

## Assessment of perioperative fluid balance

**Sir,**

We read with interest the article by Craig and Mathieu (vol 67(2), 2006, p. 108) about the appropriateness of central venous pressure monitoring for the assessment of perioperative fluid balance. The authors mention two alternatives being pulse contour analysis and oesophageal Doppler and go on to describe the third alternative of systolic pressure variation (SPV) in detail. The pulse contour analysis and SPV require the presence of an arterial line and the oesophageal Doppler study at present can only be done in sedated patients. Most surgical wards are reluctant to take patients with arterial lines in situ and hence these techniques are usually limited to the minority of post-surgical patients who are transferred to the intensive care unit or high dependency unit.

We feel that a more promising alternative on the horizon is the USCOM ultrasonic cardiac output monitor. It is a non-invasive device that determines cardiac output by continuous-wave Doppler ultrasound. It uses a transducer placed on the chest in either the left parasternal position to measure transpulmonary blood flow or the suprasternal position to measure transaortic blood flow. This flow

profile is presented as a time-velocity graphical display from which the stroke volume and hence the cardiac output is calculated.

Tan et al (2005) have described it as accurate, rapid, safe, well-tolerated, non-invasive and cost-effective. They also claim that learning curve for skill acquisition is very short. Dey and Sprivulis (2005) have found it useful in the emergency department and Knobloch et al (2005) in their air rescue service.

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Dey I, Sprivulis P (2005) Emergency physicians can reliably assess emergency department patient cardiac output using the USCOM continuous wave Doppler cardiac output monitor. *Emerg Med Australas* 17(3): 193-9

Knobloch K, Hubrich V, Rohmann P, Lupkemann M, Phillips R, Gerich T, Krettek C (2005) [Non-invasive determination of cardiac output by continuous wave Doppler in air rescue service] [Article in German]. *Anesthesiol Intensivmed Notfallmed Schmerzther* 40(12): 750-5

Tan HL, Pinder M, Parsons R, Roberts B, van Heerden PV (2005) Clinical evaluation of USCOM ultrasonic cardiac output monitor in cardiac surgical patients in intensive care unit. *Br J Anaesth* 94(3): 287-91

24 hours in a postoperative adult is a useful guide. However, replacement needs to be guided by loss, not forgetting insensible losses. If you're having trouble, call the intensivists.

Remember, paying a little extra attention to fluid balance can significantly change a patient's outcome.

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McKendry M, McGloin H, Saberi D, Caudwell L, Brady AR, Singer M (2004) Randomised controlled trial assessing the impact of a nurse delivered, flow monitored protocol for optimisation of circulatory status after cardiac surgery. *BMJ* 329(7460): 258 (Erratum in: *BMJ* 329(7463): 438)

## Reduce morbidity by balancing your fluids

**Sir,**

About 95% of bleeps I receive while on call concern fluid balance. Hydration status is a complicated affair, and the temptation to prescribe three 8-hourly bags for the majority of patients is hard to resist. However, it's not quite that straightforward.

Hypovolaemia and consequent tissue hypoperfusion is a well-recognized cause of postoperative morbidity. This is supported by several studies demonstrating that hypoperfusion of the gut during abdominal surgery extends hospital stay. Likewise, McKendry et al (2004) showed that optimizing circulatory status after cardiothoracic surgery reduces both the

length of intensive care unit stay and overall morbidity.

There are various methods of assessing hydration status that allow accurate fluid replacement. Simple tests include enquiring about thirst or even feeling for patient's armpit sweat. More conventional techniques include monitoring blood pressure, pulse, jugular venous pressure, urine output, central venous pressure, capillary refill, observing mucosa, skin turgor and oedema (both peripheral and pulmonary). Other considerations include bowel preparation, being nil by mouth, type of surgery and blood loss, feeds and drains.

A minimum of 1 ml/kg/hr of water (and essential electrolytes) should ensure adequate cardiac output, maintaining essential organ perfusion. Excessive fluid can lead to pulmonary oedema – 3 litres of crystalloid/