Assessing Falls – Why do they happen?

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Why are FALLS so difficult to assess?

- No other mammals spend their day standing upright - upright balance requires smooth functioning and integration of complex neurological and cardiovascular systems.
- Therefore FALLS can be caused by multiple problems: vertigo, strokes, cardiac and neurological diseases, neck disorders, physical deconditioning, and medications that do not fall under a single organ-specific specialty.
- The Assessment of FALLS is not a major focus of the medical curriculum.

Objectives - To Review Contributors to Falls (this is an oversimplification as patients may have > 1 category)

1. **VERTIGO**
   - **SENSE OF MOVEMENT**
2. **DYSEQUILIBRIUM (unsteadiness)**
   - **Persistently Poor Balance - Patient ambulates poorly all the time. You are not surprised that they fall.**
3. **PRESYNCOPE**
   - **Patient ambulates well most of the time but the has episodes LIGHT HEADEDNESS and falls**
   - **Syncope (Loss of Consciousness)**
4. **MEDICATION Related**
5. **Non-Specific**
   1. **DEPRESSION / ANXIETY**
   2. **Hypoglycemia**

Many patients complain of "DIZZINESS" – What questions should you ask?

- History can help separate serious from benign conditions. The following are standard questions. The reasons for asking these questions will become clearer in upcoming slides.
- **What do you mean by "dizzy"**
  - **Vertigo**: an illusion of movement where none exists
  - **Lightheadedness:** fainting, feel like you are going to pass out
  - **Imbalance**: dizziness or unsteadiness only when patient is ambulating
- **Description of symptoms important**
  - When it first started
  - How it progressed
  - Recent illnesses/New Meds
  - Associated Diseases (i.e. Hypoglycemia)

"DIZZINESS" – What questions should you ask?

- **Associated symptoms**
  - Nausea
  - Headache
  - Hearing loss / Tinnitus
  - Imbalance
  - Sensory symptoms (vision, speech, slurring, etc)
- **What provokes/worsens symptoms**
  - Head movement or other change in position
  - Medications
  - Sleep
  - Stress
- **Recurring: initial, typical, most recent**
- **How Long does it last – seconds/minutes/hours/Continuous???**

These questions can help you decide which of the following categories you may be dealing with.

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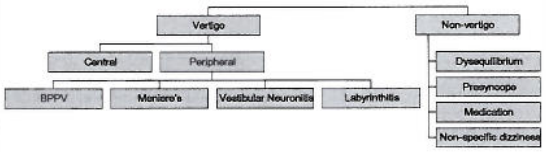
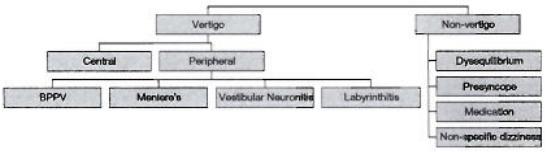
FALLS – a systematic approach

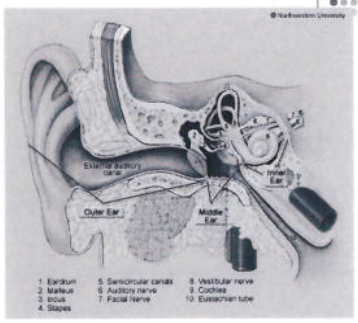


1. VERTIGO



Vertigo

- Feeling of movement when one is stationary (does not need to be spinning)
- Central – Cranial Nerve 8 (Vestibular Nerve) within Central Nervous System (Brain)
- Peripheral – Ear … areas 5, 8 in this picture



Central Vertigo

Central = Central Nervous System

- DDX Migraines, MS, trauma, strokes, tumor etc.
- Need neuroimaging +/- ENT special studies (refer to ENT or neurology)

- Look for Neurological signs suggesting brain or brainstem pathology:
  - Gait and limb ataxia
  - Cranial nerve findings
    - Slurred speech, diplopia
  - Focal weakness/numbness
  - Incontinence

