From epidemiological observations to clinical practice: is the measure of postural blood pressure abnormal changes the new vital sign?

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In the present issue of the Journal, Wiersinga *et al.* [1] report the findings of a prospective study aimed at assessing the potential role of orthostatic hypotension in determining mortality in a cohort of 1240 geriatric multi morbid patients.

Orthostatic hypotension is a common condition in older individuals, with higher prevalence in patients with comorbidities, such as hypertension, diabetes mellitus, previous cardiovascular disease, Parkinson's disease [2–4]. Despite the relatively high prevalence of orthostatic hypotension in older adults, it is not correct to consider this condition, such as a frequent, harmless age-related peculiar manifestation. There is much evidence showing that orthostatic hypotension is a major disabling condition, which can lead to functional impairment, increased morbidity and mortality. Previous studies have demonstrated that orthostatic hypotension is associated with falls and falls-related injuries, myocardial infarction, stroke, heart failure, dementia, and all-cause mortality [5–10].

So, what are the additional values of this study to the existing knowledge? Wiersinga *et al.* have confirmed previous findings adding some novelties. An innovative aspect of this study is the additional specific focus on the duration and the magnitude of orthostatic hypotension. Therefore, orthostatic hypotension defined as a drop in SBP of at least 20mmHg and/or a DBP of at least 10mmHg [11]. This was further differentiated in early orthostatic hypotension (EOH) defined as orthostatic hypotension only at 1 min of standing up; delayed as orthostatic hypotension only at 3 min after standing up and prolonged occurring at both 1 and 3 min after standing up (DPOH). The magnitude of the drop in both SBP and DBP after either 1 or 3 min was quantified, the largest drop (at either 1 or 3 min) in both SBP and DBP was assessed.

In this study, orthostatic hypotension was present in 34.9% of the patient included; DPOH was more frequent, being present in 23% of the patients included whereas EOH was found in 11.9% of the patients. During a median follow-up of 1.9 years, 273 patients (22%) died. Patients with orthostatic hypotension had a higher mortality rate than patients without orthostatic hypotension [hazard ratio, 95% confidence interval (CI) 1.50 (1.18–1.91)]. However, after stratification for EOH and DPOH only DPOH predicted mortality [hazard ratio, 95% CI 1.69 (1.28–2.22)] whereas EOH did not. Moreover, patients with an increased drop in both SBP and DBP had the highest risk of mortality (*P* value for trend $\leq$0.001). The finding that both the duration and magnitude of the initial reduction in BP is clinically relevant, telling us not to look at orthostatic hypotension only as a dichotomous variable (orthostatic hypotension present yes/no) but suggesting that it is necessary to perform a qualitative evaluation of the postural change of BP levels. Wider changes indicates a more serious aberrant regulation of the blood pressure eventually associated with higher risk.

One point, which needs to be discussed is the diagnostic criterion that is not only used in the present study but also used in many other investigations. As described by the authors, the measurements of blood pressure were limited, these were performed after lying down for at least 3 min followed by measurements at 1 and 3 min after standing up. Therefore, no information on blood pressure and heart rate variability after standing was available. This is one of the most frequents pitfalls when assessing postural blood pressure changes. We only obtain information on single heart beat-related blood pressure values after 1 and after 3 min. A good assessment of these changes can only be possible when performing continuous blood pressure monitoring. Considering a mean heart rate of 70 bpm, we only have information on two blood pressure values out of 210. This can be particularly relevant for the assessment of initial orthostatic hypotension. A study, which included 326 community dwelling adults aged 65 years and over who underwent continuous blood pressure monitoring during tilt testing, found that 59% of the participants had a drop in

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blood pressure meeting the diagnostic criteria [12]. This prevalence is much higher when compared with the prevalence reported by other studies where intermittent measurements were performed [2,3]. It can be speculated whether the criterion used in the present study was subop-timal; conversely, it could also be argued that a continuous measurement could give a too high false-positive rate. Hence, a comparison study presenting an integrated approach in order to establish the gold standard for the assessment of orthostatic hypotension seems to be urgently needed.

Another point, which has to be discussed is the fact that knowing the cause of orthostatic hypotension can offer chances for interventions. For instance, if heart failure would cause abnormal blood pressure postural changes, and consequently blood pressure regulation disorders, clinicians would be able to search and find a therapeutic fine tuning in order to correct this aberrant hemodynamics. However, as stated by the authors in older patients with numerous pathologies and poly pharmacy, orthostatic hypotension is common and often without a single cause, and an etiological diagnosis can be very challenging.

And then the most important question: is the terminology orthostatic hypotension misleading? Consider a 72-year-old man, undergoing blood pressure measurements during orthostatic challenge and with a baseline blood pressure of 180/90 mmHg. Blood pressure levels after orthostatic challenge are 150/80 mmHg. Independently of the type of measurement performed (continuous or not), is it correct to use the term orthostatic hypotension? The answer is no, this is not correct.

Probably it is time to use a novel terminology.

Keeping in mind that after orthostatic challenge, we could measure a decline in blood pressure, which is not always hypotension, and not forgetting that we could also measure a significant increase of the blood pressure, we should forget the misleading term hypotension and talk about Postural Blood Pressure Abnormal Changes, and we should consider this as a major cardiovascular risk factor.

The finding of an increase of blood pressure levels after orthostatic challenge is not uncommon. The disabling role of orthostatic hypertension has also been reported. For this entity, we do not have a clear clinical definition but we know that also orthostatic hypertension can be a risk factor for cardiovascular morbidity and mortality as shown by observational and RCT studies [13,14]. For these reasons, we should consider the Postural Blood Pressure Abnormal Changes as a serious condition, indicating that blood pressure regulation mechanisms are not functioning properly impairing blood pressure homeostasis.

Eventually, as speculated by Wiersinga *et al.*, the duration and magnitude of orthostatic hypotension could be seen as a marker of decreased resilience in older patients independent of comorbidity. This vision needs one last consideration. If the identification of postural blood pressure abnormal changes (being a decline or an increase) can give to clinicians valuable information on blood pressure regulation disorders and consequently on individual prognosis, why do we not include this simple to perform measurement in daily clinical practice? This condition needs much more attention. This should no longer be considered an innocent expression of vascular aging but is a major cardiovascular risk being a signal of serious cardiovascular dysfunction with a high risk of morbidity and mortality. Perhaps it is time to consider postural blood pressure abnormal changes as a vital sign. A neglected measurement, which can give additional insights on the real cardiovascular and hemodynamic condition of the single patient, and possibly, help in providing tailored therapeutic interventions.

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Conflicts of interest

There are no conflicts of interest.

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