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COMMENTARY

Wrist devices with both accuracy and feasibility, new option to measure nocturnal blood pressure?

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Nocturnal blood pressure (BP) is very well-known for its association with adverse cardiovascular outcomes. Even though there have been many clinical studies investigating the epidemiology and therapeutics to control nocturnal BP, there are limitations in gathering data to apply to clinical trials and generating clinical evidence for real world clinical practice.

First, the reproducibility of nocturnal blood pressure and/or its dipping patterns performed during a single day are not sufficiently accurate to be adopted in clinical practice. Only in a research setting can nocturnal blood pressure be measured over a couple of days using ambulatory blood pressure monitoring (ABPM). As well as ABPM, home blood pressure monitoring (HBPM) to measure nocturnal BP is not effective because of patient discomfort during sleep due to repeated upper arm cuff inflations.

Second, strictly speaking, when a patient complains of poor sleep because of upper arm discomfort during nocturnal BP measurements, the measured nocturnal BP can partly reflect the BP in response to discomfort induced by upper arm cuff inflations. This makes physicians reluctant to prescribe ABPM and is a major barrier to wider use of ABPM despite major guidelines recommending it for the diagnosis and monitoring of treatment responses.[1] To alleviate discomfort when measuring BP, several cuffless technologies are now frequently applied in manufacturing wearable devices. However, they are not yet formally validated for clinical use. In comparison to cuffless devices, some wrist devices have been formally validated for clinical use. Wrist devices are also regarded as causing less discomfort than upper arm devices.

Third, masked hypertension or masked uncontrolled hypertension is recognized as important target to refine the quality of hypertension control. The difference in the prevalence between ABPM and HBPM was reported remarkable and it depends on the availability of nocturnal blood pressure and/or nocturnal hypertension.[2] In this regard, the advantage of ABPM in diagnosing masked hypertension only can be generalized in the context of feasibility of ABPM. In other words, usefulness of HBPM in diagnosing masked hypertension can be improved a lot once nocturnal BP can be feasibly measured.

Kuwabara et al[3] validated a wrist device, the Omron HEM-960IT, in a supine position with the palm positioned upwards, sideways, and downward. The accuracy in the supine position fulfilled ANSI/AAMI/ISO81060-2:2013 guidelines as well as the accuracy in the sitting position. Because this study protocol can be exchanged for the recent universal validation protocol for a device of unknown accuracy, it seems that the result of this study continues to be valid.

The critical issue of the accuracy of the wrist device is the level of the device in relation to the heart level. A wrist device should be positioned at the heart level when BP is measured. Even in this study,[3] the patient's palm was held on a pillow to adjust the level to the level of the heart in a supine position. This indicates significant progress since the wrist device was initially introduced for a validation study when it failed even in a sitting position.[4] Of course, this is a good first step to tackle nocturnal BP as well by making a breakthrough in the feasibility issues of the upper arm cuff devices.

However, at the same time, there are still some important practical issues that remain. First, in clinical practice, the palm may not be forced to have these three palm positions during sleep. When the palm is on the chest of a patient in the supine position or when a patient sleeps in a lateral decubitus position, the accuracy of the data of this study may not be generalized because the level of the device is quite above or below the heart. Due to these issues, additional monitoring of the levels of the heart and palm or the monitoring of the motion of the wrist device may be necessary.

Second, researches comparing upper arm devices and wrist devices regarding the accuracy as well as feasibility or patient discomfort are needed because the data is greatly affected by patient posture and the level of the palm, as the authors have noted.[3]

In spite of these limitations, wrist devices validated in a supine position seem to be a promising tool to measure nocturnal BP with good reproducibility and sufficient feasibility to be adopted for clinical research and practice.

CONFLICT OF INTEREST

I declare that I have no conflict of interest.

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