Peripheral Vertigo

Peripheral = inner ear or vestibular system

- no CNS neurological signs except vertigo, nausea and decreased hearing (all explained by inner ear or vestibular system dysfunction)
- refer to ENT if does not resolve over time

Common Causes (hard to differentiate):

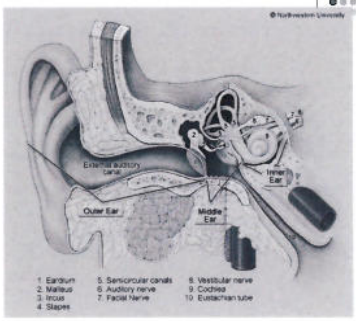
1. Benign Paroxysmal Positional Vertigo (BPPV)
2. Meniere's Disease
3. Vestibular Neuronitis
4. Labyrinthitis
5. Motion Sickness (not reviewed)

1. BPPV or BPV: BENIGN (Paroxysmal) POSITIONAL VERTIGO

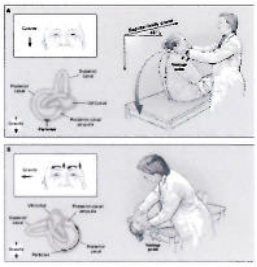
- Commonest Cause of Chronic Vertigo in the Elderly. Sometimes associate with trauma.
- Cause: Calcium crystals dislodged and move to semi-circular canals
- Symptoms and signs:
  - Sudden onset vertigo lasting seconds to minutes, episodic, brought on by changes in head position (rolling over, bending, looking upward)
  - Nausea
  - Rotatory (torsional) Nystagmus where top of eye rotates toward the affected ear in twitching fashion

BPPV

- Calcium crystals (Canaliths) in semi-circular canals (area 5)



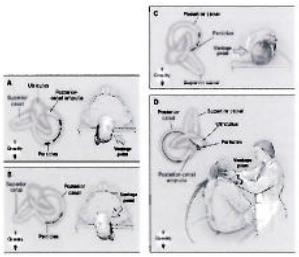
BPPV diagnosis: Dix-Hallpike or Nylen Barany Test



- Rotatory Nystagmus starts 5 – 10 seconds after positioning
- Nystagmus lasts 5 – 120 seconds
- Visual fixation does not suppress Nystagmus
- Nystagmus suppressed / fatigued by repeated manoeuvre

BPPV treatment : Canalith Repositioning Procedure = EPLEY's Maneuver

- Exercises that provoke vertigo used to reposition crystalline debris (the dislodged Calcium Crystals)
- 5 minutes in each position, repeat 3 times

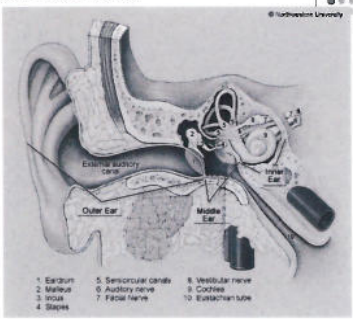


2. Meniere's Disease

- Cause: Excess fluid in inner ear
- Symptoms and Signs:
  - Attacks of Vertigo lasting minutes to hours (max 24 hours) – unexpected, not triggered by position
  - Fluctuating progressive hearing loss (one or both ears)
  - Unilateral or bilateral tinnitus
  - Sensation of fullness or pressure in ear.
  - Nausea, vomiting, sweating
  - Horizontal Nystagmus

Meniere's Disease

- Increased endolymphatic fluid in semicircular canals (area 5)

