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# Best timing for measuring orthostatic vital signs?

We typically take a blood pressure within 3 minutes of a patient rising from a supine to a standing position. But is that too long?

## PRACTICE CHANGER

Measure orthostatic vital signs within 1 minute of standing to most accurately correlate dizziness with long-term adverse outcomes.<sup>1</sup>

## STRENGTH OF RECOMMENDATION

**B:** Based on a single, high-quality, prospective cohort study with patient-oriented outcomes and good follow-up.

Juraschek SP, Daya N, Rawlings AM, et al. Association of history of dizziness and long-term adverse outcomes with early vs later orthostatic hypotension assessment times in middle-aged adults. *JAMA Intern Med.* 2017;177:1316-1323.

## ILLUSTRATIVE CASE

A 54-year-old woman with a history of hypertension presents with a chief complaint of dizziness. You require an assessment of orthostatic vital signs to proceed. In your busy clinical practice, when should assessment take place to be most useful?

Orthostatic hypotension (OH) is defined as a postural reduction in systolic blood pressure (BP) of  $\geq 20$  mm Hg or diastolic BP of  $\geq 10$  mm Hg, measured within 3 minutes of rising from supine to standing. This definition is based on consensus guidelines from the American Academy of Neurology and the American Autonomic Society<sup>2</sup> and has been upheld by European guidelines.<sup>3</sup>

The prevalence of OH is approximately 6% in the general population, with estimates ranging from 10% to 55% in older adults.<sup>4</sup> Etiology is often multifactorial; causes may

be neurogenic (mediated by autonomic failure as in Parkinson's disease, multiple system atrophy, or diabetic neuropathy), non-neurogenic (related to medications or hypovolemia), or idiopathic.

It's important to identify OH because of its associated increase in morbidities, such as an increased risk of falls (hazard ratio [HR] = 1.5),<sup>5</sup> coronary heart disease (HR = 1.3), stroke (HR = 1.2), and all-cause mortality (HR = 1.4).<sup>6</sup> Treatments include physical maneuvers (getting up slowly, leg crossing, and muscle clenching), increased salt and water intake, compression stockings, the addition of medications (such as fludrocortisone or midodrine), and the avoidance of other medications (such as benzodiazepines and diuretics).

The guideline-recommended 3-minute delay in assessment can be impractical in a busy clinical setting. Using data from the Atherosclerosis Risk in Communities (ARIC) study, investigators correlated the timing of measurements of postural change in BP with long-term adverse outcomes.<sup>1</sup>

## STUDY SUMMARY

### Early vs late OH assessment in middle-aged adults

The ARIC study is a longitudinal, prospective, cohort study of almost 16,000 adults followed since 1987. Juraschek et al<sup>1</sup> assessed the optimal time to identify OH and its association with the adverse clinical outcomes of fall, fracture, syncope, motor vehicle crash, and

mortality. The researchers sought to discover whether BP measurements determined immediately after standing predict adverse events as well as BP measurements taken closer to 3 minutes.

Study participants were between the ages of 45 and 64 years (mean 54 years), and 26% were black and 54% were female. They lived in 4 different US communities. The researchers excluded patients with missing OH assessments or other relevant cohort or historical data, leaving a cohort of 11,429 subjects.

As part of their enrollment into the ARIC study, subjects had their BP measurements taken 2 to 5 times in the lying position (90% of participants had  $\geq 4$  measurements) and after standing (91% participants had  $\geq 4$  measurements) using a programmable automatic BP cuff. All 5 standing BP measurements (taken at a mean of 28, 53, 76, 100, and 116 seconds after standing) were measured for 7385 out of 11,429 (64.6%) participants. Subjects were asked if he or she “usually gets dizzy on standing up.”

Researchers determined the association between OH and postural change in systolic BP or postural change in diastolic BP with history of dizziness after standing. They also determined the incidence of falls, fracture, syncope, motor vehicle crash, and mortality via a review of hospitalizations and billing for Medicaid and Medicare services. Subjects were followed for a median of 23 years.

## Results

Of the entire cohort, 1138 (10%) reported dizziness on standing. Only OH identified at the first BP measurement (mean 28 secs) was associated with a history of dizziness upon standing (odds ratio [OR] = 1.49; 95% confidence interval [CI], 1.18-1.89). Also, it was associated with the highest incidence of fracture, syncope, and death (18.9, 17, and 31.4 per 1000 person-years, respectively).

After adjusting for age, sex, and multiple other cardiovascular risk factors, the risk of falls was significantly associated with OH at BP measurements 1 to 4, but was most strongly associated with BP measurement 2 (taken at a mean of 53 secs after standing) (HR = 1.29; 95% CI, 1.12-1.49), which translates to 13.2 falls per 1000 patient-years. Fracture

was associated with OH at measurements 1 (HR = 1.16; 95% CI, 1.01-1.34) and 2 (HR = 1.14; 95% CI, 1.01-1.29). Motor vehicle crashes were associated only with BP measurement 2 (HR = 1.43; 95% CI, 1.04-1.96). Finally, risk of syncope and risk of death were statistically associated with the presence of OH at all 5 BP measurements.

## WHAT'S NEW

### Earlier OH assessments are more informative than late ones

This study found OH identified within 1 minute of standing to be more clinically meaningful than OH identified after 1 minute. Also, the findings reinforce the relationship between OH and adverse events, including injury and overall mortality. Evaluation for OH performed only at 3 minutes may miss symptomatic OH.

## CAVEATS

### Could a healthy population skew the results?

The population in this study was relatively healthy, with a lower prevalence of diabetes and coronary artery disease than the general population. While there is no reason to expect detection of OH to differ in a population with more comorbidities, the possibility exists.

If OH is not identified in < 1 minute of standing, standard OH evaluation within 3 minutes after standing should be performed, as OH identified at any time point after standing is associated with adverse events and increased mortality.

This study did not address the effects of medical intervention for OH on injury or mortality. Also, whether OH is the direct cause of the adverse outcomes or a marker for other disease is unknown.

## CHALLENGES TO IMPLEMENTATION

### A change to protocols and guidelines

Although none were noted, any change in practice requires updating clinical protocols and guidelines, which can take time. **JFP**

## ACKNOWLEDGMENT

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**This study found that orthostatic hypotension identified within 1 minute of standing was more clinically meaningful than OH identified after 1 minute.**

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