

BP monitoring that suits the needs of patients



Both hypotension and hypertension can potentially impair the function of vital organs such as heart, brain, or kidneys, thus monitoring of arterial blood pressure (BP) is a mainstay of haemodynamic monitoring in acutely or critically ill patients. Arterial BP can either be obtained invasively via an arterial catheter or noninvasively. While intermittent oscillometric BP measurements are usually sufficient in stable, low-risk patients, the continuous invasive BP monitoring with an arterial catheter is still preferred in critically ill patients, says a review paper published by *Frontiers in Medicine*.

The direct measurement of BP via arterial cannulation is regarded as the clinical reference method (criterion standard). In clinical routine, it is commonly performed during high-risk surgery and in intensive care medicine. However, as the paper points out, the cannulation of an artery can be time-consuming, needs to be done by a trained operator, and is associated — although very rarely — with potential major complications such as embolism, lesion of nerves or vessels, or ischaemia. For these reasons, BP is very commonly measured noninvasively.

According to the paper, noninvasive BP measurement provides either intermittent or continuous readings. Most commonly, an occluding upper arm cuff is used for intermittent noninvasive monitoring. BP values are then obtained either manually (by auscultation of Korotkoff sounds or palpation) or automatically (e.g., by oscillometry). For continuous noninvasive BP monitoring, the volume clamp method or arterial applanation tonometry can be used. Both techniques enable the arterial waveform and BP values to be obtained continuously.

"The continuous noninvasive devices are all sensitive to patient movement; therefore, monitoring of the conscious patient is possible but measurement results need to be checked for plausibility. In case of severe vasoconstriction, peripheral vascular disease, or distorted fingers due to arthritis, clinical experience has shown that it may be difficult to obtain a valid waveform using finger cuffs. Some patients report discomfort from the congestion in venous return from the fingertip where the cuff is placed. For this reason, manufacturers recommend to change the cuff to another finger after a certain period of monitoring," explain the paper authors, Agnes S. Meidert, MD, Department of Anaesthesiology, University Hospital, Ludwig-Maximilians-Universität München, Munich, Germany and Bernd Saugel, MD, Department of Anaesthesiology, Centre of Anaesthesiology and Intensive Care Medicine, University Medical Centre Hamburg-Eppendorf, Hamburg, Germany.

Interestingly, most clinicians ask themselves whether the noninvasively obtained BP curve shows the "real" BP. In addition, compared to conventional intermittent devices for BP measurement, continuous BP monitoring is relatively expensive.

Drs. Meidert and Saugel cite big data base analyses of simultaneous measurements in ICU and OR, which have demonstrated that the devices using an oscillometric method tend to overestimate hypotensive BP values and to underestimate hypertensive BP values. Also, the reliability of noninvasive intermittent BP measurement in patients with arrhythmia has been questioned. Two studies have shown recently that there is no relevant difference between oscillometric measurement in patients with or without arrhythmia.

"The question," say Drs. Meidert and Saugel, "is whether continuous noninvasive devices need to replace the direct measurement or rather fill the monitoring gap for patients who are insufficiently monitored by intermittent measurements only." For some clinicians, the ability to track changes in BP with the use of these continuous devices is particularly helpful in managing patient care.

The authors explain: "For critically ill patients in the ICU, noninvasive BP monitoring is unlikely to play a big role in the foreseeable future. Although some researchers see the age of total noninvasive BP monitoring dawning, in our point of view critically ill patients need frequent arterial blood gas analysis as well as continuous and reliable measurement of absolute BP values."

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Published on : Tue, 30 Jan 2018