

Too-Large and Too-Small Cuff Sizes results Results in Substantial Blood Pressure Measurement Error: Results from the Cuff(SZ) Randomized Trial

TAMMY MCLOUGHLIN BRADY¹⁾, Jeanne Charleston²⁾, Junichi Ishigami²⁾, Greg Prokopowicz¹⁾, Edgar Miller^{1,2)}, Kunihiro Matsushita^{1,2)}, Lawrence Appel^{1,2)}

1)Johns Hopkins University School of Medicine, 2)Johns Hopkins University Bloomberg School of Public Health

Objective: Proper cuff-size based on measured mid-arm circumference is recommended for accurate blood pressure (BP) determination. The impact of mis-cuffing (using a too-small or too-large cuff) on BP when using an automated BP device has not been rigorously tested. We aimed to determine the effects of mis-cuffing on automated BP.

Design and Methods: We conducted a randomized cross-over trial of 195 community-dwelling adults [mean age 54 yrs, 34% male (n=67), 68% Black (n=132)]. Participants had 3 sets of triplicate BP measurements (WelchAllyn ProB 2000) using an appropriately sized cuff and two additional cuff sizes (too-small and/or too-large), in random order.

Results: 31% (n=60) of the study participants had systolic BP (SBP) ≥ 130 mmHg, and 36% (n=71) had a body mass index ≥ 30 kg/m². As shown in the Figure, among persons in whom a small adult cuff was appropriately sized, too-large cuffs resulted in significantly lower SBP readings [regular adult cuff: -3.6 (-1.7 to -5.6) and large adult cuff: -7.5 (-5.5 to -9.6)]. In contrast, among persons in whom an extra-large adult cuff was appropriately sized, too-small cuffs resulted in significantly higher SBP readings [large adult cuff: +9.6 (+7.3 to +11.9) and regular adult cuff: +19.5 (+16.1 to +22.9)]. Similar effects were seen for mis-cuffing when an appropriate cuff was either a regular adult cuff or large adult cuff. We also observed similar patterns for diastolic BP.

Conclusions: Appropriate cuff selection is essential for accurate BP measurement. Choosing a too-large or too-small cuff can result in clinically meaningful errors in BP reading which could lead to under- or over-treatment of hypertension.

Figure:
Over- and Underestimation of Systolic and Diastolic Blood Pressure when using an Incorrect Cuff Size

