(Bright) future of dynamic parameters is in the operating theatre

Editor—In their article about the applicability of pulse pressure variation (PPV), Mahjoub and colleagues concluded that ‘a very low percentage of patients satisfied all criteria for valid use of PPV’. Importantly, the study was done in intensive care unit (ICU) patients. As a result, and not surprisingly, 49% were not mechanically ventilated, 25% were mechanically ventilated but kept a spontaneous breathing activity, and 12% had cardiac arrhythmias (the incidence of arrhythmia being higher in ICU patients than in the general population).

Assuming the same evaluation had been done in patients undergoing major surgery, all patients would have been mechanically ventilated without any spontaneous breathing activity and around 1% would have had atrial fibrillation (the incidence in the general population). In this regard, we can reasonably assume that the same study done in the operating theatre instead of the ICU would have concluded that PPV can be used in around 85% of the cases.

I fully agree with Mahjoub and colleagues that dynamic parameters have limitations which are frequently encountered in ICU patients. In another recent article on the same topic, Benes and colleagues showed that dynamic parameters were usable only in 51% of ICU patients admitted for polytrauma, 37% of patients admitted for sepsis, and 33% after surgery.

Interestingly, most common limitations vanish in patients undergoing major surgery so that dynamic parameters can be used and recommended to guide fluid therapy in this setting. And this is very fortunate since, over the last few years, at least eight randomized controlled trials have demonstrated that intraoperative fluid management based on the monitoring and optimization of dynamic parameters (PPV or stroke volume variation) allows a significant reduction in post-surgical complications and hospital length of stay.\(^1\)–\(^10\)

The future of dynamic parameters is bright, but mainly in the operating theatre!

Declaration of interest

F.M. is a Vice-President, Global Medical Strategy, at Edwards Lifesciences. Of note, the above statements do not support the use of any specific medical device.

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doi:10.1093/bja/aeu283

Dynamic parameters in the operating theatre: brightness goes with shadows

Reply from the authors

Editor—We thank Michard and Benes for their fruitful comment about our article.\(^1\) They emphasize the fact that the majority of pulse pressure variation (\(\Delta PP\)) limitations in the intensive care unit (ICU) vanish in patients undergoing major surgery in the operating theatre (OT), mainly because the OT is a more controlled environment than the ICU regarding mechanical ventilation. We fully agree with the fact that all patients in this environment were mechanically ventilated without any breathing activity and that the incidence of arrhythmia in this population is far lower than in the ICU. However, some limitations persist in the OT and others may appear. First, recently published data showed that decreasing tidal volume < 8 ml kg\(^{-1}\) enhances patients’ clinical outcomes during major abdominal surgery and thus should be implemented in the management protocols of patients undergoing major surgery.\(^2\) This level of tidal volume is one of the limitations of \(\Delta PP\) as it increases the number of false-negatives.\(^3\) Secondly, an increased intra-abdominal pressure impedes the ability of \(\Delta PPs\) to predict fluid responsiveness.\(^4\) This situation may happen during laparoscopic surgery. Thirdly, opening the chest, the
pericardium, or both during cardiac or thoracic surgery modifies heart–lung interaction making ΔPP useless for predicting fluid responsiveness.\textsuperscript{5} Hence, care should be taken if tidal volume is decreased (in all major surgeries?), during laparoscopic surgery and during thoracic and cardiac surgery. As we emphasized in our article,\textsuperscript{1} ΔPP limitations should be known and checked before using this parameter not only in ICU but also in OT.

**Declaration of interest**

None declared.

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doi:10.1093/bja/aeu287

Making bisoprolol a perioperative agent

Editor—We read with great interest the recent editorial by Foex and Sear\textsuperscript{1} and applaud their comprehensive review on β-blockers and cardiac protection. These medications have significant anaesthetic implications for the providers as the patients taking them are already at higher risk for any surgical procedures.

According to the authors, while metoprolol appears to be inferior to atenolol in protecting high-risk patients, bisoprolol is likely to become the preferred drug of choice in the future as it provides better protection. Their analysis of 14 studies (n=1298 patients) showed that a single-dose treatment was effective in reducing perioperative myocardial infarction (odds ratio 0.17) and myocardial ischaemia (odds ratio 0.22). These treatments were not associated with significant hypotension or bradycardia. We agree with their recommendations that the initiation of β-blockers in patients who will undergo non-cardiac surgery should not be considered routine, but carefully considered on a case-by-case basis.

In a recent article, Ashes and colleagues\textsuperscript{2} also found that selective β-blockade with bisoprolol was associated with a decrease in the incidence of postoperative strokes when compared with atenolol and metoprolol.

In addition to the details of preoperative use of β-blockers, another consideration for the anaesthesia provider is what agent to administer during surgery when their arterial pressure, heart rate, or both increase to alarming heights, especially patients with pre-existing coronary artery disease since atenolol, metoprolol, and bisoprolol only come in a pill form. In terms of i.v. β-blockers to combat hypertension and tachycardia, the two commonly used agents come to mind: esmolol, which has fast onset, but short duration, and labetolol, which takes a bit longer to act, but lasts longer. With the recent evidence on bisoprolol offering better protection, more research should be directed at development of bisoprolol as an i.v. form.

**Declaration of interest**

None declared.

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1 Foex P, Sear JW. β-Blockers and cardiac protection: 5 yr on from POISE. Br J Anaesth 2014; 112: 206–10  

doi:10.1093/bja/aeu286

Benefits of continuous capnography monitoring for intensive care patients significantly outweigh any risks

Editor—We read with interest the letter by Dr Kingston and Dr Loh.\textsuperscript{3} Although the authors ascribe the clinical problem to the capnography line, it would be interesting to know whether the incident was detected more quickly because of it and whether adverse sequelae (such as those identified in NAP4) were averted. In our hospital, we have been using continuous capnography monitoring for all ventilated patients on our intensive care unit (ICU) for more than 5 yr. NAP4 showed that 70% of airway-related complications (and deaths) on ICU could have been prevented by the use of continuous capnography monitoring;\textsuperscript{2} and this has been followed by national and European recommendations for the use of such monitoring for all patients reliant on an artificial airway.\textsuperscript{4–5} As the authors point out, education of ICU staff is essential, and we, like many ICUs, run training programmes for both the use and interpretation of capnography traces.\textsuperscript{6} The authors are right to highlight the risk of the capnography tubing running in the opposite direction to the ventilator.