

## Can noninvasive BP monitoring replace arterial catheter?



Although its reliability is often questioned, noninvasive blood pressure (NIBP) monitoring with an oscillometric arm cuff is widely used. Indeed, intermittent arm NIBP is the first-line monitoring technique during prehospital care, in the emergency department, at intensive care unit (ICU) admission or even during the whole ICU stay, according to an article to appear in the journal CHEST.

"Even in specific circumstances such as arrhythmia, hypotension, vasopressor infusion and possibly in obese patients, arm NIBP could be useful, contrary to widespread belief," the article says. "Hence, postponing the arterial catheter insertion pending the initiation of more urgent diagnostic and therapeutic measures could be a suitable strategy."

Despite the wide use of intermittent NIBP, its fundamental operating principles are not familiar to many physicians. This may partly explain why the reliability of intermittent NIBP is sometimes questioned, in particular in the critically ill, encouraging invasive measurements, the article points out.

NIBP is a fast-evolving field as illustrated by the development, over the last decade, of several devices displaying continuous measurement of BP now entering the clinical arena. They might soon offer an elegant compromise between noninvasive though intermittent NIBP monitoring and beat-to-beat though invasive intra-arterial monitoring, the journal report says.

According to the Association for the Advancement of Medical Instrumentation (AAMI), NIBP and intra-arterial BP devices are deemed interchangeable if the mean bias between the two techniques (accuracy) and its standard deviation (precision) do not exceed 5 and 8 mmHg, respectively. In their last update, the so-called ISO Standard 81060-2, the AAMI criteria were slightly refined in order to take into account the variability of the intra-arterial measurements.

Do continuous NIBP devices provide acceptable accuracy and precision?

Since the aforementioned ISO standard does not cover continuous NIBP, acceptability of the accuracy and precision lacks consensual definition. The ISO standard has been proposed for various settings, from ambulatory to healthcare facility use.

In the critically ill, the ISO criteria are not so stringent and could be seen as maximal limits of tolerability. However, even using these rather loose tolerance boundaries (5 mmHg and 8 mmHg for mean bias and its standard deviation, respectively) to compare continuous NIBP with invasive BP, a 2013 systematic review and meta-analysis concluded that continuous NIBP was not sufficiently reliable, the article notes.

In addition, trending ability denotes the capacity of continuous NIBP devices to accurately follow BP changes over time. This implies that the device should be able to detect and take into account major confounders such as disease- or therapy-induced changes in the vasomotor tone of the upper limb. Some devices perform periodical recalibrations of the BP waveform, via changes in finger cuff pressure and contemporaneous analysis of the plethysmogram changes (Nexfin™/ClearSight™) or via upper arm NIBP (CNAP™ system).

It should be noted, however, that even invasive BP as displayed by bedside ICU monitors may exhibit inaccurate measurements. "Indeed, artefacts due to inappropriate dynamic response of the fluid-filled monitoring systems such as underdamping/resonance phenomena are frequent in the clinical setting," the article says.

Given the arterial catheter-related burden, fully managing critically ill patients without any arterial catheter may also be an option. "Indeed, the benefit patients may experience from an arterial catheter is questioned in recent studies failing to demonstrate that its use reduces mortality. However, randomised controlled trials to confirm that NIBP can safely fully replace the arterial catheter are yet to be done."

Source: [CHEST](#)

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