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Research Article

Orthostatic Hypotension in the Elderly: A Forgotten Predictor of Falls, Frailty, and Functional Decline

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A B S T R A C T

A persistent drop in systolic blood pressure of at least 20 mmHg or diastolic blood pressure of at least 10 mmHg within three minutes of standing is known as orthostatic hypotension (OH), a common geriatric syndrome. About 20% of senior citizens living in the community and up to 60% of those living in institutions are affected by OH, which is a major cause of falls, frailty, functional decline, cognitive impairment, and higher mortality. The pathophysiology of OH in the elderly is complex and includes common comorbidities like diabetes, Parkinson's disease, and polypharmacy, as well as impaired autonomic nervous system function, decreased baroreflex sensitivity, vascular stiffness, and diminished cardiac responsiveness. When standing, these alterations result in insufficient cerebral perfusion, which can cause light-headedness, syncope, and an elevated risk of falls. Owing to temporary symptoms and inadequate blood pressure monitoring procedures, OH is still underdiagnosed despite its clinical significance. For the frail elderly, multimodal management strategies that include both pharmaceutical therapies and non-pharmacologic measures have proven beneficial in lowering complications.

Artificial intelligence, wearable technology, and continuous blood pressure monitoring have the potential to improve OH detection and personalisedtreatment in the future. to lessen the substantial impact of OH on geriatric health, this review emphasisesthe current knowledge, research gaps, and clinical implications of OH in older adults. It also points out that there must beawareness and focused interventions.

Keywords: Orthostatic Hypotension, Elderly, Falls, Frailty, Functional Decline, Blood Pressure, Autonomic Dysfunction, Cerebral Perfusion, Risk Factor, Aging, Fall Prevention, Geriatric Syndrome

Introduction

Expanding on this summary, the following introduction situates orthostatic hypotension (OH) within the broader context of geriatric healthcare, highlighting its underlying mechanisms, clinical significance, and the rationale for prioritizing its management in older adults. A sustained drop in systolic blood pressure of at least 20 mmHg or diastolic blood pressure of at least 10 mmHg within three minutes of standing is known as orthostatic hypotension (OH). About 20% of older adults who live in the community and

up to 60% of elderly patients who are institutionalisedor hospitalised suffer from this common clinical condition. Because of physiological changes and the increased burden of comorbidities in this population, the prevalence of OH rises significantly with age.[1]

The pathophysiology of OH in older adults is complex and includes decreased baroreflex sensitivity, decreased cardiac output, impaired vascular responsiveness, and impaired autonomic nervous system function. A person's venous return to the heart is temporarily reduced when they stand up because of the 500–1000 mL of blood that typically pools in the lower extremities and splanchnic circulation.

Baroreceptors located in the aortic arch and carotid sinus quickly sense the drop in cardiac output and stroke volume. In response, these receptors trigger the sympathetic nervous system, leading to vasoconstriction, an increased heart rate, and enhanced cardiac contractility as compensatory mechanisms. During upright posture, this coordinated response keeps blood pressure and cerebral perfusion stable.[2]

However, this compensatory mechanism is blunted by a number of physiological changes that occur with ageing. Alpha-1 adrenergic receptor sensitivity is reduced, heart rate response is attenuated, and baroreflex function is lost. Furthermore, decreased cardiac output and stroke volume when standing are caused by artery stiffening and compromised myocardial relaxation. Volume depletion is made worse by dehydration, which is common in the elderly due to a decreased thirst response and renal concentrating ability.

Together, these elements result in insufficient vasoconstriction and the incapacity to sustain blood pressure while standing, which clinically presents as OH.

