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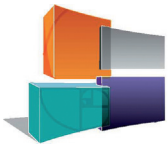

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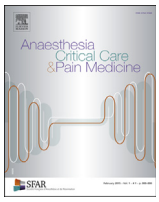

Editorial

Perioperative haemodynamic therapy: Why are recommendations not being adopted?

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1. Introduction

Reducing postoperative morbidity is an ongoing challenge for anaesthesiologists. Several trials have suggested worthwhile clinical benefits to perioperative haemodynamic therapies guided by cardiac output monitoring [1]. However, clinical guidelines have only been partially adopted into clinical practice. In a recent issue of Anaesthesia Critical Care and Pain Medicine, Molliex et al. conducted a large observational study of 807 patients aged $\geq$ 75 years, and found that few patients were offered a haemodynamic optimisation protocol (2%) [2]. Similarly, Joosten et al. showed that operating room and intensive care unit patients may spend less than half their time within pre-determined target ranges for arterial pressure [3]. We know that the use of perioperative haemodynamic monitoring varies widely across Europe [4]. These examples of poor compliance are worrying when we consider the high rates of morbidity and mortality rates amongst some surgical populations. If we are to improve patient care, we need to identify the reasons for this.

2. Perioperative haemodynamic management: what are the current recommendations?

2.1. Fluid administration

Fluid administration is the cornerstone of perioperative haemodynamic management. Inappropriate fluid administration can lead to hypovolaemia or fluid overload with specific complications. In order to rationalise fluid administration, national and European recommendations propose a simple protocol based in the titration of volume expansion according to stroke volume [5,6], although ongoing major trials may further shape this guidance [7]. A stroke volume rise in response to a fluid challenge is used as an indication that further fluid administration may be appropriate. More importantly, if there is no stroke volume response to a fluid challenge, we can be confident that fluid resuscitation is not required.

2.2. Inotropes

The most widely studied inotropic agents have been dopexamine and dobutamine. However, dopexamine is no longer widely available and physicians have returned to equipotent doses of dobutamine. Occasionally, some anaesthesiologists use other agents including adrenaline and phosphodiesterase inhibitors such as enoximone.

2.3. Vasopressors

There is a growing body of research highlighting the relationship between perioperative hypotension and the development of post-operative renal, myocardial and cerebral complications [8,9]. Periods of high blood pressure in the perioperative period may also lead to complications. There is currently no clear consensus on the ideal blood pressure target during surgery. Systolic blood pressure less than 80 mmHg [10,11], mean arterial pressure less than 60 mmHg [12], and a reduction of 30% to 50% from baseline are common treatment thresholds used in clinical practice [11,13].

3. Are the current recommendations specific and adapted to our practice?

3.1. Stroke volume maximisation using fluid

The original objective of perioperative haemodynamic optimisation was to increase tissue oxygen delivery. Early studies in the 1970s and 1980s employed aggressive therapeutic strategies including high doses of fluid, inotropes and vasopressors, often determined by complex algorithms based on pulmonary arterial catheter data. The results of these trials were mixed with some suggesting impressive benefits and other suggesting harm [9–12]. Simplified algorithms have now been proposed with optimisation of stroke volume but lower doses of inotropic drugs [14], and the most recent studies provide less clear answers to the question of clinical effectiveness of these algorithms [15]. It is not clear today that haemodynamic optimisation alone can improve patient outcome. Obviously, when we look in meta-analyses at all these studies carried out over more than 50 years, using different

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protocols, with totally different mortality and morbidity rates, results remain positive. Concerns that stroke volume maximization using fluid associated with administration of low dose of inotrope may increase the incidence of postoperative myocardial injury remain although this risk may be minimal with modern haemodynamic therapy algorithms [16].

3.2. Which type of fluid?

Cornerstone of recent algorithms is fluid administration. The majority of clinical trials indicating treatment benefit used colloid solutions. However, several major trials in critically ill patients suggest starch solutions in particular may result in higher rates of acute kidney injury and reduced survival [17,18]. The use of these products appears to be declining although a further trial of perioperative use of starch is in progress. The use of 'balanced' intra-venous crystalloid solutions is increasing due to concerns about hyperchloraemic acidosis, although there are limited data available to confirm the benefits of this approach.

3.3. What type of monitor?

Despite many technological advances, the perfect cardiac output monitor still does not exist. The choice of device must be guided by a compromise between invasiveness and precision. In most cases, it is best to use a monitor, which is familiar to the clinician. Provided the monitor is accurate, it is not necessary for this to have been studied specifically in interventional trials of haemodynamic therapy. Pulse contour and oesophageal Doppler are the most widely used techniques at present [4].

