Dizziness is Common, Dangerous, and Expensive

- 9.6% of general population
- #3 most common complaint at age 60+
- #1 reason for a doctor visit at age 75+
- 1/3 of patients age of 65+ may experience falls
- Fall related injuries cost 20 Billions annually
Growth of Dizziness Center

![Bar chart showing growth of dizziness center]

- VNG Tests
- Consults

- 10/1/09-9/30/10: 744 VNG Tests, 550 Consults
- 10/10/10-9/30/11: 975 VNG Tests, 786 Consults
- 10/1/11-9/30/12: 1287 VNG Tests, 1127 Consults
- 10/1/12-9/30/13: 1280 VNG Tests, 1328 Consults
- 10/1/13-9/30/14: 1248 VNG Tests, 1339 Consults
What is Dizziness/Vertigo?
Where are all these patients?

- G.P./Family practice: 35%
- Internal Medicine: 19%
- E.N.T.: 22%
- Cardiology: 5%
- Neurology – 4%
- Other: 4%
Etiologies of Dizziness/Vertigo

- Vestibular: 56%
- Psychiatric: 16%
- Cerebral or cardiovascular: 7%
- Brain tumor: 1%
- Unknown: 13%
- Other: 7%
Figure 1–7 Each neuron in the vestibular portion of the eighth cranial nerve has a so-called resting discharge. That is, numerous action potentials (about 90 per second) occur even with the head at rest. Although these neurons require expenditure of energy even while the head is still, their constant high-level firing rate is useful because such cells can sense motion in both the excitatory and inhibitory directions via depolarization or hyperpolarization that increases and decreases eighth nerve firing rate, respectively. (Source: Adapted with permission from Kelly JP: Vestibular system. In: Kandel ER, Schwartz JH, Jessell TM (eds). Principles of Neural Science, ed 3. Norwalk, CT: Appleton & Lange, 1991, p. 506.)
Figure 1–10 The reciprocal push–pull interaction of the two labyrinths is disrupted after acute peripheral labyrinthine injury. For example, following the acute loss of right unilateral peripheral vestibular function, there is a loss of resting neural activity in the right vestibular nerve and right vestibular nuclei. Because the brain normally detects differences in activity between the two vestibular nuclear complexes, even when stationary the imbalance in neural activity is interpreted as a rapid head movement, in this case to the left.
Specific Diagnosis is COMPLEX

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Frequency %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benign paroxysmal positional vertigo (BPPV)</td>
<td>18.3</td>
</tr>
<tr>
<td>Phobic postural vertigo (PPV)</td>
<td>15.9</td>
</tr>
<tr>
<td>Central vestibular vertigo</td>
<td>13.5</td>
</tr>
<tr>
<td><strong>Migraine Associated Vertigo</strong></td>
<td>9.6</td>
</tr>
<tr>
<td>Vestibular neuritis</td>
<td>7.9</td>
</tr>
<tr>
<td>Meniere's disease</td>
<td>7.8</td>
</tr>
<tr>
<td>Bilateral vestibular</td>
<td>3.6</td>
</tr>
<tr>
<td><strong>Psychogenic vertigo (without PPV)</strong></td>
<td><strong>3.6</strong></td>
</tr>
<tr>
<td>Vestibular paroxysmia</td>
<td>2.9</td>
</tr>
<tr>
<td>Perilymph fistula</td>
<td>0.4</td>
</tr>
<tr>
<td>Various other disorders</td>
<td>12.3</td>
</tr>
<tr>
<td>Unknown etiology</td>
<td>4.2</td>
</tr>
</tbody>
</table>

\[ n = 4,790 \text{ patients from another dizziness center (1989-2003)} \]
In the Brain:

Nerve impulses are sent through the brain stem and into the acoustic imaging centers in the cerebral cortex of the opposite temporal lobe. Medial areas are responsible for high-frequency recognition (°) and more lateral areas of the cortex are responsible for low-frequency recognition (†).
Classifications of Vertigo/Dizziness

**Peripheral**
- BPPV 18.3%
- Vestibular Neuritis 7.9%
- Labrynthitis
- Bilateral Vestibular Hypofunction 7.8%
- Meniere’s disease 7.8%
- Vestibular Paroxysmia 2.9%
- Superior Canal Dehiscence
- Perilymph fistula 0.4%
- Vestibular schwannoma

**Central**
- Migraine Associated Vertigo 9.6%
- Phobic postural vertigo/Chronic Subjective Dizziness 19.5%
- Stroke
- Tumor
- Multiple Sclerosis 13.5%
- Chiari Malformation
- Degeneration (atrophy due to age or toxic agents)
Case #1 BPPV

• 73-year-old female, who started complaining of dizziness 3 months ago.

