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Accuracy of Noninvasive Blood Pressure Monitoring in Critically Ill Adults

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Abstract

Background: Blood pressure (BP) is routinely invasively monitored by an arterial catheter in the intensive care unit (ICU). However, the available data comparing the accuracy of noninvasive methods to arterial catheters for measuring BP in the ICU are limited by small numbers and diverse methodologies.

Purpose: To determine agreement between invasive arterial blood pressure monitoring (IABP) and noninvasive blood pressure (NIBP) in critically ill patients.

Methods: This was a single center, observational study of critical ill adults in a tertiary care facility evaluating agreement (≤10% difference) between simultaneously measured IABP and NIBP. We measured clinical features at time of BP measurement inclusive of patient demographics, laboratory data, severity of illness, specific interventions (mechanical ventilation and dialysis), and vasopressor dose to identify particular clinical scenarios in which measurement agreement is more or less likely.

Results: Of the 1852 critically ill adults with simultaneous IABP and NIBP readings, there was a median difference of 6 mm Hg in mean arterial pressure (MAP), interquartile range (1-12), $P < .01$. A logistic regression analysis identified 5 independent predictors of measurement discrepancy: increasing doses of norepinephrine (adjusted odds ratio [aOR] 1.10 [95% confidence interval, CI 1.08-1.12] $P = .03$ for every change in 5 µg/min), lower MAP value (aOR 0.98 [0.98-0.99] $P < .01$ for every change in 1 mm Hg), higher body mass index (aOR 1.04 [1.01-1.09] $P = .01$ for an increase in 1), increased patient age (aOR 1.31 [1.30-1.37] $P < .01$ for every 10 years), and radial arterial line location (aOR 1.74 [1.16-2.47] $P = .04$).

Conclusions: There was broad agreement between IABP and NIBP in critically ill patients over a range of BPs and severity of illness. Several variables are associated with measurement discrepancy; however, their predictive capacity is modest. This may guide future study into which patients may specifically benefit from an arterial catheter.

Keywords: blood pressure; hemodynamic monitoring; shock; vascular access devices.

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