Dizziness and Vertigo: Diagnosis and Treatment Options

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Disclosures

- Speaker Bureau:
  - Sanofi-Pasteur, Merck, Pfizer, Seqirus, Moderna: Vaccines
  - AbbVie and Biohaven: Migraines
  - Idorsia: Insomnia
- Consultant:
  - Sanofi-Pasteur, Pfizer, Merck, Seqirus, and Moderna: Vaccines
  - GlaxoSmithKline: OA/Pain
  - Bayer: Chronic Kidney Disease
  - Idorsia: Insomnia
  - Shield Therapeutics: Iron Deficiency Anemia
  - *All relevant financial relationships have been mitigated*

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Objectives

- Upon completion of this session, the participant will be able to:
  - Review etiology of dizziness and vertigo
  - Discuss diagnostic options for the individual presenting with dizziness and vertigo
  - Identify treatment options for the individual with dizziness and vertigo

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Statistics

- Dizziness accounts for 5% of primary care visits
  - Third most common complaint in outpatient visits
  - Most common complaint for individuals 75 years of age and older
- For individuals 85 years of age and older, constitutes 7% of all primary care visits
- Dizziness is often a frustrating symptom for patients and a difficult workup for providers
- Given frequency, healthcare providers must be confident in the work-up and treatment

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Differential Diagnosis

- Differential list is vast for both dizziness and vertigo
- Chronic cases average 5 visits to a provider without resolution, in many cases
- Nearly 1/3 of patients presenting with dizziness or vertigo will be never have a specific diagnosis despite a comprehensive work-up and evaluation

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Of 444 patients with Vertigo or Dizziness…

- Primary psychiatric disorder: 109
- Unknown: 96
- Acute vestibulopathy: 69
- Syncope: 37
- Epilepsy: 36
- Post-traumatic: 31
- Cerebrovascular disease: 30
- BPV: 22
- Other: 14

Perkin, G.D. Mosby's Color Atlas and Text of Neurology; 2nd edition. 2002

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What is our goal?

- Goal for primary and urgent care:
  - Recognize and refer emergent, life threatening or potentially disabling conditions
    - Either to specialty or ED as directed by symptomatology and PE
  - Treat more common and benign conditions aggressively and per evidenced-based guidelines

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Dizziness vs. Vertigo

- Dizziness
  - Sense of disturbed relationship to space
    - "Lightheaded"
  - Feeling of turning
- Subjective perception
- Surroundings are not moving

- Vertigo
  - Sensation of movement or spinning; either patient or surroundings
  - With eyes closed, sensation of motion
    - Motion can be rotatory: spinning or translational: swaying back and forth

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Four Main Classifications of Dizziness

- Four categories:
  - Vertigo: spinning or swaying sensation
    - BPV
    - Meniere disease
    - Vestibular neuritis
    - Acute Labyrinthitis
  - Disequilibrium: perceived imbalance while walking
    - Parkinson's disease
    - Diabetic neuropathy

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Four Main Classifications of Dizziness

- Four categories:
  - Presyncope: sense of impending LOC
    - Medications (orthostatic hypotension)
    - Vasovagal syncope
    - Cardiac disease or rhythm disturbance
  - Lightheadedness
    - Depression, anxiety or hyperventilation syndrome

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History Is Most Critical!

- Is it triggered by a particular place?
- Is it brought on by a particular movement
- Is it accompanied by tinnitus or hearing loss
- Is it constant or paroxysmal?
- Are there any symptoms accompanying the complaint to explain the problem?
- Any changes in gait?
- Any recent trauma?

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Evaluation of dizziness and vertigo

- BP/Pulse
- HEENT
- EOM's and retinal exam
- Hearing evaluation
- Weber test
- Rinne test
- Carotid
- Cardiac examination
- Vibratory and joint-position sense
- Reflexes

- Past pointing
- Tandem gait
- Romberg test
- Passive and active rotational tests
  - Neurologic Pearls, pp. 99.

