Orthostatic Hypotension in the Elderly
(from a Geriatrician’s POV)

Workshops E
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Disclosure statement

• No conflict of interest to declare.

• All medications presented are *off-label* use except midodrine & droxidopa.

• (Any Rx brand names mentioned are purely for ease of recognition.)
Learning objectives

As a result of attending this session, participants will be able to:

• Define what is orthostatic hypotension (OH.)
• Cite some common - and some less common but important - reasons for chronic OH in the elderly.
• Cite pharmacologic and non-pharmacologic treatments that may be tried to treat OH.
Clinical significance of OH in elderly

• Common
  – ~6% healthy old, ~50% “sicker” old (e.g. LTC)

• Mortality
  – Up to 2x ↑ all-cause mortality (vascular)

• ↑ Morbidity
  – Falls risk
  – Cognitive impairment
  – Frailty marker
  – ↑hospitalization LOS
Normal response to “orthostatic stress” (i.e. standing up!)

\[ \text{CO} = \text{HR} \times \text{SV} \]

\( \downarrow \text{VR} \)
\( \downarrow \text{CO} \sim 20\% \)
\( \downarrow \text{BPs} < 5-10 \text{ mmHg} \)

Baro-Rc (+)SNS, (−)PNS

\( \uparrow \text{HR} \sim 5–25 \text{ beats/min} \) - blunted with “(N) aging”?
Vasoconstriction (\( \uparrow \) arterial tone, \( \downarrow \) venous compliance)

\( \uparrow \text{BPd} > 5-10 \text{mmHg} \)
Definition OH (AAS, others)

• Supine → Stand “within 3 min.”
  ↓BPs ≥20  -or-  ↓BPd ≥10 mmHg
  • Supine resting 5-10 min.
  • Seated only if cannot stand

• Note also:
  – ΔHR (no Δ → cause of OH?)
  – Symptoms (fit with history?)
Note HR changes in DDx OH

- **No ↑ HR** – “Chronotropic incompetence”
  - ANS dysfunction? Blocked 2° Rx? (BB, CCB, digoxin)

- **↑ HR 5-25/min** – “Blunted response”
  - “Normal” but insufficient to maintain BP
  - ↑ does not r/o ANS dysfxn

- **↑↑ HR >30/min**
  - Hypovolemic? ANS dysfxn? (POTS)

- **↓(↓) HR**
  - Vaso-vagal? ANS dysfxn?
Symptoms of OH

- None (asymptomatic)
  - “Normal aging”…?

- Classic cerebral hypoperfusion Sx
  - Postural lightheadedness
  - End-organ hypoperfusion - vision dim OU, angina, TIA

- Atypical / non-specific Sx – e.g.
  - Falls, injury from falls
  - Fatigue, “weak”
  - Cognitive slowing (“cloudy”)
  - Neck / back pain (“coat hanger headache”)

Classic OH symptoms but no OH by #s?
- Arm not relaxed (leaning on walker)
- Pain, Fear of falling, etc.
- “Orthostatic intolerance”? Other causes of “dizziness”
Causes of chronic OH: #1 = MEDS

- All cardiovascular meds
  - No clear “best” anti-HTN Rx to use re: OH, but…
    - Avoid direct vasodilators (hydralazine)
    - Avoid alpha-blockers (clonidine)

- Anticholinergics (“anticholinergic burden”) – e.g.
  - Bladder relaxants
    - e.g. older: oxybutinin > newer: solifenacin
  - Antihistamines (e.g. H1 diphenhydramine, H2 ranitidine)
  - Anti-emetics (e.g. H1 dimenhydrinate, antipsychotic metoclopramide)
• Parkinson’s Rx
  – Dopaminergic Rx
    • L-dopa, Dopa agonists (pramipexole, ropinerol)
  – Amantadine - anticholinergic
    • Not used in Geri due to this + risk cognitive side effects

• Psych Rx – e.g.
  – TCA, Benztropine – anticholinergic
  – Antipsychotics – “low potency”, haloperidol, risperidone