Numerous comorbid conditions, including diabetes mellitus, Parkinson's disease, heart failure, and chronic kidney disease, are common in elderly patients and can lead to autonomic dysfunction and OH. Additionally, polypharmacy is common in this age group, and drugs such as antidepressants, diuretics, alpha-blockers, and antihypertensives may cause or exacerbate OH.[3]

Orthostatic hypotension holds clinical significance in older adults due to its association with an increased risk of falls, fractures, frailty, cognitive decline, hospitalisation, and mortality. Cerebral hypoperfusion brought on by the abrupt drop in blood pressure results in symptoms like syncope, lightheadedness, dizziness, and blurred vision. OH-related falls are a major cause of serious injuries and diminished independence. Moreover, recurrent episodes of cerebral hypoperfusion may hasten cognitive deterioration and aid in the advancement of dementia. Despite its importance, OH remains underdiagnosed and undertreated. Routine orthostatic blood pressure checks are frequently left out of clinical evaluations, and symptoms can be vague. Raising awareness is essential for early detection and intervention to avoid negative consequences.[4]

Management strategies include nonpharmacological approaches such as volume expansion, physical counterpressure maneuvers, and careful review of current medications. When conservative measures are ineffective, pharmaceutical treatments may be considered. Elderly functional status, fall prevention, and quality of life can all be greatly improved with tailored management that aims to minimize OH episodes.

In supposition, orthostatic hypotension is a common yet often overlooked condition in the elderly with profound implications for falls, frailty, and functional decline. Understanding its complex pathophysiology and clinical relevance is important for improving outcomes in this vulnerable population.[5]

While the introduction establishes OH as a multifactorial geriatric syndrome with substantial health implications, understanding its true burden and management requires a critical synthesis of empirical evidence. Therefore, the next section provides a structured literature review summarizing key studies, data sets, and clinical insights.

Literature Review

Numerous studies on a range of senior populations have examined orthostatic hypotension (OH), emphasisingits epidemiology, pathophysiology, clinical implications, and management approaches. In their study of older patients with OH and hypertension, Wiersinga et al. (2025) reported comprehensive blood pressure readings, medication profiles, and clinical outcomes such as frailty and falls.

A clinical overview of elderly OH patients was given by Ringer (2023), who focused on the difficulties in diagnosing them through medication assessment and comorbidity. Fedorowski (2022) investigated the relationship between OH and cardiovascular outcomes, abnormalities of gait, and cognitive decline by looking at a combination of clinical and population cohorts. In a meta-analysis involving 5,465 older adults, Tran et al. (2021) reported a prevalence of initial orthostatic hypotension of approximately 27.8%. The study highlighted the importance of continuous blood pressure monitoring as a key tool for accurate diagnosis and early detection.[6]

Let me know if you'd like to build this into a broader discussion of diagnostic strategies or include it in a literature review.

Zhang et al. (2024) examined a group of 4,383 senior Chinese citizens and found that the two main comorbidities causing OH were hypertension and cerebrovascular disease. Raber

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et al. (2025) advocated for individualized care by discussing customised hypertension management strategies for frail elderly patients with OH. In their analysis of sizable adult hypertensive cohorts, Juraschek et al. (2024) emphasised the mortality and cardiovascular risks connected to OH. In their review of diagnostic developments, Wieling et al. (2022) placed a strong emphasis on beat-to-beat blood pressure monitoring and standardized active stand tests for precise OH detection.

Strong correlations between OH, cognitive impairment, frailty, and higher mortality were found by Peters et al. (2024) in their meta-analyses of aggregate geriatric cohorts. Dani et al. (2021) provided clinical management protocols that included symptom questionnaires and blood pressure data for elderly OH patients. Freeman et al. (2018) outlined thorough diagnostic procedures and categorised OH subtypes. Kaufmann et al. (2017) reported positive results from pharmacologic trials involving droxidopa and concentrated on neurogenic OH.[7]