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Past Pointing

- Sit opposite the patient
- Have patient stretch his/her arms out to meet yours
- Fingers should touch
- Patient's eye's closed; have him/her raise hands above head and bring back down to touch yours
- Normally; should be able to be done
- Labyrinthine disorders: deviation to the right or left of clinician's fingers: past pointing
- Consistent with abnormality of the labyrinth system or loss of positional sense
  - Side of abnormality is the side the patient will deviate toward

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Romberg Test

- Have patient stand with feet together and eyes closed
- Patient will lean/fall toward side of abnormality in BPV

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Additional Stimulation Tests

- Dix-Hallpike maneuver
- Orthostatic signs while lying, sitting, standing
- Valsalva maneuver
- Forced hyperventilation
- Sudden turns while walking

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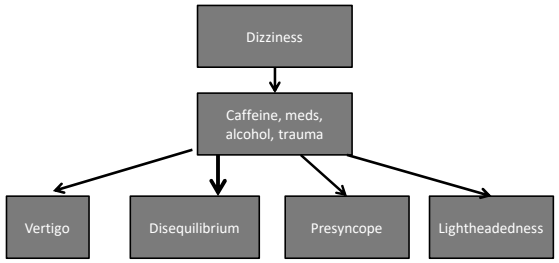
Great Algorithm



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Vertigo: A Comprehensive Look

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Vertigo

- A symptom of disease in the vestibular system
- Can also be seen in patients experiencing an aura from a migraine or seizures (particularly, temporal lobe)
  - Weiner & Goetz, 2002, pp 206

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One Way to Look at Vertigo

- Intermittent vs. Continuous
- Intermittent
  - Triggered
  - Spontaneous
- Continuous
  - Acute

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Another Way to Think of Vertigo

Peripheral Vertigo

- Most common
- Damage to the inner ear receptors or to the vestibulocochlear nerve

Central Vertigo

- Less common
- Damage to centers that process vestibular signals in the CNS
  - Most of these centers are located within the brain stem

Signs and symptoms will help you to distinguish between the two

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Differential: Peripheral Vertigo

- Most common causes are benign
  - Benign positional vertigo (BPV)
  - Acute labyrinthitis
  - Vestibular neuritis
  - Meniere syndrome
  - Perilymph fistula
  - Basilar migraine
  - Acoustic neuroma
  - Cholesteatoma

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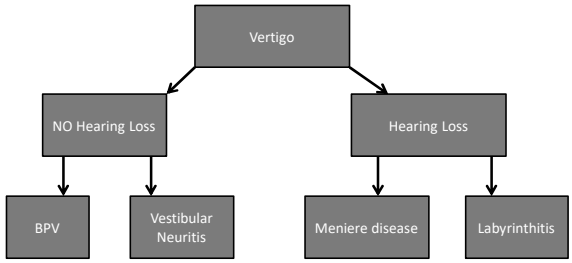

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SS

- 55-year-old woman who presents with an acute onset of feeling like she is moving-she feels like she is spinning internally
- Occurs in response to position changes
- Associated with mild nausea
- Gait: holds onto husband as she walks into the examining room
- + horizontal nystagmus on p.e. otherwise exam normal
- Difficulty with tandem walking

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Peripheral Vertigo

- Damage to inner ear or vestibulocochlear nerve
- Main function of the vestibular system is to stabilize the eyes during head movements
- Tends to be more sudden and occurs in brief attacks
- Highly suggested if occurs first thing in am
- Peripheral vertigo will be characterized by abnormal eye movements
  - Nystagmus will be present but lessens when patient fixes a gaze
  - Either horizontal or rotary
  - Triggered by provoking factor
  - May be accompanied by hearing loss or tinnitus
  - Difficulty walking
  - Nausea or vomiting

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Video - Nystagmus

- University College of Dublin
- You tube: please search video

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What SHOULD NOT BE PRESENT!

- Incoordination of hands
- Diplopia or dysconjugate eye movements
- Loss of sensation
- Weakness

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Another Cause:

- Case study
  - HC – 48 year old male
  - History: vertigo lasting 20-30 minutes
    - Followed by severe, unilateral headache
  - N/v
  - + photo
  - Numerous episodes throughout lifetime
  - No obvious cause

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Basilar Migraine (Bickerstaff syndrome)

- Subtype of migraine with aura
- Pathophysiology:
  - Symptoms begin in the brainstem / basilar artery
  - Symptoms include: vertigo, diplopia, paresthesias, tinnitus, syncope
  - Most common in women
- Treatment:
  - Avoid triptans and ergotamines
  - Prevention: verapamil, antiepileptics, TCA's
    - Avoid beta blockers as they can worsen condition in some

http://emedicine.medscape.com/article/1142731-overview accessed 02-20-2016

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Vertiginous Migraine

- Vertigo may be present in up to 33% of individuals with migraine
- Becoming increasingly more recognized
- Treatment remains same as Basilar migraine

http://emedicine.medscape.com/article/1142731-overview accessed 02-20-2016

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Benign Positional Paroxysmal Vertigo

