



Orthostatic Hypotension In the Post-Acute Setting

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Objectives

- Define orthostatic hypotension
- Discuss pathophysiology and etiologies
- Discuss signs and symptoms
- Discuss risk factors and mitigation strategies
- Discuss medical treatments

Prevalence

- >200,000 cases per year in the US
- More common in geriatric population
 - Estimated to affect up to 20% >65 yo
- Linked to falls in the elderly
- Often a barrier to progress during rehab



Definition of Orthostatic Hypotension

- Orthostatic hypotension is a form of low blood pressure that occurs suddenly when moving from a sitting or lying position to a standing position.



What is Blood Pressure?

- SBP – indicates the pressure your blood is exerting against your artery walls when the heart beats.
- DBP – indicates the pressure your blood is exerting against your artery walls while the heart is resting between beats.

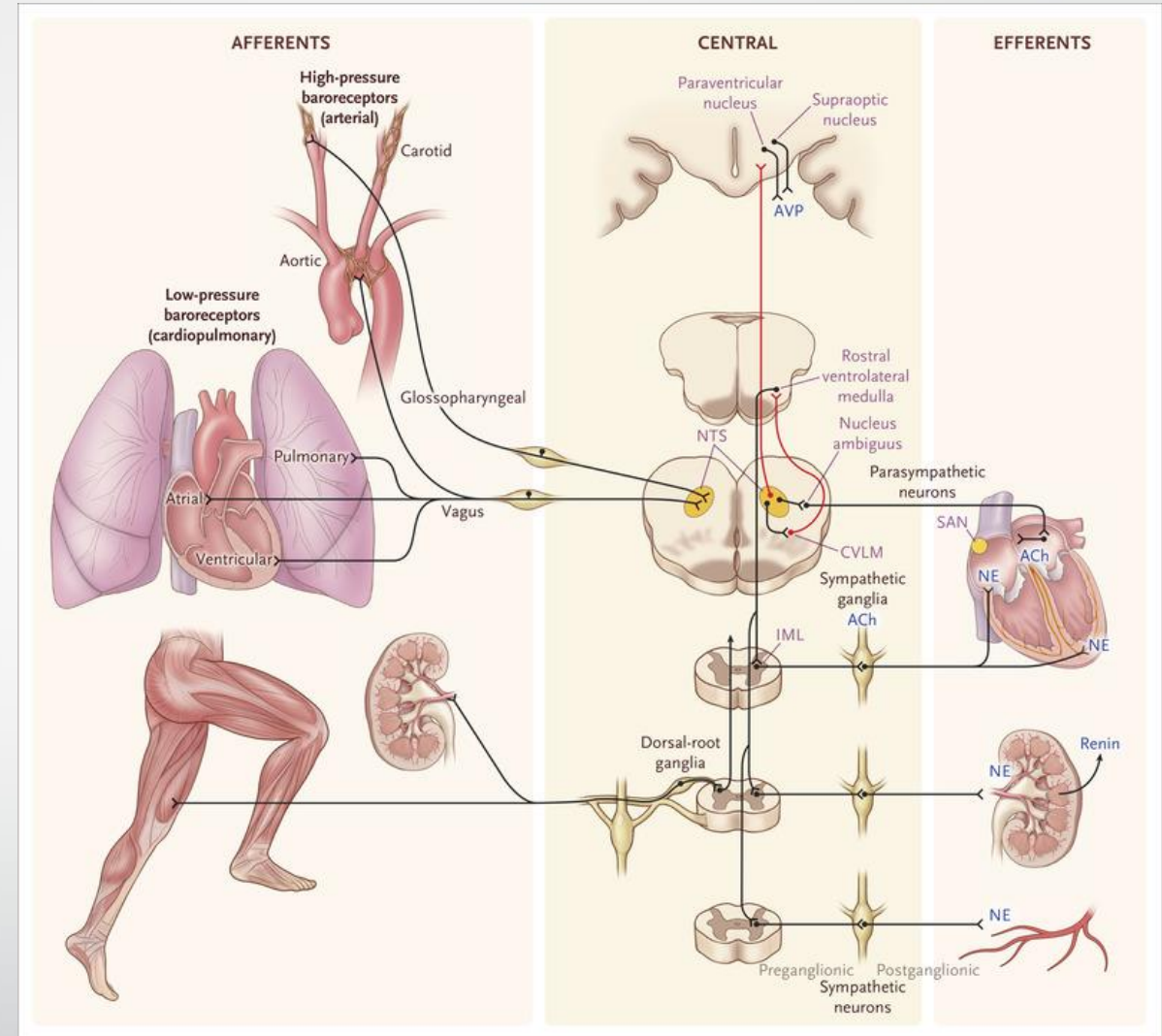


Baroreflex Physiology

Upon standing, gravity causes blood to pool in your legs and abdomen (~500-1000ml). This causes a decrease in BP as there is less blood circulating back to your heart.

