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Orthostatic hypotension: an often overlooked risk factor for falls

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Case study of orthostatic hypotension in the hospital setting

Every day we care for older hospitalized adults who are at risk for orthostatic hypotension. Take the case of Mr. Smith. Mr. Smith, is a 83 year-old gentleman who had been admitted to the hospital with congestive heart failure; additionally, he had multiple comorbid diagnoses including diabetes mellitus, hypothyroidism, depression, hyperlipidemia, and hypertension. His medications included furosemide 40 mg twice a day, potassium 20 meq daily, lisinopril 40 mg daily, levothyroxine 100 mcg daily and sertraline 100 mg daily. After 3 days in the hospital, Mr. Smith was ready for discharge. His nurse, Bruce, had an admission at the same time Mr. Smith's daughter arrived to pick him up. Bruce asked Sheila, another RN on the unit, if she wouldn't mind transporting Mr. Smith down to the hospital entry way. When Mr. Smith's daughter pulled up her car, Mr. Smith stood up from the wheel chair and promptly fainted, hitting his head against the pavement. As a result, Mr. Smith was readmitted to the hospital for orthostatic hypotension, fall, and assessment for potential traumatic brain injury. Later he admitted that he had been feeling dizzy, but did not report it to the nurses.

Why should we be concerned about orthostatic hypotension?

Orthostatic hypotension (OH), generally defined as a drop in blood pressure with position change from lying or sitting to standing, is a common, complex problem that is associated with aging. The prevalence of OH rises from 5% among middle aged adults, to 30% for those 70 years and older to >40% for those 80 years and older.¹⁻³

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Among hospitalized older adults, rates over 50% have been reported.^{4,5} OH is associated with increased risk for falls, coronary heart disease, stroke and death.^{3,6} In the acute care setting OH may be an underlying reason for an older adult's hospitalization, such as Mr. Smith's fall, a consequence of treatment of diseases, or combination of both. OH can complicate the treatments of other conditions, such as heart failure, hypertension and renal disease; oftentimes older adults require a fine line of balancing the goals of treatment with the unintended consequences of treatment. Indeed, at the recent annual meeting of the American Geriatrics Society, leading experts in cardiology and geriatric medicine debated the 2017 ACC/AHA guidelines recommending a target of 130 mm Hg systolic blood pressure for hypertension management for older adults because of the potential risk of OH in older frail adults.

What is OH and how is it caused?

In 1996, the Consensus Committee of the American Autonomic Society and the American Academy of Neurology clinically defined OH as "a reduction of systolic blood pressure of at least 20 mmHg or diastolic blood pressure of at least 10 mmHg within 3 minutes of standing" from a supine position (1996, p. 1470).⁷ OH presents with varied and somewhat vague symptomatology.³ Symptoms include dizziness and syncope. Additional symptoms include feeling faint, blurred vision, chest pain, pain in the back of the neck and shoulder (known as coat hanger pain), palpitations, disorientation and confusion, weakness and fatigue.^{3,8} Unfortunately, 60%-70% of older adults, especially those with a diagnosis of dementia, either have no symptoms or have atypical presentations.^{3,8,9} Further complicating the detection of OH is the dynamic nature of blood pressure. OH is often not a persistent state and may not be reproducible.^{4,10} The goals of treatment are focused on the treatment

of symptoms while optimizing quality of life, independence and function.

Postural changes from lying to standing have significant hemodynamic effects.^{3,8} Gravitational forces cause significant venous pooling (500 ml to 700 ml) in the lower extremities and abdomen, reducing venous blood flow and filling of the heart. This reduction causes a transient decrease in cardiac output and blood pressure. The autonomic nervous system reacts to counteract gravity through compensatory mechanisms. Baroreceptors in the carotid sinus and aortic notch stimulate a sympathetic response to increase venous return, heart rate and vascular resistance to restore and maintain cardiac output and blood pressure. Any interruption in this process combined with aging changes leads to an abnormally large drop in blood pressure with delayed compensation. The resulting decrease in cerebral perfusion is the basis for the neurologic symptoms of OH.

Are there risk factors for OH?