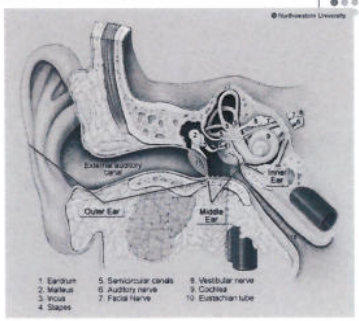


3. Vestibular Neuronitis

- Vestibular Neuronitis = inflammation of vestibular nerve
- Symptoms and Signs;
  - Vertigo + Nausea and Vomiting
    - unexpected, not triggered by position
    - +/- Nystagmus
  - Unlike labrynthitis (next topic) is **NOT** associated with auditory symptoms (no tinnitus or decreased hearing)
- May be associated with prior viral upper respiratory tract infection

Vestibular Neuronitis

- Inflammation of vestibular nerve (area 8)

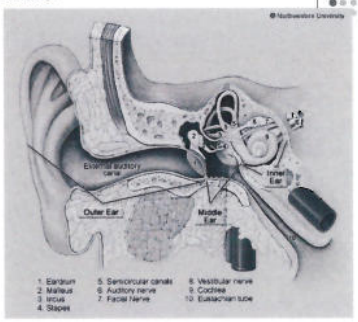


4. Labyrinthitis

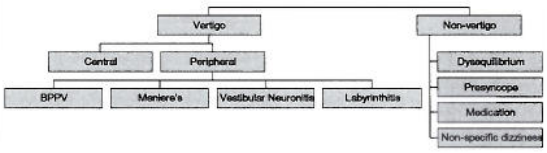
- Labyrinthitis – inflammation of inner ear.
- Symptoms and Signs:
  - Acute onset of non-position dependent vertigo (often severe)
    - +/- nausea and vomiting
    - +/- hearing loss and tinnitus
- May occur after viral or bacteria infection (especially upper respiratory tract infection), or head injury
- Lasts 1 – 6 weeks but can have residual symptoms for months or years

Labyrinthitis

- Inflammation of inner ear (areas 5 and 9)



2. DYSEQUILIBRIUM



Dysequilibrium

- Stable / constant non-episodic balance problems unrelated to symptoms that can be explain by ear pathology (i.e. vertigo, nausea, tinnitus loss of hearing ….).
- A sense of imbalance that occurs primarily when walking
- Consider this as a vital sign or a RED FLAG that something medical may be going on – almost any illness, when severe enough or when combined with other contributors, can interrupt the neuro-cardiac integration required to stand upright all day (an unusual position for mammals).

FALLS due to persistently poor balance

- Perspective Shift #1
  - In order to maximize your clinical effectiveness, view this as a **vital sign**. Like HR, BP, Temperature there is a baseline value that is normal for the patient. If balance (or poor balance) is stable this suggests the patient is medically stable. If balance / mobility has recently deteriorated this suggests an underlying medical problem that needs to be diagnosed and treated. If mobility is not improving or is worsening after treatment, this suggests that you have missed something (similar to new onset sinus tachycardia or new onset hypotension).

FALLS due to persistently poor balance

- Perspective Shift #2
  - View stable but persistently poor balance as an opportunity to practice preventative medicine. Dealing with this on an outpatient basis may prevent trauma related admissions to the ward or ICU such as hip / wrist / pelvic / vertebral fractures, SDH etc.
  - Preventative medical interventions adopt the 'pay a little bit now or a lot later' perspective.

The SIGNS (Red Flags)

- Outpatient (how can you tell if your patient has a balance problem and what might be causing it?)
  - O/E: Watch them walk into your office. Are they using a cane or walker, holding on to the wall or furniture, or holding on to a family member for dear life?
  - Hx. Ask about the above. Ask if they have had falls (ignore the word 'accidental' as people with balance problems have more 'accidental' falls). Ask if they have had near falls (show them what you mean). Greater than 2 falls or recurrent near falls are a concern.
  - Think: Has the frequency of falls / near falls changed due to a medication change or a change in a clinical condition?

The SIGNS (Red Flags)

- Inpatient
  - O/E & in discussion with RN / OT / PT:
    - Is balance and mobility improving with treatment of the diagnosed medical condition? If it is significantly worse than prior to admission and particularly if it has worsened since admission you may be dealing with either deconditioning or may have missed a problem (I.e. the vital sign perspective).
  - Think: Has the frequency of falls / near falls or has mobility changed due to a medication change or a change in a clinical condition?

