Letters to the Editor

Response to Recommendations for Blood Pressure Measurement in Human and Experimental Animals; Part I: Blood Pressure Measurement in Humans and Miscuffing: A Problem With New Guidelines: Addendum

Since the recommendations for blood pressure measurement in humans were published,1 questions have been raised regarding the recommendations for cuff sizes in subjects with obese arms and how the width of the cuffs should relate to the length.2 In the 1993 recommendations,3 the largest recommended bladder width was 20 cm, whereas in the latest version it is 16 cm (Table). The 2005 document stated that, “the ‘ideal’ cuff should have a bladder length that is 80%, and a width that is at least 40% of arm circumference (a length to width ratio of 2:1). A recent study comparing intra-arterial and auscultatory blood pressure concluded that the error is minimized with a cuff width of 46% of the arm circumference.”

The study that examined this issue was published by Marks and Groch,4 who measured blood pressure directly from the radial artery and indirectly from the brachial artery in 50 subjects who were in an intensive care unit and had intra-arterial lines as part of their routine care. The average arm circumference of these patients was 29.7 cm, and the published figure shows that the highest circumference was 37 cm. Thus, only 2 of their 50 patients had arm circumferences in the 35 to 44 cm range, and none had circumferences in the 45 to 52 cm range. The investigators used a cuff that was 32 cm long, and the maximum width was 18 cm. We believe that it is not appropriate to extrapolate the findings of this study to the question of the optimal width for the proposed 42-cm-long cuff in patients with arm circumference in the 45- to 52-cm range for 2 reasons: first, none of the patients in the study had arm circumferences in this range, and, second, a 42-cm-long cuff was not evaluated.

The classic study on the use of different cuff sizes in patients with obese arms was performed by King,5 who compared 2 cuffs, 26 cm and 42 cm, and concluded that the 42-cm cuff was more accurate when compared with intra-arterial pressure. The maximum arm circumference in his patients was 38 cm.

Two studies have compared the effects of using 3 cuff sizes (equivalent to the adult, large adult, and thigh cuff in the American Heart Association [AHA] recommendations) in obese patients. Linfors et al6 studied 470 patients, of whom 78 had an arm circumference of ≥35 cm. The authors compared readings taken with a thigh cuff (17.4×45 cm) and a large adult cuff (14.5×37 cm) and stated that “there was no difference in the prevalence of pressures as measured by the large adult or thigh cuffs. Since the large adult cuff is more convenient to use, subsequent analyses are restricted to results obtained with the large adult cuff.” The second study was performed by Maxwell et al,7 who used a thigh cuff of 18×36 cm and a large adult cuff of 15×33 cm and found that for systolic pressure there was a consistent difference of ≈4 mm Hg between the 2 cuffs, but this was largely independent of arm circumference, making its significance hard to interpret. For diastolic pressure, there was a difference between the readings with the 2 cuffs that varied with arm circumference, but it was small, increasing from ≈1 mm Hg with an average-sized arm (28-cm circumference) to ≈2.5 mm Hg with an arm circumference of 48 cm.

A third study examined the impact of cuff width on measurement of blood pressure in the thigh and compared the indirect measurement against intra-arterial pressure.8 The authors used a narrow (10×40 cm) and wide (17×64 cm) cuff and found no difference between the 2 in assessing femoral artery pressure, although neither was very accurate. Further study of the impact of cuff width on thigh blood pressure measurement is needed to confirm this observation.

Thus, none of these studies compared cuffs with a width of 16 versus 20 cm and a length of 42 cm, and the available data do not suggest that any substantial difference between them should be expected. We are well aware that the previous AHA recommendations did recommend a thigh cuff with a 20-cm width, but the main reason why we did not include a recommendation for a cuff this wide was that 20 cm is greater than the length of the upper arm in the vast majority of people, making it impractical to place the stethoscope in the brachial fossa. We would also note that in the recently published European Society of Hypertension guidelines,9 the largest cuff size recommended for patients with obese arms is 12×40 cm. This was based on the 1997 version of the British Society of Hypertension guidelines,10 and confirmed by the more recent (2004) version,11 which recommended 3 cuff sizes for routine use in patients with arm circumferences of ≤50 cm (small adult: 12×18 cm; standard adult: 12×26 cm; and large adult: 12×40 cm). The guidelines also mentioned a thigh cuff of 20×42 cm for patients with arm circumferences between 50 and 53 cm.

A second letter, by Prisant et al,12 suggests that the new recommendations imply that epidemiological blood pressure collected before 2005 will be unusable, and that “all of the current cuffs would have to be replaced.” These are serious charges, but we do not believe that the original AHA criteria have in practice been followed very rigorously, as shown by 2 recent examples of large clinical trials (W.C. Cushman, personal communication). First, the Antihypertensive and Lipid Lowering treatment to prevent Heart Attack Trial (ALLHAT) trial recommended that a large cuff (15-cm width) be used when the arm circumference is 30.1 to 37.5 cm and a thigh cuff (17.5-cm width) when the circumference is ≥37.6 cm. Second, the ongoing Action toControl Cardiovascular Risk in Diabetes (ACCORD) trial recommends that a “large” cuff be used if the arm circumference is 32 to 42 cm and an “extra large or thigh” cuff if the circumference is ≥42 cm. Exact dimensions are not specified. These 2 trials are among the largest ever funded by the National Institutes of Health (NIH).

1993 and 2005 Recommendations for Cuff Sizes in Obese and Overweight Subjects

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Health, but it is notable that they differ not only on their recommendations on cuff dimensions, but also on the arm circumferences for making cuff selections.

In view of the increasing prevalence of severe obesity, the issue of the ideal cuff size in patients with very large arms is clearly important. Although there is general agreement that a cuff of sufficient length be used (e.g., 42 cm), it is not possible to resolve the issue of the optimal width for the thigh cuff, because the appropriate studies have not been done. This is an area worthy of further investigation.

Disclosures

None.

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References


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