Additionally, polypharmacy—specifically, antihypertensive and psychotropic drugs—was found by Mol et al. (2019) to be a major factor in the prevalence of OH in older adults. In population-based studies, Wolters et al. (2016) connected OH with the onset of dementia, while Shaw et al. (2019) connected OH with a doubled risk of falls in older adults. Romero-Ortuno and Kenny (2012) showed that frailty and worse health outcomes are associated with OH. Finally, in large cardiovascular cohorts, Juraschek et al. (2018) linked OH to higher cardiovascular events and all-cause mortality.[8]

Collectively, these studies provide a broad evidence base on OH's prevalence, underlying mechanisms, clinical impacts, and treatment, yet variable methodologies and population differences highlight the need for harmonised approaches in future research and practice.[9]

Table 1.Summary of Key Studies on Orthostatic Hypotension (OH) in Elderly Populations

No.	Author(s) / Dataset	Source	Population	Key Variables / Data Features	Access Details
1	Wiersinga et al., 2025	Lancet Healthy Longev.	Elderly patients with hypertension and OH	BP measurements, medication, symptom assessment, clinical outcomes (falls, frailty)	Published study; data accessible upon request
2	Ringer, 2023	StatPearls	Elderly orthostatic hypotension patients	Clinical presentation, comorbidities, medication, diagnostic test results	Public access via StatPearls
3	Fedorowski, 2022	JACC 2022	Mixed cohort; clinical & population data	OH diagnosis, cardiovascular outcomes, gait and balance data, cognitive assessment	Published; data request may be needed
4	Tran et al., 2021	Age Ageing	5,465 older adults	Blood pressure (initial OH assessment), demographics, continuous BP monitoring	Public meta-analysis
5	Zhang et al., 2024	Front. Cardiovasc. Med.	4,383 Chinese elderly	BP, comorbidities (hypertension, cerebrovascular), demographic data	Published study
6	Raber et al., 2025	Lancet Healthy Longev.	Frail elderly patients	Blood pressure, medication, symptoms of OH, cardiovascular function	Published; collaboration recommended
7	Juraschek et al., 2024	Hypertension Journal	Large hypertensive adult cohorts	BP measurements including OH, cardiovascular incidents, mortality data	Controlled public access
8	Wieling et al., 2022	Lancet Neurol.	Elderly subjects in diagnostic studies	Active stand test results, continuous beat-to-beat BP, symptom recording	Published review

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9	Peters et al., 2024	Eur. Heart J.	Aggregate geriatric cohorts (>60,000)	OH diagnosis, cognitive tests, frailty scores, mortality	Meta-analytic data
10	Dani et al., 2021	Clin. Med. (Lond.)	Clinical elderly OH patients	Diagnosis, management protocols, BP data, symptom questionnaires	Published clinical review
11	Freeman et al., 2018	JACC	Mixed populations	OH subtypes classification, pathophysiology, comprehensive diagnostics	Published; clinical guidelines
12	Kaufmann et al., 2017	Neurology	Patients with neurogenic OH	Autonomic function tests, pharmacological trial results	Randomized controlled trials
13	Mol et al., 2019	Drugs Aging	Elderly adults on polypharmacy	Medication profiles, OH episodes, adverse drug effects	Published review
14	Shaw et al., 2019	Age Ageing	Elderly with history of falls	Orthostatic BP changes, fall incidents, balance testing	Observational cohort
15	Wolters et al., 2016	PLoS Med.	Population-based cohorts	OH assessments, dementia diagnosis, brain imaging	Population-based study
16	Romero-Ortuno & Kenny, 2012	Clin. Auton. Res.	Elderly with frailty and OH	Frailty scores, orthostatic BP, hospitalization data	Observational study
17	Juraschek et al., 2018	J Am Coll Cardiol.	Cardiovascular cohort studies	BP measurements, OH diagnosis, mortality, cardiovascular events	Large cohort studies

Recognising these limitations is a critical first step in identifying gaps within the existing research.

