofen
3. carbamazepine
4. methylprednisolone
5. Percocet
A patient presents with L-sided facial droop, expressive aphasia and LUE weakness. Where is the stroke?

1. right MCA
2. basilar artery
3. right PCA
4. left MCA
Patient presents with left-sided facial droop, expressive aphasia and LUE weakness x 2 hours. After the H&P, what is the best next step?

1. administer t-PA
2. CT scan of head
3. lumbar puncture
4. administer ASA, Plavix and simvastatin
A 60 y/o man complaining of resting tremor of the hand has postural instability and cogwheel rigidity on exam. Which is the most appropriate initial medication?

1. tetrabenazine
2. propranolol
3. alprazolam
4. carbidopa-levodopa

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Which of the following findings on lumbar puncture is most suggestive of bacterial meningitis?

1. elevated opening pressure
2. lymphocytic pleocytosis
3. oligoclonal bands
4. decreased glucose

Rutgers PANCE/PANRE Review Course
A 6 year old unvaccinated girl presents with acute onset high fever, malaise, N/V, confusion and stiff neck. Which is the most appropriate first step?

1. lumbar puncture
2. CT head
3. x-ray sinus
4. IV antibiotics