Dysequilibrium

- **A** Activity or Environmental factors
- **I** Intrinsic factors (i.e. disease)
- **D** Drugs

Prioritize by giving each of the contributors found on this list a weighting from 1 (minor) to 10 (major)

Activity or Environmental factors

- Orthostatic Postural Hypotension
  - Getting out of bed or off chair / couch
- Subclavian Steal Syndrome
  - Lifting / Using arms
- Strokes, Neuropathy, Parkinsonism …
  - Tripping over rugs, thresholds
- Vertebrobasilar Insufficiency (next slide)
  - Looking up
- Activity may gives clues to risk reduction strategies

Vertebrobasilar Insufficiency

- Provoked by head or neck movement
- Seconds to minutes
- Other brainstem symptoms
  - Diplopia
  - Dysarthria
  - Facial numbness
  - Ataxia
- Reduced vertebral artery flow on doppler or angiography
- Treatment:
  - Behaviour modification

Intrinsic factors (i.e. disease)

- Neurological
- Vision
- Cardiovascular
- Musculo-skeletal
- Other

Intrinsic factors - Neurological

- 3Ds - Dementia, Delirium, Depression
  - Apraxia, decreased compensation, slow mentation
- Stroke, subdural hematoma, subarachnoid bleed, cerebellar disease, NPH
- Spinal stenosis, Myasthenia Gravis, ALS
- Peripheral or Autonomic neuropathy
  - ETOH, DM, B12 …
- Parkinsonism (next slide)

DDx of Parkinsonism

1. Parkinson's Disease (idiopathic parkinsonism)
   - **TRAP**: Resting **T**remor, Cogwheel **R**igidity, **A**kinesia / bradikinesia (slowness), **P**ostural Instability (decreased balance, falls)
2. Vascular parkinsonism
   - TRAP, no response to Parkinson's meds, basal ganglia strokes
3. Drugs (antipsychotics, GI drugs [stemetil, maxeran])
4. Lewy Body disease
   - Dementia, Longstanding Hallucinations, Longstanding Fluctuation
5. Progressive Supranuclear Palsy (PSP)
   - Loss of downward gaze and then all eye movements, depression, anxiety, psychosis, dementia
6. Late Alzheimer's
7. Multisystem atrophies (MSA – multiple neurologic symptoms)
   1. Shy-dragger, OPCD, SND etc

Intrinsic factors - Vision

- Sudden vision changes with inadequate time to compensate
- Cognitive problems interfering with inability to compensate for poor vision.
- Severe vision problems beyond ability to compensate
- DDX:
  1. Glaucoma (lose peripheral vision – tunnel vision)
  2. Cataracts
  3. **A**ge **R**elated **M**acular **D**egeneration (ARMD)
     - lose **c**entral **c**olor vision
     - Sudden change in vision in patient with ARMD is an ophthalmologic emergency – call ophthalmologist ASAP to have them determine if patient has a growing retinal tear and needs laser treatment on an urgent basis.

Intrinsic factors - Cardiovascular

- Coronary Artery Disease (angina, ACS, MI)
- Syncope (arrhythmia, blockage of blood flow due to Aortic Stenosis / Pulmonary Embolism etc)
- CHF – SOB, severe pedal edema
- Orthostatic hypotension
  - **Always consider** especially in people with potential autonomic neuropathy (e.g. **DM, parkinsonism**)
  - See later in presyncope section

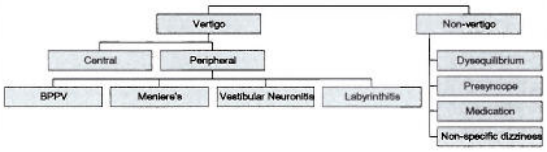
Intrinsic factors - Musculo-skeletal

- Musculo:
  - Myopathy / Myositis
- Skeletal:
  - Arthritis (foot, ankle, knee, hip, back)
    - Deformity altering biomechanics
    - Poor pain control
      - start Tylenol Arthritis 650-1300mg TID straight
      - If still in pain and no CHF or renal dysfunction then consider NSAID
      - Later narcotics (watch for anorexia and weight loss, constipation, delirium)
- etc