• Narcotics
• BPH non-selective α-blockers
  – e.g. Terazosin
    • Use α-1a selective +/- @HS - e.g. tamsulosin CR
    • Still risk of OH…
  – Add 5-α reductase (-) e.g. finasteride

• Corticosteroid withdrawal

• OTC (e.g. anti-histamines, diuretics)

• Alcohol
Causes of chronic OH: Disease

• Cardiovascular disease
  – ↓ CO or obstructed cardiac outflow tract
    • e.g. CHF, severe aortic stenosis
  – Isolated systolic hypertension
    • Up to 1/3 of pts with HTN have OH
    • Arterial stiffness → “HTN begets OH”
  – Severe chronic venous insufficiency (CVI)
    • Venous pooling
• Neurological – ANS dysfunction
  – Neurodegenerative
    • ~50% Parkinson’s disease have OH
    • Atypical parkinsonism (“Parkinson’s Plus”)
      – Multiple system atrophy (MSA-a, Shy-Drager)
  – Peripheral neuropathy
    • Diabetes DM1 & DM2: ~20%
      – Up to ~65% elderly w/ DM2
    • ↓ vit B12, ESRD, ↓thyroid, meds
      – Auto-immune, infectious, proteinopathy, etc.
• Deconditioning (severe)
  – “Immobility syndrome”

• Idiopathic ~30%
  – “Blunted” baro-Rc – element of (N) aging?

• Multifactorial…
  – Typical “geriatric syndrome”
    • e.g. PD on L-dopa with BPH alpha-blocker taking OTC hypnotic (ACh) for insomnia due to nocturia
  – Presents as a “geri syndrome” - Falls
    • “Atypical” presentation of common disease in frail elderly
When to check for OH?

• When making Dx or follow up of pt known for e.g.:  
  – HTN – ASK if postural dizziness or falls  
  – Parkinson’s  
  – Diabetes - peripheral neuropathy

• Falls

• Polypharmacy  
  – Esp. cardiovascular & anticholinergic Rx
Investigation of OH

• **History** – symptoms of OH plus:
  – Possible causes (e.g. Parkinson’s)
  – Other autonomic symptoms (GI, GU, dry mouth)
  – Post-prandial hypotension – esp. post-simple carbs

• **Medication review**
  – New? Dose increased?
  – Diurnal pattern ↔ symptoms?

• **Physical exam**
  – Postural VS
  – Signs of possible causes – e.g.
    • CV: Heart murmur, carotid bruits
    • Neuro: EPS (PD), PNP
• **Diary of symptoms**
  – BP ↔ Meds, specific activities, after meals, time of day
  – Home BP & HR *when symptomatic*

• **Labs** – looking for possible causes, e.g.:
  • Hb, electrolytes, renal, glucose / HbA1c, TSH
  • AM cortisol (>200)
  • Urine Na, UA (specific gravity), urine output

• **Specialized BP measurement** - usually not needed
  – ABPM – symptoms at specific time of day?
  – Tilt table testing

• **Imaging** - depending on history & exam
Treatment – principles:

- Goals of treatment
  - “Treat the patient, not the numbers”
  - …albeit the pt’s symptoms can be vague…

- Remove BP lowering Rx first, if possible
  - Alternatives
  - Lowest effective dose

- Non-pharmacologic, Pharmacologic
Non-Rx – Principles:

• **↑VR** (↓venous pooling), ↑vascular resistance
  – Positioning (“physical counter-manoeuvres”)
  – Compression (esp. abdominal binder)

• **↑IV volume** (volume expansion)
  – Dietary – fluids (esp. fluid bolus), salt
  – “Head-up tilt” (positioning, esp. in combination w/ dietary)

• Avoid triggers of vasodilation
# Positioning

Table 3. Effect of standing exercises on standing blood pressure.

<table>
<thead>
<tr>
<th>Manoeuver</th>
<th>Effect on standing BP (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toe raise</td>
<td>+20 ± 21</td>
</tr>
<tr>
<td>March in place</td>
<td>+22 ± 17</td>
</tr>
<tr>
<td>Leg crossing</td>
<td>+25 ± 19</td>
</tr>
<tr>
<td>Squat</td>
<td>+41 ± 23</td>
</tr>
</tbody>
</table>

Compression

• Abdo binder:
  – 40mmHg
  – Able or has assist to apply (aide)
  – At / p/c meals for post-prandial OH?