On change of position, there is an immediate reduction in filling pressure of the R atrium, a fall in cardiac output and arterial pressure.

Special cells, called baroreceptors, located in the carotid sinus and aortic arch sense when a lower BP occurs. The baroreceptors send signals to centers in your brain, which signals your heart to beat faster and pump more blood, which stabilizes the BP. These cells also vasoconstrict the blood vessels and increase the BP.



Syndromes of Orthostatic Intolerance

- Postural Hypotension: SBP drops ≥ 20 mmHg during transition from lying down to standing up, or when the DBP drops by ≥ 10 mmHg within 3 minutes after standing.
- Orthostatic Intolerance: symptoms are relieved by recumbence
- Postural orthostatic tachycardia syndrome (POTS): patient is symptomatic with a rise in heart rate >30 on standing, usually not associated with hypotension
- Dysautonomia

Signs and Symptoms of Orthostatic Hypotension

- Lightheadedness or dizziness when standing up after sitting or lying down is the most common symptom
- Blurry vision
- Weakness
- Syncope/presyncope
- Confusion
- Nausea, hot, clammy
- Falls



Etiology

Disorder of the body's natural regulatory process including:

- **Dehydration.** Fever, vomiting, poor PO intake, severe diarrhea or strenuous exercise excessive sweating
- **Cardiac disorders.** Heart conditions such as bradycardia, heart valve problems, MI or heart failure.
- **Endocrine disorders.** Thyroid conditions, adrenal insufficiency (Addison's disease) and low blood sugar (hypoglycemia). Diabetes can damage the nerves that help send signals regulating BP.
- **Neurologic disorders.** Central vs Peripheral neurologic disorders
 - Central: Parkinson's disease, multiple system atrophy, Lewy body dementia, pure autonomic failure, and SCI.
 - Peripheral:
 - infectious etiologies such syphilis, lyme, HIV, Chagas
 - Infiltrative processes such as amyloidosis, sjogrens, sarcoidosis
- **Nutrition.** Vitamin B12, folate and iron deficiency.
- **Postprandial hypotension**
- **Traumatic Injury/Bleeding.** hypovolemia
- **Paraneoplastic syndromes**
- **Up to 40% have no identifiable cause**

Risk Factors

- **Age.** more common in age 65 and older. The baroreceptors near your heart and neck arteries that regulate blood pressure can slow as you age. It also may be harder for an aging heart to speed up and compensate for drops in blood pressure.
- **Heat exposure.** Leading to excessive sweating and dehydration. Hot bath/shower causing vasodilation
- **Bed rest.** Prolonged bedrest leading to dysregulation of baroreflex.
- **Pregnancy.** The circulatory system expands rapidly during pregnancy, BP is likely to drop. This is normal, and BP usually returns to your pre-pregnancy level after delivery.
- **Alcohol.** Consumption of alcohol.
- **Medications.** These include medications used to treat high blood pressure or heart disease, such as diuretics, alpha blockers, beta blockers, calcium channel blockers, angiotensin-converting enzyme (ACE) inhibitors and nitrates. Other medications include medications for Parkinson's disease, certain antidepressants, certain antipsychotics, muscle relaxants, medications to treat erectile dysfunction and narcotics.

