



Accurate blood pressure measurement: Why does it matter?

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Measurement of a patient's blood pressure is one of the most common and basic medical assessments. However, errors in measuring blood pressure occur often. Most errors result in overestimates of blood pressure, which could cause almost twice as many patients' receiving the diagnosis of hypertension as actually have high blood pressure. In other cases, hypertension is likely underdiagnosed owing to underestimates of blood pressure. Many errors result in variability of readings and cause confusion regarding blood pressure status. "Casual" readings — those obtained with little attention to patient factors or recommended technique — cause errors in blood pressure assessment and are not highly correlated with target organ damage. Currently no evidence exists to support the use of casual readings in assessing a patient's need for pharmacologic treatment. Conversely, standardized readings — those that follow recommended protocols — correlate with hypertensive target organ damage and were used in the major randomized controlled trials that showed the benefits of pharmacotherapy.

The level of the blood pressure is the main factor in the decision to start antihypertensive therapy. Despite the importance of blood pressure assessments, current guidelines for patient preparation and measurement technique are rarely followed, and the equipment used is often inaccurate.¹ For example, few physicians have patients rest for 5 minutes before blood pressure measurement as recommended.¹ Activities of daily living can have substantial and variable effects on blood pressure (Table 1). These activities result in a variable but high estimate of blood pressure in the "unrested" patient relative to that obtained with a standardized technique.³ In 3 studies none of the physicians tested followed all the recommendations of the American Heart Association when measuring blood pressure, and few recommendations were followed by more than a minority of physicians.^{1,4,5}

Equipment problems or misuse occur often too. Most physicians still use a regular-sized cuff to measure blood pressure in patients with large arms.¹ In patients whose arm circumference is best suited for a large cuff, the use of a regular-sized cuff causes consistent overestimation of diastolic blood pressure by approximately 6 mm Hg.⁶ Inaccurate sphygmomanometers are also common: 30% to 40% of aneroid sphygmomanometers used by physicians are out of calibration by 4 mm Hg or more, and about 10% are out of calibration by 10 mm Hg or more.¹ Inadequate prepara-

tion of patients, significant deviations from recommended technique and inaccurate sphygmomanometers often result in blood pressure measurement errors of 10 mm Hg or more.¹

The large clinical trials on which treatment recommendations are based used standardized blood pressure measuring techniques and patient preparation.⁶ The people who measured blood pressure in these trials were specifically trained and used well-maintained, calibrated sphygmomanometers. Despite the observation that casual blood pressure readings are weakly associated with illness and death from cardiovascular disease,⁷ currently there is no evidence to show that patients found to have mild hypertension by casual measurement benefit from treatment.

The magnitude of the problem caused by inaccurate blood pressure measurement can be estimated by considering the effects of a small but consistent error in blood pressure measurement. These errors commonly occur when inappropriate equipment (e.g., inaccurate sphygmomanometer) or technique (e.g., measuring blood pressure with the patient's arm dangling at his or her side) is used. Consistent overestimation of diastolic blood pressure by 5 mm Hg would more than double the number of patients with hypertension in a physician's practice (estimated from

Table 1: Average changes in blood pressure associated with 14 common activities*

Activity	Change in blood pressure, mm Hg	
	Systolic	Diastolic
Attending a meeting	+20.2	+15.0
Working	+16.0	+13.0
Commuting	+14.0	+9.2
Walking	+12.0	+5.5
Dressing	+11.5	+9.7
Doing chores	+10.7	+6.7
Talking on telephone	+9.5	+7.2
Eating	+8.8	+9.6
Talking	+6.7	+6.7
Doing desk work	+5.9	+5.3
Reading	+1.9	+2.2
Doing business (at home)	+1.6	+3.2
Watching television	+0.3	+1.1
Sleeping	-10.0	-7.6

*Changes are shown relative to blood pressure while relaxing. Adapted from reference 2.



the adult Canadian population).⁸ People who are identified incorrectly as having hypertension may experience adverse effects of medication and have increased insurance and treatment costs. Furthermore, labelling leads to an increased perception of disease and absenteeism from work.⁹

Conversely, consistent underestimation of diastolic pressure by 5 mm Hg would reduce by 62% the number of patients perceived as hypertensive.⁸ These errors could deprive patients of therapy proven to be beneficial and could lead to increases in serious medical and social complications. The effects of consistent errors of 10 mm Hg in systolic pressure could be similar.

Depending on the clinical circumstance, accurate, reproducible blood pressure readings may not be necessary. When dealing with inpatients the clinician is often interested only in the extremes of blood pressure, and basal readings may not be possible owing to pain, anxiety or acute therapies. The potential inaccuracy of the readings must be recognized, and clinicians need to be aware that the techniques used to crudely estimate blood pressure in inpatients are inappropriate in the ambulatory setting. Only readings obtained using recommended technique are appropriate when making decisions about long-term cardiovascular risk or the potential for therapeutic intervention.

This article should not discourage the measurement of blood pressure. Many Canadians either are unaware of their high blood pressure or have poorly controlled hypertension.⁸ Adult Canadians need to have their blood pressure measured at all suitable opportunities. However, blood pressure must be measured appropriately if patients are to benefit fully from therapeutic intervention. Several publications discuss how to measure blood pressure.^{6,10-14} Physicians and the public need to recognize that accurate blood pressure readings play a critical role in the assessment and management of hypertension.

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