• Result:
  – ↑BPs up to 20?
• Compression stockings
  – Fitted by Rx
  – 30-40 mmHg (ABI >1.0)
  – Waist or thigh-high (knee-high only to ↓VR)
  – Able or has assist to apply (device, home care)

• Result:
• ↑BPs n/s – ~15 mmHg?
  – Not EBM…

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Rx

Compliance stockings

Date ____________

Patient: __________________________
Address: __________________________

Prescription: __________________________

Length: Thigh-high

#: __________________________

Pressure: 30-40 mmHg

(Open/closed toe): …

Diagnosis: Orthostatic hypotension
Dietary Tx for volume expansion

• Hydration – not just water
  – $\geq 2L/d$ -or- Urine output ~2L/d
  – Caffeine – stimulant vs. diuretic
  – Avoid alcohol

• Water bolus
  – Drink (1-) 2c. *fast* $\rightarrow \uparrow$ BPs stand ~20+ / ~2h
    • 1st thing in AM
    • PRN e.g. a/c activity, a/c meal (post-prandial OH)

• Salt
  – Aim NaCl 9-12g/d (!) -or- ↑ u.Na+ >170 mM
DID YOU KNOW?

These six popular foods can add high levels of sodium to your diet.

As part of a healthy dietary pattern that emphasizes the intake of vegetables, fruits, nuts, whole grains, lean vegetable or animal protein, and fish and minimizes the intake of fruits, red meats and processed red meats, refined carbohydrates, and sugary drinks, the American Heart Association recommends 2,300 milligrams (mg) or less a day of sodium.*

Daily suggested sodium referenced below is based on 2,300 mgs/day recommendation:

1. **BREADS & ROLLS**
   - Some foods that you might eat throughout the day, such as bread, can add up to a lot of sodium even though each serving may not be high in sodium.

2. **PIZZA**
   - A slice of pepperoni pizza can contain almost a third of your daily recommended dietary sodium. Try swapping in veggies to your next slice.

3. **SANDWICHES**
   - A sandwich or burger from a fast food restaurant can contain more than 100 percent of your daily recommended dietary sodium. Try half a sandwich with a side salad instead.

4. **COLD CUTS & CURED MEATS**
   - One 2-oz. serving of deli meat can contain as much as a third of your daily recommended dietary sodium. Build a sandwich with fresh vegetables such as lettuce, tomatoes, avocados, and bell peppers.

5. **SOUP**
   - Sodium in one cup of canned soup of the same variety can range from 49 to 920 mg per cup — more than a third of your daily recommended intake. Check the labels to find lower sodium varieties.

6. **BURRITOS & TACOS**
   - Tacos, taquitos, and burrito fillings can pack a big sodium punch. Choose burritos and tacos that are full of veggies and lean sources of protein.

*See the section on sodium reduction for more information about how to reduce sodium intake.

**From the Heart Check® Challenge, a simple tool to help you eat smart.**
“Head-up tilt” - “Reverse Trendelenburg”

~12° = 15cm / 6”

↓ Postural natruriesis

↓ Vascular redistribution of leg edema
Avoid triggers

• **Vasodilation**
  - Heat - Hot weather, hot shower, hot tubs, sauna, fever
  - Alcohol
  - Large meals esp. high in simple carbohydrates (e.g. pasta)

• **Toileting overnight**
  - ↓ Nocturia – fluid mgmt, leg edema mgmt, caffeine/diuretics in AM
  - ↓ Getting up - Urinals / bedside commode, diapers (last resort)

• **Prolonged standing**
  - Modify activity
  - 4-wheeled walker, wheelchair (last resort)
Patient education material on OH (non-Rx mgmt of OH)

MSA Trust
www.msatrust.org.uk

Rx – NB: All “off-label” except midodrine & droxidopa

• *Before add Rx, see what Rx can take away first!*

• ↑ Intravascular volume
  – Salt tabs (NaCl) 1 - 2g PO BID (AM, noon)
  – Fludrocortisone
  – NSAIDs?