Examples of medications that may cause or exacerbate orthostatic hypotension

Drug group	Mechanism of hypotension and comments
Diuretics <ul style="list-style-type: none"> Loop diuretics (eg, furosemide, torsemide) or thiazides 	Extracellular fluid volume depletion.
Adrenergic antagonists	
<ul style="list-style-type: none"> Alpha-1-adrenergic blockers (eg, alfuzosin, tamsulosin, terazosin) 	Alpha-1-adrenergic blockers produce vasodilation via direct effect in vascular smooth muscle.
<ul style="list-style-type: none"> Beta-adrenergic blockers (eg, propranolol) 	Beta-adrenergic blockers reduce cardiac output and renin release. May also reduce vascular peripheral resistance.
Alpha-2-adrenergic agonists (eg, tizanidine, clonidine)	Vasodilation via central inhibition of sympathetic efferent activity.
Nitric oxide-mediated vasodilators <ul style="list-style-type: none"> Nitroglycerin, hydralazine Phosphodiesterase-5-inhibitors (eg, sildenafil) 	Vasodilation via direct effect in vascular smooth muscle.
Renin-angiotensin system (RAS) inhibitors (eg, lisinopril, valsartan)	Vasodilation via RAS inhibition.
Calcium-channel blockers (eg, verapamil, diltiazem)	Reduction of cardiac output, vasodilation via direct effect in vascular smooth muscle.
Dopamine antagonists <ul style="list-style-type: none"> Phenothiazines (eg, chlorpromazine) Atypical antipsychotics (eg, olanzapine, risperidone, quetiapine) 	Vasodilation via central inhibition of sympathetic efferent activity.
Antidepressants (eg, trazodone, amitriptyline)	Vasodilation via central and peripheral inhibition of sympathetic efferent activity through stimulation of adrenergic receptors.
Selective serotonin receptor reuptake inhibitors (eg, paroxetine)	Unknown mechanism, possibly via central and peripheral inhibition of sympathetic efferent activity through stimulation of alpha-2-adrenergic receptors.
Sodium-glucose co-transporter 2 inhibitors (eg, empagliflozin, canagliflozin)	Volume depletion via osmotic diuresis.

Spinal Cord Injury

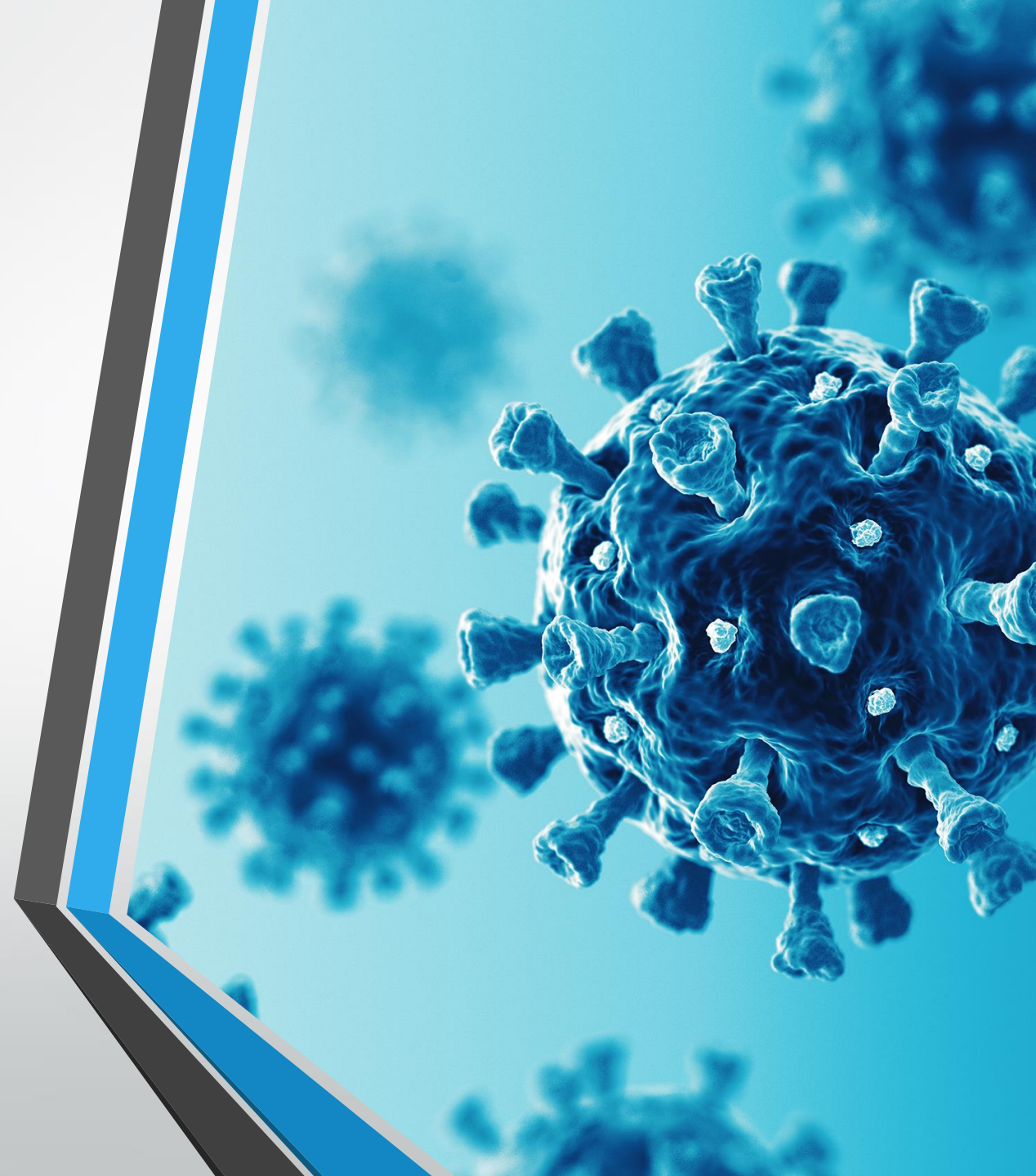
Autonomic Nervous System impairment is common