- Most common in middle-age to older individuals
- Two times more common in women
- Patient complains of vertigo when getting out of bed or turning in bed to shut off alarm clock
  - Presence of vertigo upon awakening, highly suggestive of peripheral vertigo, in particular, BPV
- Etiology:
  - Loose otolith in the semicircular canals
  - Free floating in the semicircular canal, causing symptoms with head movements
  - Causes false sense of motion

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Benign Positional Paroxysmal Vertigo

- Most common semicircular canal affected is the posterior canal
- Second most common, horizontal canal
- Most common triggers:
  - Extending head back to look up (Top shelf vertigo)
  - Turning over in bed
  - Getting in and out of bed

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Benign Positional Paroxysmal Vertigo

- Head positioning affects symptoms
- Nystagmus: rotatory
- Nystagmus and vertigo: fatigues in 60 seconds
- Repeated testing: decreases symptoms
- NO hearing loss
- Diagnostic criteria:
  - Positive Dix-Hallpike maneuver

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Dix-Hallpike positional test for benign positional nystagmus

- Also called Barany maneuver
- Patient rapidly moved from sitting to head-hanging position
  - Head below body by about 30 degrees
  - Head turned 45-90 degrees
  - Keep eyes open and look for nystagmus with maneuver
  - Repeat with head turned to opposite side
- Results
  - Rotary nystagmus; indicate of BPV/abnormality of the vestibular system

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Remember….

- Nystagmus is diagnostic of vestibular debris in the ear that is facing downward, closest to the examination table
- Positive test: BPV
- Negative test: does not rule out BPV
- Sensitivity of test: 50%-88%

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Treatment for BPV

- Treatment: meclizine and PT; rarely surgery
- Meclizine (antivert) 25mg – 50 mg every four – six hours
- Vestibular rehabilitation:
  - Series of head and neck exercises performed at home
  - Epley maneuver (canalith repositioning)
    - Safe and effective
  - Balance therapy is beneficial
- Benzodiazepines may be beneficial
- Antiemetics can be beneficial

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Vestibular Neuritis: Another Cause of Peripheral Vertigo

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Vestibular Neuritis

- Viral infection of the vestibular nerve
  - Presents often times after a virus
  - Thought to represent an injury to vestibular nerve (on one side) – 8th cranial nerve
- Most common between 40 – 50 years of age
- Prognosis: tends to resolve over 1 - 2 months

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Vestibular Neuritis

- Physical exam findings
  - Acute vertigo (only has once- if recurrent episodes – not likely)
  - Often disabling and requires bed rest for many
  - N/V
  - **Normal hearing!**
  - Altered balance
  - Nystagmus: horizontal and unidirectional

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Vestibular Neuritis

- Diagnosis:
  - History and PE – used most of time for diagnosis
  - Caloric tests (caloric paresis on involved side)
- Treatment: meclizine, PT, prednisone may be helpful
  - Prednisone: 60 – 100 mg orally daily x 10 days
  - Prednisone has been known to shorten course

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Ramsay Hunt Syndrome

- Variant of vestibular neuritis
- Caused by varicella zoster virus
- Involves both cranial nerve VII and VIII
  - Facial paresis
  - Tinnitus
  - Hearing loss
  - Vestibular defect
- Treatment: antiviral and prednisone

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Big Differential….

- Ischemia within the posterior fossa or posterior circulation CVA can present very similarly to vestibular neuritis
- With CVA, will have:
  - Focal numbness
  - Weakness
  - Slurred speech
  - Potentially, diplopia

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Vertigo AND Hearing Loss…..

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Acute Labyrinthitis: Peripheral Vertigo

- Infection of the labyrinthine organs
  - Inflammation of the canals of inner ear
- Often confused with acute vestibular neuronitis
  - Remember: acute labyrinthitis is accompanied by hearing loss
- Usually result of viral infection or bacterial infection
  - I.e. Otitis media or viral upper respiratory infection
- May also be result of allergies, cholesteatoma or medications which are toxic to middle ear

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Acute Labyrinthitis

- Presentation:
  - Severe vertigo
  - Hearing loss
  - Nausea
  - Vomiting
  - Fever
- Complication:
  - Suppurative labyrinthitis
  - Infection extends from middle ear through a ruptured membrane or fistula
  - Requires hospitalization for fluids/IV antibiotics
  - Potential for surgery
  - IMMEDIATE ER referral/evaluation

