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PRINCIPAL FINDINGS OF THE INVASIVE BLOOD PRESSURE META-ANALYSIS CONSORTIUM (INSPECT) ON THE ACCURACY OF BRACHIAL CUFF BLOOD PRESSURE DEVICES

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Objective: Accurate measurement of blood pressure (BP) is crucial for hypertension management. Accuracy of brachial cuff (B_{CUFF}) devices to measure invasive (intra-arterial) BP at the brachial artery (B_{INV}) and aorta (A_{INV}) has never been systematically assessed. This study aimed to determine the: 1) relationship between B_{INV} and A_{INV}; 2) accuracy of B_{CUFF} devices to estimate invasive BP and; 3) accuracy of B_{CUFF} devices to classify BP thresholds.

Design and method: Three individual patient meta-analyses (by search of online databases and systematic review supplemented by measurements in a tertiary hospital cardiac catheterization laboratory) were performed to determine: 1) B_{INV} versus A_{INV} BP; 2) B_{CUFF} versus B_{INV} BP and A_{INV} BP and; 3) B_{CUFF} for BP classification versus invasive BP.

Results: Most subjects (90%) were patients undergoing cardiac catheterization (total N = 3004; mean age 58.7 years, 95%CI [54.0, 63.4], 68% male). As shown in the table: 1) B_{INV} systolic BP (SBP) was significantly higher than A_{INV} SBP whilst A_{INV} diastolic BP (DBP) was slightly higher than B_{INV} DBP. 2) B_{CUFF} underestimated B_{INV}SBP and overestimated B_{INV} DBP. The mean difference between B_{CUFF} SBP and A_{INV} SBP was small, whilst B_{CUFF} DBP overestimated A_{INV} DBP. However, according to mean absolute difference, B_{CUFF} and A_{INV} showed poor agreement. 3) B_{CUFF} correctly classified 31.1/28.4% of high-normal (SBP 130–139 mmHg), 54.2/52.6% of grade I (SBP 140–159 mmHg) and 45.2/50.3% of grade II (SBP 160–179 mmHg) hypertension cases, using B_{INV} / A_{INV}, respectively, as the reference. Correct classification was more frequent for SBP B_{CUFF} values <120 mmHg or ≥180 mmHg (both > 75%).

Conclusions: While recognising the clinical importance of B_{CUFF} devices, there is wide variability in device accuracy for measuring intra-arterial BP. Although B_{CUFF} devices are reasonable for correctly classifying BP at low and very high BP thresholds, more accurate B_{CUFF} devices in the high-normal BP to grade II hypertension range should improve hypertension management.

	Systolic BP (mmHg)		Diastolic BP (mmHg)	
	Mean difference	Mean absolute difference	Mean difference	Mean absolute difference
Meta-analysis 1	15 studies, 524 participants		14 studies, 504 participants	
B_{INV} minus A_{INV}	9.0 [5.9, 12.1]*	7.6 [5.6, 9.9]*	-0.95 [-1.7, -0.17]^	2.4 [1.8, 3.0]*
Meta-analysis 2	22 studies, 738 participants		17 studies, 665 participants	
B_{CUFF} minus B_{INV}	-5.9 [-8.8, -3.0]*	8.3 [7.0, 9.8]*	5.1 [2.9, 7.3]*	7.0 [5.9, 8.3]*
Meta-analysis 3	37 studies, 1742 participants		34 studies, 1513 participants	
B_{CUFF} minus A_{INV}	0.66 [-1.5, 2.8]#	8.7 [7.2, 9.0]*	5.1 [3.1, 7.1]*	7.0 [6.0, 8.1]*
	Data are mean [95% confidence intervals]. *P<0.0001, ^P<0.05, #P=Not significant. Linear mixed modelling used to account for patient clustering within studies.			

[table 1]