Accurate Blood Pressure Measurement: Why Do Monitors Read High?

If you've ever used an automated monitor to measure blood pressure, you've probably encountered a reading you thought was too high. In these situations, clinicians usually take a measurement themselves using a sphygmomanometer and stethoscope to either confirm the reading or question whether the monitor is working properly. If the reading is confirmed, you and your patient may be surprised to realize that your patient's blood pressure is not what you expected. Alternatively, if the reading is different, you may wonder if your monitor is calibrated or operating correctly.

Regardless of the situation, why is this happening at all? First, the longer a patient sits waiting for blood pressure measurements to be taken, the more likely it is that blood pressure stabilizes to its resting level. In fact, the American Heart Association (AHA) and the British Hypertension Society (BHS) recommend that clinicians allow a patient to sit still without talking for at least five minutes prior to measurement. [1, 2] While this is a thoughtful recommendation, there will be some patients whose blood pressure will take longer to stabilize depending on their physiology, stress level, and previous activity. In fact, for most patients, it is likely that the first measurement will be higher than the second regardless of the resting interval. [3]

Another factor to consider is that the two measurements (the one by the monitor and the one from the clinician) are usually taken with different devices and different blood pressure cuffs (the piece wrapped around the patient's arm). While the cuff from the monitor may be approximately the same to that of the sphygmomanometer, they are rarely the same exact size. If they are not the same size, consider that a cuff that is too small for a patient's arm will overestimate blood pressure.

In a study on cuff application, undercuffing accounted for 84% of cuff sizing errors. [4] These over-estimations have been shown to be significantly larger than the errors using a cuff that is too large. [1]

Finally, most monitors measure blood pressure differently than clinicians do. They employ a technique called "oscillometry," which measures the pressure waves associated with the sounds (Korotkoff sounds) that clinicians listen for when they measure blood pressure; the latter technique is called "auscultation."

Oscillometry is used in a vast majority of automated BP devices because it has shown generally good agreement with auscultation. [1] However, there are times when the two techniques result in significantly different results. Thus, the BHS recommends occasionally checking the monitor against a mercury sphygmomanometer or other known pressure standard. [2]

So, how does one account for all of these complicating factors that are a part of measuring the two numbers that represent a patient's cardiovascular health? While patience and understanding on the part of the clinician are required to ensure that blood pressure measurements are carefully taken, different monitors or instruments are required as well. These devices should 1) employ clinical-grade automated technology, 2) allow clinicians to take a manual measurement with a stethoscope as do

sphygmomanometers, and 3) encourage careful observer technique when taking measurements with a stethoscope. Deflating the cuff at 2-3 mmHg/sec, as recommended by the AHA and BHS, is the most difficult and important thing to do to ensure accuracy. [1, 2]

The ADC ADView 2 Modular Diagnostic Station was designed to address these concerns. Built on automated technology that the leading defibrillator and monitor manufacturers use, the ADView 2 is the first clinical-grade, automated blood pressure device that allows clinicians to take manual measurements with a stethoscope using the same cuff as the automated measurement. Furthermore, when you use the device's manual mode to take a blood pressure measurement with your stethoscope, it automatically deflates the cuff at 3 mmHg/sec – ensuring optimum conditions to obtaining an accurate manual measurement.

References

1 Pickering TG, Hall JE, Appel LJ, Falkner BE, Graves J, Hill MN, Jones DW, Kurtz T, Sheps SG, Roccella EJ. Recommendations for Blood Pressure Measurement in Humans and Experimental Animals: Part 1: Blood Pressure Measurements in Humans: A Statement for Professionals From the Subcommittee of Professional and Public Education of the American Heart Association Council on High Blood Pressure Research. Hypertension. 2005; 45: 142-161. 2 British Hypertension Society. Blood Pressure Measurement With Mercury Blood Pressure Monitors. Poster: available from the British Hypertension Society at http://www.bhsoc.org/how_to_measure_blood_pressure.stm, accessed 6 Nov 2008. 3 Manning DM, Kuchirka C, Kaminski J. Miscuffing: inappropriate blood pressure cuff application. Circulation. 1983; 68(4): 763-766. 4 McAlister FA, Straus SE. Evidence based treatment of hypertension: Measurement of blood pressure: an evidence based review. British Medical Journal. 2001; 322: 908-911 (14 April).