CRITICAL CARE

COMMENTARY

Haemodynamic optimisation: are we dynamic enough?

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See related research by Cannesson *et al.*, http://ccforum.com/content/15/4/R197

Abstract

Perioperative haemodynamic optimisation of high-risk surgical patients has long been documented to improve both short-term and long-term outcomes, as well as to reduce the rate of postoperative complications. Based on the evidence, cardiac output monitoring and fluid resuscitation, combined with the use of inotropes, would seem to be the gold standard of care for these difficult surgical cases. However, clinicians do not universally apply these techniques and principles in their everyday practice. By exploring the reasons why this is so, perhaps we could move forward in the standardisation of care and the application of evidence-based practice.

Over time theoretical advances and critical investigation have expanded our knowledge of how to manage patients. Clinical practise is constantly changing, whether due to a single signature study or an increasing body of evidence – but are physicians aware of this information, and do they have the tools to allow them to undertake new procedures and protocols? In the previous issue of *Critical Care*, Cannesson and colleagues explore attitudes and practices surrounding current haemodynamic management of high-risk surgical patients in Europe and the United States [1].

Over 20 years, haemodynamic optimisation – also known as goal-directed haemodynamic therapy (GDHT) – in high-risk surgical patients has been documented to improve postoperative outcomes such as decreasing complication rates and shortening both intensive care and hospital lengths of stay [2,3]. There are also numerous systematic data analyses showing improvements with GDHT, some of them quite recent [4,5].

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Hamilton and colleagues published data from over two decades that showed haemodynamic optimisation could result in a significant reduction in mortality [4]. In addition, subgroup analysis revealed that this increase was specifically in studies that used pulmonary artery catheters as their mode of cardiac output monitoring, those that used fluids plus inotropes rather than fluids alone, those that measured either cardiac index or oxygen delivery and those that aimed for supranormal parameters. A further reduction in complication rates was shown in all subgroups that had haemodynamic optimisation. These observations were all despite dwindling numbers of modern trials showing in-study mortality benefit [4]. We suspect that this decline is largely because studies are no longer powered for this but rather are aimed at decreasing hospital stay and promoting the use of enhanced recovery protocols [6].

Gurgel and Nascimento also showed that studies using the pulmonary artery catheters significantly reduced mortality in high-risk surgical patients (odds ratio = 0.67; 95% confidence interval = 0.54 to 0.84), as did studies that were guided by the cardiac index, oxygen delivery index and oxygen consumption index rather than central or mixed venous oxygen saturations [5].

Furthermore, long-term follow-up of high-risk surgical patients who had GDHT showed improvement over 15 years. Follow-up data from one of the original studies show that long-term survival was improved in the GDHT group [7], possibly due to decreased complications in the immediate postoperative period – data that are supported by other studies [8] Moreover, those patients in the intervention group who did develop a postoperative complication still had a survival benefit over those that developed a complication in the control group [7]. Despite this evidence, the clinical application of these principles seems not to have been universally adopted by anaesthetists and critical care physicians – can Cannesson and colleagues tell us why [1]?

Randomly selected members of the American Society of Anaesthesiology (ASA) and active members of the European Society of Anaesthesiology (ESA) were emailed an invitation to take part in the study with a link to an

online survey website. A total of 368 questionnaires were completed (57.1% from ASA members and 42.9% from ESA members), covering member demographics, individuals' practices and opinions. As expected, there was a considerable degree of heterogeneity in the way anaesthetists in the two regions worked and this makes the overall message difficult to find. Also, the response rate of only around 50% makes one wonder how self-selecting the responders are – are these only the enthusiasts responding?

More ESA responders practised in big university hospitals compared with ASA responders, who were more likely to be based in private practice. ESA responders were also more likely to manage high-risk patients in the ICU themselves (79.7% ESA vs. 31.6% ASA), despite the fact that ICUs with >40 beds were more common in the United States (37.9% ASA vs. 17.8% ESA).

ESA responders reported a greater use of protocol-driven haemodynamic management of high-risk patients than ASA responders (30.4% and 5.4%, respectively), but this seemed to employ invasive arterial pressure, central venous pressure and non-invasive arterial pressure as the top three modes of haemodynamic monitoring. Despite the fact that nearly all responders agreed that oxygen delivery was of major importance for patients undergoing high-risk surgery, and knew that cardiac output is a major component of oxygen delivery, only about one-third of responders in each group had measured cardiac output. Furthermore, across all responders, blood pressure, urine output and clinical experience were the preferred indicators for volume expansion despite little evidence of individual advantage. Pulmonary artery catheters were much more widely used to monitor cardiac output among ASA responders compared with ESA responders (85.1% vs. 55.3%, respectively), who favoured the PiCCO monitor (44% ESA vs. 1.1% ASA), but without the benefit of protocol-driven care to a GDHT endpoint the use of the monitors must be questioned – using the monitor is one thing, using it properly is another!

Even allowing for the limitations that are inherent in interpreting survey data, Cannesson and colleagues show us that practice remains out of sync with the current evidence base with regards to GDHT [1]. Whether this is because physicians still doubt the evidence base, worry about inaccuracies in monitoring techniques or simply lack the energy and motivation needed to change practice is unclear. Further international dialogue is clearly needed to highlight this uncertainty and to motivate changes in practice on a local level.

Abbreviations

ASA, American Society of Anaesthesiology; ESA, European Society of Anaesthesiology; GDHT, goal-directed haemodynamic therapy.

Competing interests

The authors declare that they have no competing interests.

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