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Length of Time Required to Achieve a Stable Baseline Blood Pressure in the Diagnosis of Orthostatic Hypotension

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To the Editor:

Diagnosis of orthostatic hypotension (OH) is essential because the consequences include morbidity and mortality^{1, 2}. Prevalence is estimated to be as high as 6% in community-dwelling older adults and 65% in older person's care facilities³.

Diagnosis depends entirely on a drop in systolic or diastolic blood pressure (BP) from baseline. Baseline is typically estimated after a period of supine rest. The rationale behind the supine rest is to establish a stable baseline, improving the precision of diagnosis, but how long is needed to reach a stable baseline remains uncertain, if it can be reached at all. The aim of this study was to identify the minimum time of supine rest required to achieve a stable baseline BP.

METHODS

All consecutive patients attending the Newcastle upon Tyne Hospitals National Health Service Foundation Trust Falls and Syncope Service who consented for their clinical data to be used for research were recruited between February and May 2009. Patients with OH aged 65 and older were matched to a non-OH case for age, sex, diabetes mellitus, and antihypertensive medication (diagnoses in controls included noncardiovascular falls, vertigo, peripheral neuropathy). Those with arrhythmias were excluded. Each patient underwent a 10-minute supine rest while recording a continuous, noninvasive electrocardiogram and beat-to-beat BP using digital plethysmography

(Taskforce, CNSystems, Graz, Austria). They were then assisted to a standing position to assess for OH. Mean BP was calculated for each minute of rest. The coefficient of variability ($C_v = \text{standard deviation} / \text{mean} \times 100$) was calculated for each minute as a measure of BP variability. OH was diagnosed using the BP recordings alongside a clinical assessment by an experienced clinician. Repeated-measures analysis of variance was performed to identify statistically significant differences between consecutive minutes; results were considered significant when $p < .05$. Permission to perform the study was granted by the local research and ethics review panel.

RESULTS

Of 336 consecutive patients, 208 were aged 65 and older (median 76, maximum 90), and among these, 36 cases of OH were identified. Each group was 44% female, 11% with diabetes mellitus, and 31% on antihypertensive medication. Forty-seven percent of those with OH were taking fludrocortisone, midodrine, or both.

BP trends over 10 minutes can be seen in Figure 1, with all significant changes occurring within the first 4 minutes. During the initial rest period, the BP of those without OH declined much more sharply than that of those with OH.

Variability of systolic BP in the OH group fell nonsignificantly over the first 3 minutes of rest, reaching a nadir of 2.3% and thereafter oscillating between 2.7 and 3.2%. A similar, nonsignificant pattern was seen in the control group, with the nadir in the third minute (2.7%), and although overall systolic BP C_v values were higher (range 2.7–3.6%), they were not significantly so. DBP variability also reached a nadir in the third minute in the OH group (range 2.7–3.9%) and in controls (3.3–4.1%) and oscillated over the remaining time nonsignificantly.

DISCUSSION

The observed BP reduced significantly over the first 4 minutes of supine rest, suggesting that 4 minutes rest is required before standing for the diagnosis of OH in older people. In support of this is the change in BP variability, which also declines over the initial resting period, although it reaches a nadir slightly earlier than 4 minutes.

BP most likely has the greatest reductions in the initial stages of rest as activity in the sympathetic arm of the autonomic nervous system withdraws and parasympathetic activity predominates as the autonomic nervous system (ANS) reaches a resting state. The purpose of lying-to-standing BP is to challenge the ANS, and these data suggest that 4 minutes rest is sufficient to achieve an autonomic baseline. After the initial decline, BP demonstrates an oscillatory pattern, best seen in the OH systolic BP trend in Figure 1. Normal intraindividual BP variation that occurs with respiration, cognitive processing, and changes in vasoactive hormones may explain these oscillations and limit any further stability of the baseline.

There appears to be little advantage to be gained by resting longer than 4 minutes to achieve a stable baseline BP value in the diagnosis of OH.

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FIGURE 1. Systolic and diastolic blood pressure (BP) trend over 10 minutes of supine rest for those with orthostatic hypotension (solid line) and the control group (broken line). Asterisks indicate where statistically significant changes occurred minute by minute.