Research Gaps

There are still a number of significant research gaps in the study of orthostatic hypotension (OH) in the elderly, despite mounting evidence. The majority of large epidemiological studies are cross-sectional or region-specific, which limits the ability to generalise findings across diverse populations. However, these studies have established prevalence and associations with hypertension, frailty, falls, and dementia. While they show prevalence trends, cohorts like Zhang et al. (2024)[10] in Chinese elders or Tran et al. (2021) in older adults living in the community do not have long-term follow-up to elucidate causal pathways. Comparability is also limited by the different diagnostic approaches used in different studies, even though meta-analyses such as Peters et al. (2024) associate OH with frailty and cognitive decline.

Although knowledge of OH subtypes, mechanisms, and management techniques has improved as a result of clinical and pathophysiological research, significant gaps in treatment personalisation and diagnostic standardisation still exist. Although many clinical studies still rely on single office measurements, which underestimate the prevalence of OH, current guidelines place an emphasis on active stand testing and continuous blood pressure monitoring (Wieling et al., 2022).[11] Pharmacologic interventions like droxidopa are beneficial, according to trials like Kaufmann et al. (2017), but the evidence is restricted to small, highly selective neurogenic OH cohorts. Similarly, research on frail older adults suggests customised antihypertensive treatment (Raber et al., 2025), but there is little data on how to balance blood pressure management with fall prevention.[12]

Lastly, despite strong observational links with the use of psychotropics and antihypertensives, the role of polypharmacy and multimorbidity in OH is not well understood (Mol et al., 2019).[13] Causality is unclear because the majority of current research is unable to distinguish between underlying comorbidities and drug effects. Furthermore, there are strong correlations between cognitive and mortality outcomes (e.g., Wolters et al., 2016; Juraschek et al., 2018);[14] however, there is still residual confounding, and the mechanisms are still unknown. In order to develop strong

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predictive models and guide all-encompassing management strategies, future research must prioritise longitudinal, standardised, multi-center studies that integrate clinical, cognitive, and pharmacological data.[15]

The need for focused future research and innovation is highlighted by the identification of these gaps. Priority areas and suggestions for improving clinical practice and outcomes for older adults with OH are described in the section that follows.[16]

Integrating current clinical guidelines and recommendations for orthostatic hypotension (OH) in the elderly

Management of Orthostatic Hypotension in the Elderly

Instead of concentrating only on reaching normative blood pressure levels, effective management of orthostatic hypotension (OH) in older adults seeks to lessen symptoms, increase standing tolerance, improve physical function, and prevent falls. Patient education, pharmacological and non-pharmacological interventions, and a thorough medication review customized for each patient are all components of a comprehensive approach.[17]

Patient Education and Lifestyle Modifications

Patients should receive counseling on identifying the signs of OH and avoiding aggravating factors that can exacerbate postprandial hypotension, such as sudden changes in posture, extended standing, hot conditions, alcohol consumption, and large meals high in carbohydrates. When medically indicated, it is best to maximize salt and water intake. Gradually getting out of a seated or lying position and staying active with customized exercise regimens that prioritize safe activities like swimming, cycling, and rowing should be prioritized.[18]

Non-pharmacological Interventions

Physical counterpressure techniques like squatting, muscle tensing, and leg crossing are important interventions because they increase venous return during symptomatic episodes. Although patient adherence may vary due to discomfort, peripheral pooling can be decreased by using abdominal binders and compression stockings (ideally thigh-high with 30 mmHg pressure). Depending on tolerance and comorbidities, raising the head of the bed by 10 to 30 degrees while you sleep may help reduce nocturnal supine hypertension. Evidence for symptom mitigation supports avoiding prolonged immobility and strategically consuming fluid boluses (e.g., 400–500 mL water intake before standing).

Medication Review and Optimisation

A thorough medication reconciliation is essential, with special attention to lowering or changing medications like diuretics, beta-blockers, alpha-blockers, antidepressants, and vasodilators that are known to worsen OH. While maintaining proper blood pressure control, adjustments should reduce the risk of supine hypertension. Antihypertensive medication taken at night may lessen OH symptoms during the day. Medication adjustments can be guided by ongoing ambulatory blood pressure monitoring.