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Cholesteatoma

- Benign growth that occurs in the middle ear behind the ear drum
- Thought to be related to repeated infections
- Causes ingrowth of the skin of the TM
- Can increase in size and destroy the bones of the middle ear
- Can cause hearing loss and vertigo
- Treatment: surgical removal

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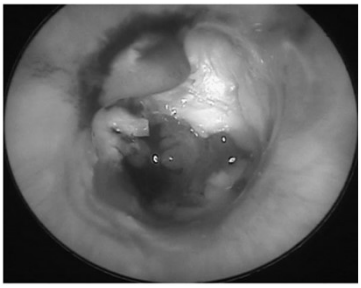
Cholesteatoma



Picture from Wendy Wright, APRN

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Meniere Disease

- Increased endolymphatic fluid in the inner ear
- Pathophysiology:
  - Dilation of the endolymphatic system
  - Caused by excess production of endolymph or diminished reabsorption

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Meniere Disease

- Recurrent attacks of:
  - Tinnitus
  - Low frequency hearing loss
  - Ear fullness
  - Intense vertigo (minutes to an hour)
    - Unusual to last longer than 2 hours
- 4^{th} – 6^{th} decade; rare after 70 years of age
- Hearing loss – unilateral and sensorineural
  - Often, tinnitus is permanent
- As disease progresses, attacks are more frequent and more severe
- Over time, most people develop bilateral hearing changes

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Treatment

- Sodium restriction
  - 1-2 grams of sodium daily
  - Salt increases endolymphatic volume
  - Very beneficial to most
- Diuretics
  - HCTZ or triamterene/HCTZ
- Intratympanic dexamethasone
- Severe cases
  - Obliteration of the labyrinth or 8th CN
  - Gentamicin injection (transtympanically) – but greater risk of hearing loss than surgery

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Acoustic Neuroma

- Tumor composed of Schwann cells of the vestibular nerve
- Presenting symptoms:
  - Vertigo
  - Unilateral hearing loss
  - Tinnitus
- Diagnosis:
  - Gadolinium-enhanced MRI
  - Gold standard for this diagnosis
  - Monitor regularly:
    - Tumor can expand intracranially

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AB

- 66 year old female who presents to NP complaining of:
  - Pressure in right ear x 4 hours
  - Concerned re: an ear infection as she is flying over next 48 hours
  - History of allergic rhinitis
  - Accompanied by vertigo
  - Notices that sound is “muffled in ear”

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AB (continued)

- Evaluation by NP
- Normal examination except pale, boggy turbinate's
- No evidence of AOM
- ? Slight fluid behind right TM
- Diagnosis: Serous OM
- Treatment: OTC treatment; i.e. oxymetazoline nasal spray and pseudoephedrine

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AB (continued)

- Call 12 hours later….
  - Worsening hearing loss, difficulty hearing right ear
  - No pain, feels blocked
  - Concerned as she is flying
  - Seen by MD
  - Diagnosis: OME
  - P: loratadine, increased fluids, continue nasal spray

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AB (continued)

- 6 months later, letter received from specialist
- Diagnosis:
  - Sudden Sensorineural Hearing Loss (SSNHL)

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SSNHL

- Most cases occur in the morning and progress rapidly over a 12-hour period
- First presentation is often tinnitus or sense of fullness; often in the morning
- Peak incidence: 6th decade of life
- Most cases idiopathic
  - May be infectious, result of an acoustic neuroma
  - Trauma or drug induced
  - Occlusion of cochlear artery
- 40% accompanied by vertigo
  - Poor prognosticator

http://otologytextbook.com/sudden_sensorineural_hearing_los.htm accessed 02-01-2016

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SSNHL

- 30-65% will completely or partially recover without treatment
- Treatment:
  - Aimed at eliminating offending cause
  - Steroids
    - 10-day course of steroids
    - 40-60 mg of prednisone daily or similar
    - 78% vs. 38% had partial/complete recovery compared with placebo
  - Vasodilator therapy

http://otologytextbook.com/sudden_sensorineural_hearing_los.htm accessed 02-01-2016