There are a number of known risk factors associated with the occurrence of orthostatic hypotension including aging, comorbid diseases, medications, and bedrest. Older adults are particularly vulnerable to OH because of physiological changes that occur with aging. First, with aging there are impaired homeostatic mechanisms, such as decreased baroreflex sensitivity, diminished heart rate responses and impaired vasoconstriction, all of which increase the likelihood of OH.¹¹ Second, older adults are prone to dehydration because of impaired thirst response or purposefully limiting their fluid intake in order to decrease toileting needs due to urinary frequency.¹² Third, the kidneys lose some ability to conserve water and salt during periods of fluid restriction or volume loss because the reduction of renin, angiotensin, and aldosterone.⁸ Last, changes in the vasculature with aging can increase the risk of OH. The heart muscle stiffens resulting in impaired diastolic filling and decreased cardiac output.³ The cerebral-vasculature stiffens, reducing cerebral perfusion and producing the neurologic symptoms of OH.³

Many conditions or diseases can influence or precipitate OH development in patients during an acute hospitalization. Conditions causing low circulating volume such as arrhythmias, myocardial infarction, acute heart failure, dehydration, diarrhea, vomiting, fever and hemorrhage often manifest as an orthostatic drop in blood pressure.³⁻⁵ Additional risk factors for OH include thyroid disease, adrenal insufficiency, diabetes, Parkinson's disease, stroke, tumors, and dementia.^{3,9}

OH is a known potential side effect of medications in major drug classes, which are often included in falls risk assessment tools; these include antihypertensives, antidepressants, antipsychotics, anti-Parkinsonian drugs and opioids.^{13,14} In addition to the direct effect of medication and polypharmacy, older adults are especially prone to OH side effects because of aging changes that alter drug metabolism and elimination.^{13,14}

Last, many older adults have prolonged bedrest or minimal mobilization when hospitalized. The deconditioning associated with bedrest promotes the development of OH in hospitalized older adults. Muscle weakness, central fluid shift and adaptations of the cardiovascular system are associated with bedrest within one day. This places the older adult at increased risk of OH and related falls when first beginning to move about due to exaggerated effects of gravitational forces with standing.^{15,16}

What are issues in measuring OH?

Given the significance and prevalence of OH, especially among hospitalized older adults, falls prevention guidelines frequently recommend assessing the patient for orthostatic hypotension. However,

- Position the patient lying down for 5 minutes.
- Measure the blood pressure and pulse.
- Assist the patient to a standing position.
- Observe for symptoms of dizziness/light headedness.
- Measure the blood pressure after one minute and 3 minutes of standing.

Fig. 1. The evidence based standard procedure for measuring orthostatic blood pressures.¹⁹

nurses oftentimes do not incorporate OH measurement as part of their routine care because of the practicalities involved. The original guidelines recommending a 3-minute wait from supine to standing have not been updated in over 20 years.⁷ Recently, Juraschek and colleagues¹⁷ recommended revising these guidelines to earlier measurements. In a cohort study following over 11,000 middle-aged adults over a median 23 years, they found that OH measurements in the first 30–60 seconds had the highest association with symptoms of dizziness as well as with future risk of falls, fracture, syncope, motor vehicle accidents and mortality.¹⁷ Thus, if the 3-minute wait is impractical in the acute care setting, nurses may at least consider conducting the OH measurement in the first minute. However, keep in mind there is some evidence that for older adults, the onset of hypotension may be delayed. A standing time of 5 minutes may be needed to ascertain OH.¹⁸ Fig. 1 summarizes the sequence of procedural steps for OH measurement.

Documentation of the measurement results should include the position of each blood pressure measurement, the time of the patient in that position, the blood pressure and heart rate result and the presence of any associated symptoms.²⁰ See Fig. 2 for a documentation template from the Centers for Disease Control.²⁰

A second issue that impacts the feasibility of detecting OH is the fluid nature of the disease.¹⁰ Some have suggested checking OH every morning and evening to increase the likelihood of detecting an orthostatic blood pressure drop.¹⁰ Last, older adults may not complain of dizziness or feeling lightheaded or faint upon standing.⁹ Prospective studies show a close correlation between asymptomatic OH and a higher risk of cardiovascular problems including coronary events and heart failure. Routine screening for OH is recommended even in asymptomatic older adults to predict risk of future problems.^{20,21}

Besides the feasibility of taking postural blood pressures, there is also an issue of accuracy. Blood pressure (BP) measurement is considered a basic assessment skill, yet inaccurate BP measurement has been a long standing concern.^{22,23} Studies have repeatedly shown difficulties in the accuracy of BP measurement due to a number of factors including body positioning, the type of equipment used, cuff size, subject preparation, arm position, and cuff placement.

Inconsistencies in the procedural sequence and timing of measurement have been found to be common while obtaining blood pressure measurements for orthostasis. In a study of 170 nurses working with hospitalized older adults, Vloet and colleagues found significant variation in measurement techniques.²⁴ Nurses were

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