3.4. Is it cost effective?

One of the limitations to the implementation of haemodynamic optimisation protocols is cost. The cost of monitoring cardiac output is theoretically offset by the cost savings associated with reducing complications and length of stay [19,20]. Several studies investigated this issue suggesting a reduction in costs. However, further studies are needed to confirm these cost savings [19].

3.5. Which target for arterial pressure?

Recent studies have identified an association between perioperative hypotension and post-operative renal, cerebral and cardiac complications [12,21,22]. These findings raise several questions. Firstly, the optimal definition of hypotension remains unclear, making implementation of a treatment strategy more difficult. There are more than 140 definitions of perioperative hypotension. Second, we have not confirmed whether correcting low arterial pressure leads to a reduction in complications. Finally, very few studies have evaluated the clinical impact of targeting different blood pressure levels. It would seem that individualised blood pressure control according to the patient's history may be beneficial [23,24], but further studies are needed to finally confirm the optimal target and how to achieve this.

4. Removing barriers to improved patient care

The common sense use of haemodynamic protocols is likely to improve patient outcomes, especially if this prevents areas of poor care. However, unbeknown to their patients, many doctors are not adopting these guidelines. There are numerous barriers to changing the behaviour of doctors [25], including lack of time, low motivation, intellectual disagreement.... We propose four steps, which may improve the adoption of clinical practice recommendations for haemodynamic therapy, which may lead to better patient outcomes (Fig. 1).

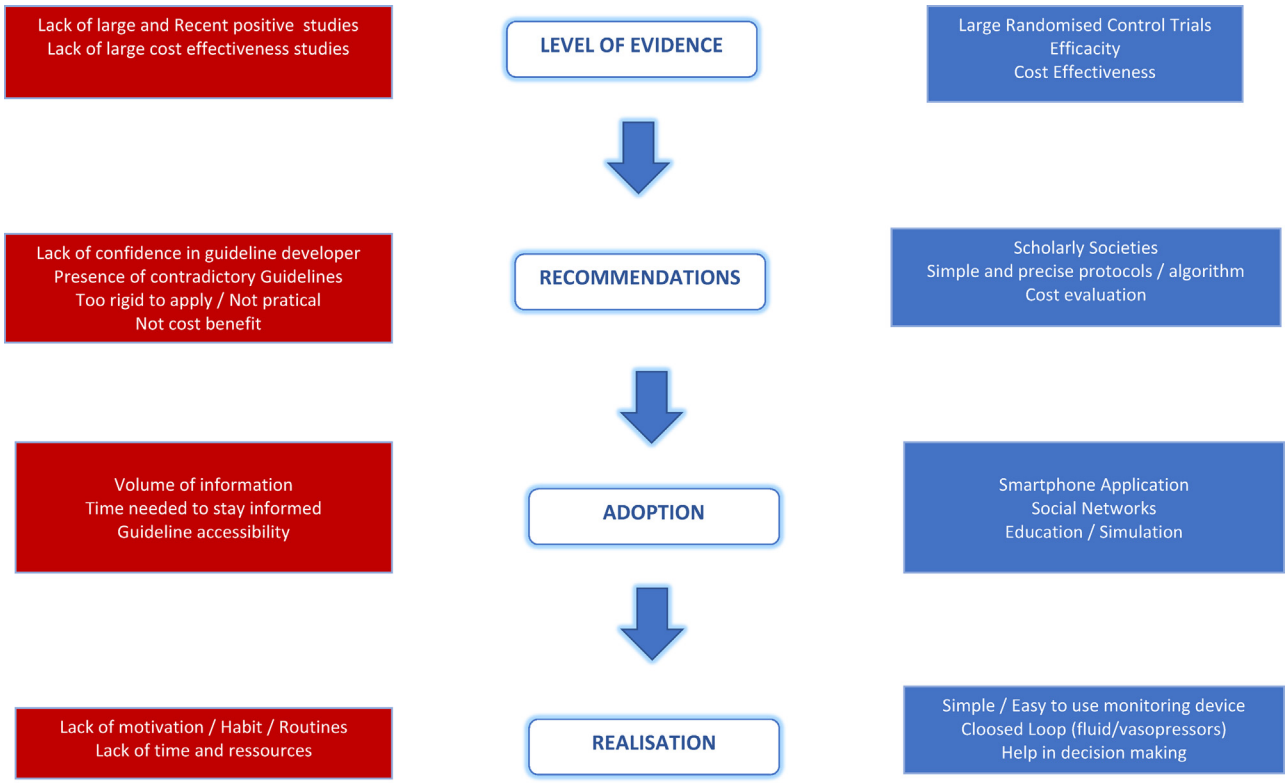

Fig. 1.

Disclosure of interest

MB received honoraria from Edwards Lifesciences and Maquet Critical Care for lecturers

RP holds research grants, has given lectures and/or performed consultancy work for BBraun, GlaxoSmithkline, Medtronic, Intersurgical and Edwards Lifesciences.

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