Drugs

- Slow reaction time (drugs that cause delirium and slow mentation)
  - Narcotics, benzodiazepines, ETOH, Anticholinergics (e.g. Ditropan, Detrol, Tricyclic antidepressants).
- Decrease cerebral perfusion (see Postural hypotension – 6 ANTIs
  - Anti-hypertensives,Anti-anginals,Anti-parkinsonian medications (e.g. sinemet),Anti-depressants (e.g., Anti-cholinergic tricyclics),Anti-psychotics (Anti-cholinergic effect),Anti-BPH (e.g. Hytrin, Flomax)
- Cause parkinsonism
  - Antipsychotics
  - GI – Stemetil, Maxeran
- Vestibular Toxicity
  - Aminoglycosides, High dose loop diretics

3. PRESYNCOPE



PRESYNCOPY (Lightheadedness) and Syncope (Loss of Consciousness)

1. **Orthostatic Hypotension**
2. **Vasovagal**
3. **Decreased Cardiac Output**
   - **Valvular**
   - **Arythmia**

Orthostatic Hypotension

- Lightheadedness 1-3 min after sitting or standing
  - Perspiration, nausea, weakness
- Lasts seconds to minutes
- ↓ SBP ≥ 20mmHg or ≥ 20%, immediately or within 3 mins of standing

ORTHOSTATIC / POSTURAL Hypotension

3D-AID acronym

- Causes associated with a **compensatory tachycardia** – 3Ds
  - Deconditioning
  - Dehydration
    - Disease
    - Drugs
      - Diuretics
      - Anorexic Drugs – narcotics, digoxin, antibiotics, cholinesterase inhibitors
  - Drugs – 6 ANTIs
    - Anti-hypertensives
    - Anti-anginals
    - Anti-parkinsonian medications (e.g. sinemet)
    - Anti-depressants (e.g. Anti-cholinergic tricyclics)
    - Anti-psychotics (Anti-cholinergic effect)
    - Anti-BPH (e.g. Hytrin, Flomax)
- Causes that present with *lack* of compensatory tachycardia - AID
  - Autonomic Dysfunction
    - Diabetic autonomic neuropathy (consider if patient has peripheral neuropathy)
    - Low B12
    - Hypothyroidism
    - ETOH abuse
    - Parkinsonism (Parkinson's disease, Progressive Supranuclear Palsy, Multisystem Atrophy (e.g. Shy Drager))
  - Idiopathic (Bradbury-Eggleston)
    - Depletion of Norepinephrine from sympathetic nerve terminals
  - Drugs
    - Beta-Blockers

Vasovagal

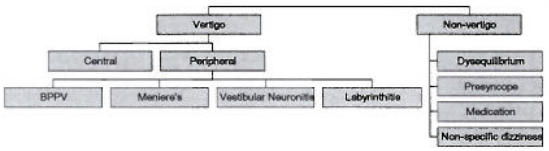
- Syncope Triggered by:
  - Stress
  - Any painful or unpleasant stimuli, such as:
    - Venepuncture
    - Hitting your funny bone
    - Experiencing medical procedures with local anesthesia
    - Post-surgical pain when standing up or moving too abruptly after the procedure
    - Giving or receiving a needle immunization
    - Watching someone give blood
    - Watching someone experience pain
    - Watching or experiencing medical procedures
    - Sight of blood
    - Occasions of slight discomfort, such as dental and eye examinations
  - Sudden onset of extreme emotions
  - Nausea or vomiting
  - Urination ('micturition syncope') or defecation, having a bowel movement ('defecation syncope')
  - Abdominal straining or 'bearing down'
  - Swallowing ('swallowing syncope') or coughing ('cough syncope')
  - Pressing upon certain places on the throat, sinuses, and eyes, also known as vagal reflex stimulation when performed clinically
  - etc

