The Implications of Blood Pressure Measurement Methods on Treatment Targets for Blood Pressure

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Over the past 45 years, a number of clinical outcome trials have evaluated the effects of blood pressure (BP) reduction on CV outcomes[1]. Most recently, The Systolic Blood Pressure Intervention Trial (SPRINT) randomly assigned 9361 persons with a systolic blood pressure (SBP) of 130 mm Hg or higher and increased cardiovascular (CV) risk to a SBP target <120 mm Hg versus <140 mm Hg. While the results of SPRINT provide evidence that the goal systolic BP should be closer to 120 than 140mmHg, the methods of BP measurement were notably different between this trial and many others. More importantly, the methodology used to measure BP in SPRINT is not what is used in most clinical practices, and this difference has significant clinical implications.

Most CV outcome trials, to date, have used either ausculatory or automatic oscillometric methods of seated BP measurement performed shortly after the patient's arrival for a visit, with similar methods currently used in most clinical practices. In SPRINT, the methodology utilized is not in widespread use clinically-i.e. BP measured after the participant sat quietly alone for 5 minutes, after which study personnel returned to the room to measure BP 3 times at 1 minute intervals with all 3 values averaged.

BP recorded in research studies using the standard BP measurement guidelines, which mandate a rest period prior to measurement (with or without AOBP), is on average 10/7 mmHg lower than BP measured in routine clinical practice[2]. Even when patients take their own BP using an automated sphygmomanometer while alone in an examining room, the mean systolic BP is still ~5 mmHg higher than the corresponding awake ambulatory or home BP[3]. Thus, systolic BP as measured in recent randomized trials, including SPRINT, is likely ~5-10 mm lower than that measured with traditional office BP measurement methodology. Consequently, targeting the systolic BP <120 mmHg without using similar BP measurement

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methods as in the trials may increase the risk of serious adverse events by systematically overshooting the trial-based BP targets and potentially leading to hypotensive complications. Thus, applying the SPRINT intensive BP targets based on usual office measurements would correspond to a systolic BP target range of 125-135 mmHg to be similar to the level of BP control targeted and achieved in the SPRINT intensive BP group.

Another method of BP measurement has been proposed using a specific method termed "automated office BP" (AOBP). Like the SPRINT method, AOBP measurement assesses BP after the patient has rested for 5 minutes, but adding to that a fully automated sequence of 5 readings over a 5-minute period, all with the patient resting quietly alone[4]. The AOBP method of BP measurement corresponds more closely with mean daytime BP (using ambulatory-awake monitoring) than with manual (ausculatory) or automated oscillometric office BP measurement and has been shown to diagnose masked hypertension as well as 24 hour ambulatory monitoring[5]. The AOBP approach minimizes white coat hypertension and yields up to 10 mmHg lower result for SBP than single automated/oscillometric BP measurement most commonly done in the real-world clinic setting[2, 3].

Almost all AOBP research has involved the patient resting alone in an examining room, most commonly for a 5-minute period, which is often impractical in a busy clinical setting. A recent study examined whether it would be possible to obtain valid AOBP readings with the patient resting quietly in a waiting room. AOBP readings using a BpTRU device (VSM MedTech Ltd, Vancouver, Canada) recorded with the patient resting quietly in the waiting room were obtained in patients referred for ambulatory BP monitoring. The relationship between the waiting-room acquired AOBP measurements and the awake ambulatory blood pressure (AABP) (mmHg) were examined in 422 patients[2]. The AABP was similar to the

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mean AOBP recorded in the waiting room, with both values being significantly lower than a single office BP taken by a nurse. Therefore, it seems plausible that even in a busy clinical practice with little time to spare, AOBP measurement could be incorporated prior to engagement with the healthcare professional.

For AOBP methodology to be incorporated into clinical practice, one needs to take the following points into consideration. First, using a fully automated patient rest time of 5 minutes followed by one-minute cycling for repeat BP measures, all with the patient alone, decreases the likelihood of the patient being disturbed. A second consideration is the cost of the AOBP devices that range from $400 to $700 US dollars. While most of the research to date using AOBP methods has been performed with a BpTRU device, which is among the most expensive; other models are as good and more reasonably priced. For example, the Omron 907 (Omron Healthcare, Lake Forest, IL) that has been extensively used in clinical trials such as ONTARGET, ACCORD, and SPRINT is less expensive. Similar to the BpTRU device, OMRON and many other oscillometric BP monitors can be programmed to take 3 consecutive measurements after 5-10 minutes delay. Lastly, when patient-activated, non-automated devices are used instead of the AOBP method, readings are only ~5/5 mmHg higher than those with AOBP, and this might represent a practical compromise.

Thus, these protocolized approaches to BP measurement suggest that the current practice of office BP measurement in most of the world overestimates BP levels, and attempting to achieve lower levels achieved in trials like SPRINT where BP was properly measured may be associated a higher risk for adverse events, which were observed in SPRINT, ACCORD and ONTARGET associated with hypotension. Thus, improving the accuracy of office BP measurement such as using AOBP is a goal, but may be impractical in

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some settings; hence, if standard office BP measurement is used without a resting period and without automatic cycling of measurements with clinic personnel out of the room, the goal systolic BP ranges for those meeting risk profiles similar to clinical trials should be adjusted 5-10 mmHg higher than the trials.

Disclosures

None.

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