

HYPERTENSION AND BLOOD PRESSURE VARIABILITY

What is blood pressure variability?

Blood pressure variability (BPV) is characterised by an array of spontaneous blood pressure variations within a 24-hour period that are influenced by day-night changes as well as response to physical activity and emotional stimuli (Figure 1).¹

Short-term vs long-term BPV

Short-term (generally within a 24-hour period) BPV can be attributed to many factors (Figure 2) including physical activity, sleep, postural changes as well as the influences of central and reflex autonomic modulation and mechanical forces generated by ventilation.² These can be detected through ambulatory BP monitoring (ABPM) or intra-arterial BP monitoring. ABPM provides detailed BP information at many time points throughout the day reflecting blood pressure changes as a result of routine daily activities.²

Long-term BPV is determined between clinic visits over time. Home blood pressure monitoring (HBPM) is able to provide BP information measured under constant conditions and fixed time periods (usually measured in the morning and evening) over a long period of time; this results in reliable and highly reproducible measurements and is thus useful to measure or detect long-term BPV.³

Clinical significance of BPV

It is a reflection of the stiffening of the blood vessels in an individual and can be used as an indicator as well as a risk factor for cardiovascular disease.⁴ Despite the presence of distinct variations, most studies still use mean BP to indicate risk.⁵

However, there is clear evidence suggesting that BPV is increased in hypertensive patients compared with normotensive individuals. BPV is also correlated with the following:

- Increase in severity of cardiac, vascular, and renal damage²
- Direct association with cardiovascular events in patients with hypertension and diabetes²
- Future stroke events in hypertensive patients⁴
- All-cause mortality and cognitive dysfunction^{6,7}

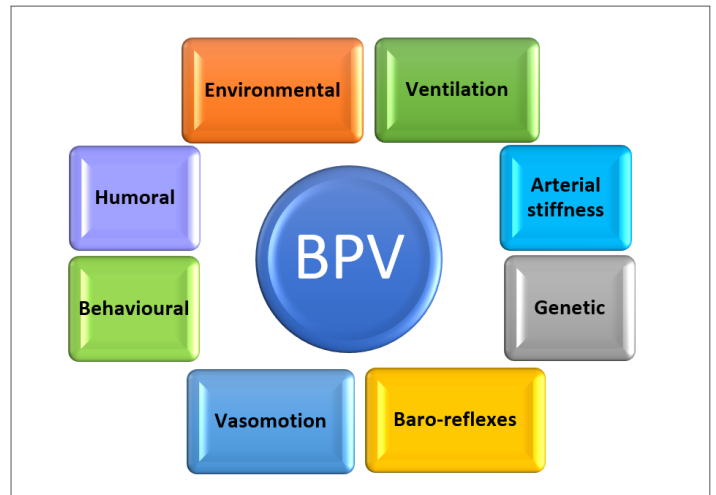


Figure 2. Factors that may contribute to 24-hour BPV¹

Therapeutic considerations

Evidence suggests that decreasing BPV in hypertensive patients can reduce cardiovascular events; therefore, BPV needs to be taken into account in management. Most cardiovascular events occur during the early morning, which coincides with the morning blood pressure surge, so careful consideration is required when selecting anti-hypertensive therapy.⁸



The Singapore Ministry of Health Clinical Practice Guidelines and international guidelines recommend long-acting anti-hypertensives to achieve more constant BP control and minimise variability.^{9,10} While all antihypertensives can effectively lower BP, calcium channel blockers were shown to be the most effective in minimising both short- and long-term BP fluctuations.^{11,12} Combining different antihypertensive agents is also effective in reducing BPV, with the added benefit of minimising side effects due to the lower dosages used.^{11,13}

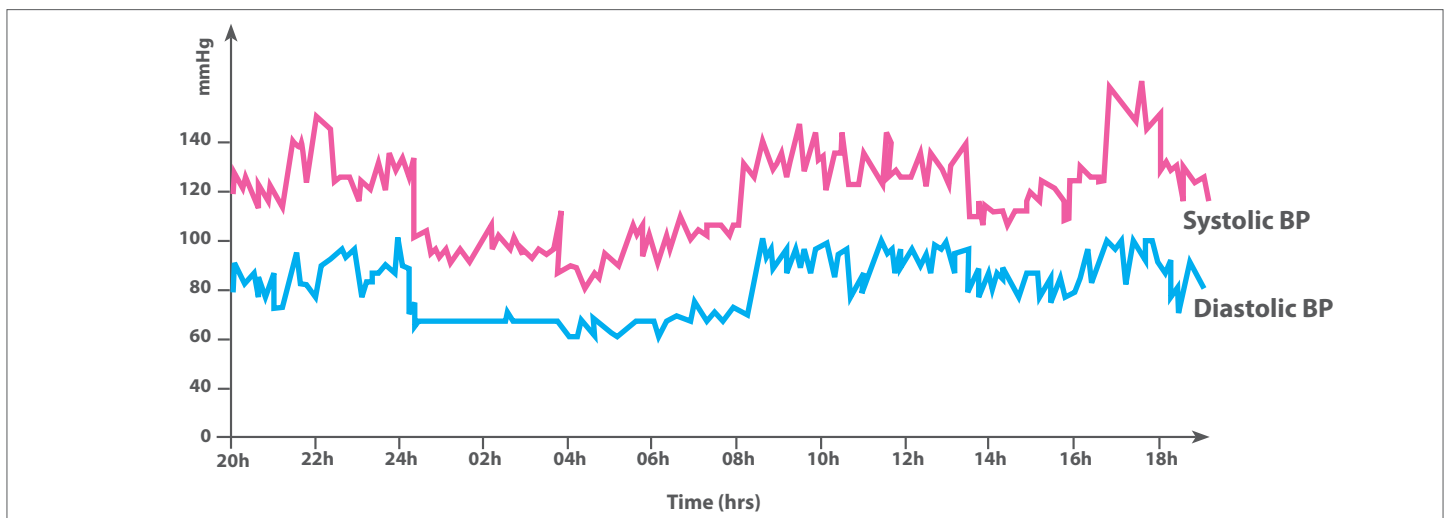


Figure 1. Example of plotted BP at different time points in a day

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