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SSNHL

- Regard SSNHL is regarded as an otologic emergency
- Refer to audiology vs. ENT acutely
- Gadolinium-enhanced MRI of the internal auditory canals should be obtained (r/o acoustic neuroma)
- A 10-day course of prednisone, 1 mg/kg/d
  - If a partial recovery is noted at the end of the 10 days, the full dose is extended another 10 days, and the cycle is repeated until no further improvement is noted.
- Additionally, acyclovir, 800 mg 5 times daily for 10 days, is prescribed because it may be beneficial and since the risks are minimal. (if you think viral)
- A 2-g sodium diet is recommended with a hydrochlorothiazide–triamterene diuretic combination
- Hyperbaric oxygen: showing promise

http://otologytextbook.com/sudden_sensorineural_hearing_los.htm accessed 02-01-2016

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It Should Be Noted

- Sudden sensorineural hearing loss increased the risk of subsequent stroke by 1.6 x in the 5 years following this event
- Thought that this may be due to an anterior inferior cerebellar artery infarction with possibility of wider progression into the posterior circulation

Lin HC, Chao PZ, Lee HC. Sudden sensorineural hearing loss increases the risk of stroke: A 5-year follow-up study. *Stroke* 2008; 39:2744-2748.

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Central Vertigo: Emergent conditions

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Central Vestibular Disorders: Vertigo

- Differential diagnosis
  - Ataxia
  - Cerebral bleed
  - Brainstem ischemia
  - Tumor
  - Multiple sclerosis

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Characteristics of Central Vertigo

Symptoms

- Marked vertigo
- Nausea
- Headache
- Ataxia
- Nystagmus is likely to be more profound
  - VERTICAL nystagmus
- May have altered level of consciousness

Additional information

- Cerebellum is often involved
- Have high level of suspicion with vertigo in:
  - Older age individual
  - Atrial fibrillation present
  - Hypertension
  - Cerebrovascular disease present

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Pearls of Practice

- Severe ataxia
- Severe nausea
- Diplopia
- Symptoms out of proportion to your examination
- All point to possible central cause

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Dizziness

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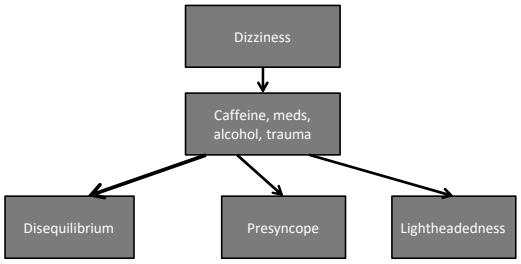

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Four Main Classifications of Dizziness

- Dizziness: remaining three differentials
  - Disequilibrium: perceived imbalance while walking
    - Parkinson's disease
    - Diabetic neuropathy
    - Proprioceptive abnormalities
  - Presyncope: sense of impending LOC
    - Medications (orthostatic hypotension)
    - Vasovagal syncope
    - Cardiac disease or rhythm disturbance
  - Lightheadedness
    - Depression, anxiety or hyperventilation syndrome

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Parkinson's Disease

- Dementia is about 6 X more common in the elderly patient with Parkinson's than in the average older adult.
- More common in the older patient who develops Parkinson's compared with the younger onset patient
- Most likely to occur in older patients who have had major depression.

Boyle PA, Wilson RS, et al. Mild Cognitive impairment: risk of Alzheimer's disease and rate Of cognitive decline. *Neurology.* 2006;67:441-5.

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Parkinson's Disease

- Clinical picture
  - Physical changes occur first – followed then by dementia
    - Shuffling gait, reduced arm swing, hesitation
  - Language is usually not affected in Parkinson's dementia
  - Visual hallucinations may occur in 1/3 of patients on long term medications designed to decrease the symptoms of Parkinson's disease.

Boyle PA, Wilson RS, et al. Mild Cognitive impairment: risk of Alzheimer's disease and rate Of cognitive decline. *Neurology.* 2006;67:441-5.

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Peripheral Neuropathy

- Hereditary neuropathy
- Acquired neuropathy
- Diabetic neuropathy
  - Decreased sensation with monofilament
  - Diminished position sense
- Work-up:
  - Nerve conduction studies

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Proprioceptive Abnormalities

- Proprioceptive abnormalities: affects the sensory fibers
  - Alcoholism
    - Deterioration of the vestibulospinal pathways
    - Often not reversible
    - Check B12 and folate
  - Syphilis
    - Deterioration of the posterior columns
    - Often complain of difficulty ambulating in darkness

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Presyncope: Orthostatic Hypotension

- Pathophysiology
  - Drop in blood pressure on position change
  - Causes decreased blood flow to the brain
- Diagnostic criteria
  - Drop in systolic BP by 20 mm Hg
  - Drop in diastolic BP by 10 mm Hg
  - Increase in pulse by 30 bpm