Decreased Cardiac Output

1. **Blockage of blood flow**
   1. **Valvular**
      1. **aortic or mitral stenosis**
      2. **Subaortic stenosis, cardiomyopathy**
      3. **Aortic dissection**
   2. **Pulmonary Embolus**

- **Arrhythmia**
  - **HR too fast (Tachycardia): VT, SVT, WPW, VF, AFIB …**
  - **HR too slow (Bradycardia); SSS, conduction blocks (complete heart block) …can be precipitated by digoxin, beta-blocker, Alzheimer medications (cholinesterase inhibitors), Ca Channel Blockers**

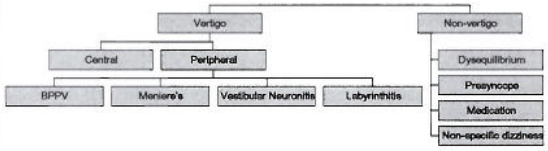
4. MEDICATIONS



Medication induced (not BP related)

- ALCOHOL
- ANTIHISTAMINES
- BENZODIAZEPINES
- ANTICONVULSANTS
  - Phenytoin (dilantin), Phenobarbital, Frisium (a benzodiazepine), gabapentin, pregabalin
  - Keep dilantin level at level that previously controlled seizures – if this info not available then try to keep level < 60)

5. Non-specific



Non-Specific; Anxiety / MOOD

- MOOD
  - Anxiety/Panic disorders
  - Mood disorders (Depression)
    - ↑ with hyperventilation or emotional stress
    - Often associated with:
      - Somatic complaints
      - Insomnia/fatigue
- Hypoglycemia

TREATMENT & PREVENTION

Inpatient Treatment

- Prioritize the contributing factors
  - Reversible vs. irreversible
  - Major vs. minor contributors
- Focus on major reversible factors first
- Involve PT / OT ASAP
- Consult specialists (e.g. cardiology, neurology, nephrology for HD patients) PRN
- Consult Geriatrics if etiology and treatment / management remains elusive or if mobility is improving but need more inpatient rehab

Outpatient Treatment

- If the diagnosis remains elusive and/or there is potential for the multidisciplinary approach to prevent future falls, trauma and admission to hospital the consider referring to:
  - Geriatric Outreach (613-562-6362 east of Bronson, 613-721-0041 west of Bronson).
    - They can triage to a geriatric day hospital that provides ongoing outpatient rehabilitation (Queensway Carleton Day Geriatric Hospital or Bruyere Continuing Care Geriatric Day Hospital).

Treatment

- Goals of treatment
  - Prevent all falls (often unachievable ideal)
  - When that is not possible then decrease frequency, severity and sequelae of falls
    - One sequelae is fractures so order a **Bone Mineral Density** and consider aggressive treatment for osteoporosis in all fallers if you feel their life expectancy merits treatment

Leaders in FALL assessment and management

- Geriatric Medicine and Care of the Elderly are:
  - Hybrid Specialties that incorporate elements from Internal Medicine, Neurology, Psychiatry, Rehabilitation Medicine and that do not focus on a single organ (cross-trainers)
  - Work with multidisciplinary teams – this is critical as many patients with falls require more than a physician's diagnosis and medication changes.
    - Q? What do Multidisciplinary Teams do?

Falls – a Geriatric Team Approach

- Treatment
  - MD / RN
    - Adjust medications (+/- Pharmacist)
    - Optimize control of medical problems
    - Bone Density (prevent fractures if does fall)
  - OT
    - Compensatory Strategies
    - Assistive devices
  - PT
    - Balance and Strength training
    - Ambulation Aides
  - SW
    - Safe housing options + support services
  - Nutrition
    - Improve oral intake
  - ?

QUESTIONS ???