- SCI patients are challenged by managing unstable blood pressure which results in persistent hypotension and/or episodes of uncontrolled HTN



Post Covid Syndrome

- The autonomic nervous system (ANS) can be affected by COVID-19 resulting in dysautonomia
 - Due to neurologic impairment from viral infection
 - Chronic volume depletion for lung compliance
 - Prolonged immobility



Complications of Orthostatic Hypotension

Persistent orthostatic hypotension can cause serious complications, especially in older adults. These include:

- **Falls.** As a result of fainting/syncope/near syncope
- **Stroke.** Reduced blood supply to the brain on standing
- **Cardiovascular diseases**
- **Kidney failure**
- **Cognitive impairment**
- **Decreased quality of life, depression, anxiety**
- **Death**

Diagnosis of Orthostatic Hypotension

Blood Pressure monitoring

Blood tests: hypoglycemia or low RBC levels (anemia)

EKG: Detects irregularities in heart rhythm or heart structure and problems with the supply of blood and oxygen to heart muscles

Echocardiogram to detect structural heart disease

Stress Test

Tilt Table test to evaluation how the body reacts to change in position

Treatment for Orthostatic Hypotension

The goal of treatment for orthostatic hypotension is to prevent or alleviate symptoms.

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graph TD; A[The goal of treatment for orthostatic hypotension is to prevent or alleviate symptoms.] --> B[Returning the patient to supine position should alleviate symptoms]; B --> C[Assess for cause];
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Returning the patient to supine position should alleviate symptoms

Assess for cause



Physician Treatment

Orthostatic hypotension treatments include:

- **Treat the underlying condition**
- **Lifestyle changes**
- **Ordering Compression stockings/Binders**
- **Physical/Occupational Therapy**
- **Cardiovascular Sympathomimetics/Antimyasthenic Agent**
- **Antihypertensives:** Adjust dosages and/or change prescription

Pharmacology for Orthostatic Hypotension

- **Medication Modifications:**
 - Review of medications
 - Discontinue, dose reduction or replacement of causative drugs
 - Acceptance of higher BP values during the day
 - Caution with supine hypertension

Pharmacology Interventions:

Recommended Drugs:

Cardiovascular Sympathomimetics/Antimyasthenic Agent

- Midodrine (Orvaten)
- Fludrocortisone
- Droxidopa (Northera)
- Pyridostigmine (Mestinon, Regonal)
- Atomoxetine

Drugs for specific conditions

- Erythropoietin (anemia)
- Desmopressin (nocturnal polyuria)
- Octreotide and Acarbose (postprandial OH)

Combination Therapy



What Can the Nurse Do?

- Implement fall precaution protocol
- Accurate monitoring and documentation of orthostatic vital signs
- When rising from a lying position, have the patient change positions slowly, dangle legs, and stand next to the bed before walking
- Teach and reinforce Lifestyle changes
- Collaborate with Therapist and Physician
- Home safety evaluation
- Provide handout on managing Postural Hypotension

Patient Education

- **Lifestyle changes:**
 - A- Abdominal Compression. Wear a binder when out of bed
 - B- Bolus of water: drink 8 oz glass of cold water prior to standing
 - B- Bed up: elevated head of bed by 10-20 deg
 - C- Counter maneuvers: contract the muscles in legs for 30 sec while prolonged standing or if symptomatic
 - D- Drugs: drugs such as midodrine, mestinon and florienef can be used to raise BP
 - E- Education: recognize early symptoms and risk factors
 - E- Exercise: avoiding inactivity with gentle exercise
 - F- Fluids and Salt

Questions?