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Presyncope: Orthostatic Hypotension

- Look at medication list:
  - Alpha blockers
  - Beta blockers
  - ACE inhibitors
  - Clonidine
  - Diuretics
  - Methyldopa
  - Nitrates
  - Antipsychotics
  - Opioids
  - Parkinson's drugs
  - Muscle relaxants
  - TCA's
  - PDE-5 inhibitors
  - Anticholinergics

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Orthostatic Hypotension

- Diagnosis:
  - SBP – drop by 30mm, DBP – drop by 20 mm, or pulse increase – 30 bpm
  - Ambulatory blood pressure monitor
  - Tilt Table Test
- Treatment:
  - Rehydration
  - Can try sodium tablets
  - Midodrine (proAmatine) up to 10 mg three times daily (alpha-1 agonist metabolite)
  - Fludrocortisone 0.1 mg daily (mineralocorticoids)
    - Increases sodium and water retention
    - Monitor blood pressure
    - Monitor potassium
    - Monitor for CHF
  - Pseudoephedrine 30 – 60 mg daily
  - Paroxetine 20 mg daily
  - DDAVP 5-40 mcg daily

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Must also consider…

- Cardiac dysrhythmia or heart block
  - SVT:
    - 75% experience dizziness
    - 30% syncopal
  - V Tach
  - V Fib
  - Atrial fibrillation/flutter
  - Complete heart block

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Does the Patient Have….

- Carotid artery stenosis
  - Check carotid pulses
  - Assess for bruits
- Aortic Stenosis
  - Murmur
  - Loudest 2nd intercostal space, right sternal border
  - Increases with forward leaning
- Outlet obstruction
  - HCM
  - Valvular

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Cardiac Etiology

- Cardiac outflow obstruction
  - Common cause of dizziness and syncope in an older individual
  - Variety of causes
    - Valvular
      - Aortic stenosis
    - Aortic dissection

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Points to aortic stenosis

- Age
  - <30= congenital
  - >70= acquired
- Co-symptoms
  - Chest pain, dyspnea
  - Symptoms occur w/ exertion
  - Multiple episodes of presyncope/near syncope
  - DOE

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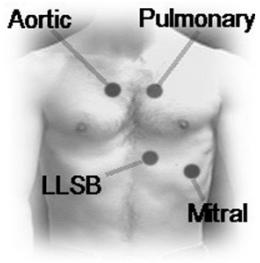
Aortic Stenosis Murmur

- Best heard in aortic region
  - Harsh sounding murmur
  - Radiates to neck



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Work-up

- Depending upon suspected etiology:
  - Echocardiogram: valvular disorder
  - Holter monitor or event monitor: rhythm abnormalities
  - Ultrasound: carotids: Carotid stenosis

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Trauma

- Concussion or whiplash injuries
  - New guidelines released by AAN
  - Dizziness reported to be as high as 78-80%
  - Limited evidence for second impact syndrome
  - However, first ten days after concussion, highest risk for second

Level B	In order to diminish the risk of recurrent injury, individuals supervising athletes should prohibit an athlete with concussion from returning to play/practice (contact-risk activity) until an LHCP has judged that the concussion has resolved.
	In order to diminish the risk of recurrent injury, individuals supervising athletes should prohibit an athlete with concussion from returning to play/practice (contact-risk activity) until the athlete is asymptomatic off medication.

http://www.aan.com/globals/axon/assets/10722.pdf accessed 02-01-2016

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Psychiatric Etiology…

- Common cause of dizziness/lightheadedness
- Anxiety is most common etiology
  - One study…28% of patients with dizziness has at least one anxiety diagnosis/disorder
  - One in four patients with dizziness met criteria for panic disorder
  - Up to 60% of patients with chronic dizziness have anxiety disorder

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Hyperventilation Syndrome

- Hyperventilation causes respiratory alkalosis
- Underlying anxiety is often the cause, but not always
- Can reproduce in office with voluntary hyperventilation, if patient willing
  - 20 deep inhalations and exhalations
- Patients may sigh repeatedly in office, providing clue to hyperventilation syndrome
- May have additional symptoms of:
  - Chest pain, paresthesias, bloating, abdominal pain

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Additional Causes of Dizziness

- Cerebral anoxia
- IDA
- Malignancy
- B12, Folate deficiency
- Blood loss
- CVA

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Thank You!

I Would Be Happy to Entertain Any Questions

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