• ↑ Vascular resistance *(vasopressors)*
  – Midodrine
  – (Droxidopa)

• In supine HTN w/ OH (SH-OH)
  – Domperidone?
  – Pyridostigmine?

• Many other off-label agents…
Volume expansion
- Fludrocortisone – off-label use
  - 0.05mg - 0.2mg PO BID (AM, noon)
  - ~20min before get out of bed in AM w/ water bolus
  - ↑BP ~10-40 / 0-15?

- Salt & water retention (mineralocorticoid analogue)
  - Attn: CHF, leg edema
  - K+ & Mg wasting
    - Check electrolytes 1-2 wks after start or ↑ dose
    - 0.1mg BID typically needs KCl ~20mEq/d
  - Some glucocorticoid effect
    - Taper to discontinue
    - OP fracture prevention Rx?
Vasoconstriction

- Midodrine – on-label use
  - NB: Brand name “Amatine” (*not* amantadine)
  - 2.5 – 10mg PO TID (AM, noon, PM – not HS)
    - ~20min before get OOB in AM w/ water bolus
    - ↑BP ~20/10 vs. n/s…?

- α-1 agonist
  - Vasoconstriction - Caution CAD, PAD
  - Caution: Urinary retention w/ BPH
  - Piloerection (scalp pruritis)
“SH - OH”

• Supine hypertension w/ orthostatic hypotension
  – Excess or continuous effect of vasopressors
  – Progressing ANS dysfunction
  – Can cause hypertensive urgency / emergency…

• Tx – not EBM…
  – Elevate head when sleep/nap
  – Avoid vasopressors towards HS
  – If severe, anti-HTN Rx @HS
    • Short-acting, lowest dose possible
      – e.g. captopril 6.25mg, metoprolol 12.5mg, hydralazine 5mg
      – e.g. NTP 0.2mg/h @HS → remove before get OOB in AM
• **Domperidone** – off-label use
  - PD on dopa agonist (apomorphine) - ↓↔ OH drop (↑BP ~?)
  - Peripheral D2 dopamine antagonist
  - 2.5-10mg PO TID
    - “EBM” 10mg QID → caution QTc syndrome esp. elderly
    - Side effects – Diarrhea, Parkinsonism, ?HTN w/ renal accumulation

• **Pyridostigmine** – off-label use
  - ↑ vascular resistance - ↑BP ~?/7
    - “Position dpdt stimulation of ANS w/o causing SH…”
  - Acetylcholinesterase inhibitor30 - 60mg PO TID
    - Side effects: “sludge” - Diarrhea, UI, drooling, tearing, etc.
Other Rx… (Neuro referral)

• Droxidopa (L-DOPS)
  – ↑ vascular resistance
  – Pro-drug → Norepinephrine
  – N/A Canada

• Stimulants to ↑ vascular resistance & HR
  – e.g. Caffeine, Pseudoephedrine
  – ++ side effects…
• Erythropoietin
  – Only if anemic
  – 50 U/kg x3/wk? → ↑BPs ~20 standing (NEJM 1993)
  – Ensure adequate iron, injection; long-term FX?
    • NB: ESRD - ↑ mortality / CV events when Rx Hb >130g/L

• Desmopressin (DDAVP, ADH analogue)
  – ↓ nocturnal polyuria
  – 0.1 - 0.2mg PO –or- 0.01mg / inh x1 I/N spray QHS
  – Caution: ↓↓↓Na+

• Octreotide (somatostatin analogue)
  • ↑ vascular resistance, ↓ splanchnic pooling p/c meals
  • +++ GI side FX, injection
Management of Orthostatic Hypotension.

Parkinson Disease and Orthostatic Hypotension in the Elderly: Recognition and Management of Risk Factors for Falls.
  – https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7220277/

UpToDate.com
  – Mechanisms, causes and evaluation of OH
  – Treatment of orthostatic and postprandial hypotension