• One morning she woke up with room spinning

• The dizziness usually lasts 20 seconds when she is laying down or getting up; looking up or bending down

• Dizziness Handicap Index was 26/100

• She denies headaches, or nausea
Left BPPV
Delayed Referral BPPV may Cost 6 times More

Cost of Tests Prior to Consultation

- Primary: $159
- Specialist: $347
- ER: $952
Case #2 Phobic Postural vertigo/Chronic Subjective Dizziness

- 77 yo F with 6-7 months of dizziness and imbalance
- Lightheadedness, no spinning
- Worse with lying down or getting up
- Staggers when walking and has to constantly watch on the floor
- A couple of falls and many near-falls
- Denies ear related symptoms
- History of depression with anxiety
- MRI of brain (-)
- Neurologic examination (-)
Diagnostic Criteria for CSD

- Unsteadiness, dizziness or both present throughout the day with fluctuation in severity, which are present on most days for 3+ months
- Symptoms are related to body posture and are most severe when walking or standing
- Symptoms are present without provocation, but can be exacerbated by:
  - active or passive motion not related to a specific direction or position
  - active visual fields
  - small-field visual stimuli
- Precipitating factors include:
  - Neuro-otologic disease causing central or peripheral vestibular dysfunction
  - Medical problems that results in unsteadiness or dizziness
  - Psychiatric disorders that produced unsteadiness or dizziness
- Low levels of anxiety or depression are common
- Clinically significant psychological distress or psychiatric disorders may be present

Staab, 2012
Case #3 Migraine-Associated Vertigo

- 44 year old female
- Complaints:
  - Lightheadedness associated with balance problems, visual disturbances, and headaches
  - Occurs daily and lasting up to hours
- History of migraine
- Denied anxiety and depression
- Overall, feels that his symptoms are getting worse, without help from vestibular therapy
Diagnostic Criteria for MAV

- **Definite Vestibular Migraine (MAV)**
  - Moderate to severe episodic vestibular symptoms
  - Current or previous history of migraine as defined by the 2004 criteria of the International Headache Society
  - One or more of the following symptoms present in two or more attacks of vertigo: migrainous headache, photophobia, phonophobia, visual or other auras
  - Other causes ruled out

- **Probable Vestibular Migraine (MAV)**
  - Moderate episodic vestibular symptoms
  - One of the following:
    - Current or previous history of migraine as defined by the International Headache Society criteria
    - Migrainous symptoms with vestibular symptoms
    - Migrainous precipitants of vertigo in more than 50% of attacks i.e. food triggers, sleep disturbance, hormonal changes
    - Response to migraine medications in more than 50% of attacks
    - Other causes ruled out

Lempert et. al 2009
CNS “Dizziness Threshold” Theory

Normal Patient

Migraine/Headache

Anxiety/Hipoc disorders

PPV

Dizziness/Vertigo

HAV/PPV
Prior to DENT Visit

- Average months: 55 mos
- Consulted 1.37 MDs
- Had an ER visit 37.5%
- Meclizine 35.9%
- Average Imaging Done 1.26

Number of Solutions Found

Prior to Dizziness Center Contact: 0

(June 2010-62 Dizzy Patients)
Dizziness Improved in 90% Patients

at Dent Dizziness and Balance Center

- 65% Improve
- 27% Non-Improve
- 8% Not Sure

- 89% Improve
- 11% Non-Improve
## Specific Vertigo needs Specific Tx

<table>
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<tr>
<th>Diagnosis</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benign paroxysmal positional vertigo (BPPV)</td>
<td>Repositioning</td>
</tr>
<tr>
<td>Phobic postural vertigo (PPV)</td>
<td>Anti-anxiety meds</td>
</tr>
<tr>
<td>Central vestibular vertigo</td>
<td>VT</td>
</tr>
<tr>
<td>Migraine Associated Vertigo</td>
<td>Lamotrigine</td>
</tr>
<tr>
<td>Vestibular neuritis</td>
<td>VT</td>
</tr>
<tr>
<td>Meniere’s disease</td>
<td>Lamotrigine</td>
</tr>
<tr>
<td>Bilateral vestibular</td>
<td>VT</td>
</tr>
<tr>
<td>Post-Concussive Dizziness</td>
<td>Lamotrigine</td>
</tr>
<tr>
<td>Vestibular paroxysmia</td>
<td>Carbamazepine</td>
</tr>
<tr>
<td>Perilymph fistula</td>
<td>Surgery</td>
</tr>
<tr>
<td>Superior Canal Dehensence</td>
<td>Surgery</td>
</tr>
<tr>
<td>Unknown etiology</td>
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</table>
Tinnitus

Insomnia

Anxiety/Stress

TMJ Neck pain

Hearing loss
Case #4

- 85 y/o male
- Progressive imbalance and lightheadedness over past 5 years (current: 2-3 days bouts of imbalance per week)
- Denied true vertigo; Denied hx of migraines
- Denied anxiety or depression although reported some life stressors
- Denied fluctuation in hearing
- Uses a cane and/or walker
- MRI results showed no abnormal findings
- Completed 4-5 weeks of vestibular therapy with no significant improvement
Vestibular Pattern on Rotary Chair and CDP

- VOR Summary
- Sensory Organization Test
- Sensory Analysis
Age-related neuronal degeneration in the vestibular system

<table>
<thead>
<tr>
<th></th>
<th>Young Adult</th>
<th>&gt; 75 Years Old</th>
<th>Decreases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semicircular Canal</td>
<td>7600</td>
<td>4600</td>
<td>40%</td>
</tr>
<tr>
<td>Saccule</td>
<td>18,800</td>
<td>14,200</td>
<td>25%</td>
</tr>
<tr>
<td>Utricle</td>
<td>33,100</td>
<td>26,100</td>
<td>20%</td>
</tr>
<tr>
<td>VIII Fibers</td>
<td>18,000</td>
<td>11,000</td>
<td>40%</td>
</tr>
</tbody>
</table>
DDX of Imbalance and Falls

- Bilateral vestibular hypofunction due to age-related peripheral vestibular degeneration
- Peripheral Neuropathy
- Normal pressure Hydrocephalus
- Severe white matter disease
- Anxiety and fear of falling
SPECIAL THANKS

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  - Courtney Hoffman
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