Pharmacological Therapy

Pharmacologic options may be taken into consideration when non-pharmacological measures prove inadequate. The primary medications authorised to enhance vascular tone and alleviate symptoms are droxidopa, a norepinephrine precursor, and midodrine, an alpha-1 adrenergic agonist. Although fludrocortisone may be prescribed to expand intravascular volume, its use requires caution due to the potential risk of supine hypertension and fluid overload Given frailty and comorbidity, dosages need to be carefully titrated and monitored.

Multidisciplinary Approach and Monitoring

Multidisciplinary cooperation between geriatricians, cardiologists, neurologists, and physiotherapists is necessary for optimal care. It is essential to regularly evaluate cognitive function, fall risk, functional status, and symptom burden. Safety depends on educating patients and carersabout emergency procedures and symptom management.

Future Directions and Recommendations

Several crucial areas require concentrated attention in order to close the ongoing gaps in our knowledge of and approach to treating orthostatic hypotension (OH) in older populations. Initially, extensive, long-term cohort research is required to clarify the causal connections among OH, frailty, cognitive decline, and cardiovascular morbidity. To improve the generalisability of the results, these studies should involve a variety of older populations with a range of comorbid conditions and ethnicities.[19]

To improve the detection of all OH subtypes, especially the initial and delayed forms that frequently elude conventional intermittent measures, continuous, beat-to-beat blood pressure monitoring technologies must be developed and widely used. By combining wearable technology with artificial intelligence algorithms, it may be possible to reduce adverse events like falls and syncope by enabling real-time risk stratification and customised intervention triggers.

Pharmacologic research must focus on evaluating both new and existing therapeutic agents in elderly patients who are frail and multimorbid, evaluating safety profiles and efficacy in real-world settings. Furthermore, optimal antihypertensive treatment guidelines that balance OH

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risk and blood pressure control are crucial, particularly for patients who also have coexisting hypertension.[20]

To create standardised, evidence-based regimens, non-pharmacological interventions such as customised exercise programmes, hydration protocols, and compression therapies should be investigated in carefully planned clinical trials. To manage the multifactorial contributors to OH holistically, multidisciplinary care models that integrate geriatrics, neurology, cardiology, and physiotherapy should be encouraged.

Last but not least, early OH identification and prompt intervention will depend heavily on standardised screening procedures and raised clinician awareness in both community and institutional settings. Clinical decision support tools and education programmescan help achieve this objective.

By reducing its significant effects on morbidity, mortality, and older adults' quality of life, these future directions together seek to revolutionise OH management.

When combined, the gaps found and the suggested future paths lead to a more comprehensive comprehension and approach to OH management. These observations are summarised in the final section, with a focus on how they relate to geriatric care and research.

Conclusion

In the elderly, orthostatic hypotension (OH) is a prevalent and clinically significant condition that significantly increases the risk of falls, frailty, cognitive decline, and cardiovascular morbidity and mortality. Because of complicated patient comorbidities and limitations in current diagnostic techniques, OH is still underdiagnosed and undertreated despite advancements in our understanding of its pathophysiology, epidemiology, and management. Treatment plans are made more difficult when OH coexists with hypertension and polypharmacy, particularly in elderly patients who are fragile. A multifaceted strategy is needed to address these issues, including multidisciplinary care models, individualized treatment plans that balance risks and benefits, and enhanced screening with ongoing blood pressure monitoring. The detection, prevention, and management of OH could be improved with future research that focuses on longitudinal studies, technological advancements, and customised interventions. This would ultimately improve clinical outcomes and overall quality of life for the elderly population. Standardised guidelines and increased clinician awareness are necessary to integrate these advancements into everyday practice.

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