

# What is the value of the pulmonary artery catheter in critical care and anaesthesia?

The use of the pulmonary artery catheter has affected the modern practice of intensive care and perioperative medicine. The morbidity and mortality rates in patients managed with pulmonary artery catheters have been questioned and the use of the pulmonary artery catheter to guide therapy remains controversial. It has been suggested that use of a pulmonary artery catheter may be of little benefit unless it is linked to specific treatments which may alter outcome. A clear understanding of the capabilities and limitations of the pulmonary artery catheter as an invasive haemodynamic monitoring tool is vital to minimize complications and maximize benefits.

## Evidence against pulmonary artery catheter use

Connors et al (1996) evaluated the effect of pulmonary artery catheter insertion within the first 24 hours of intensive therapy unit admission on 30-day mortality, and found that 30-day mortality was greater in the subset who had undergone pulmonary artery catheter insertion than in those who had not. However, this study had several limitations including the observational design and focus on the use of a pulmonary artery catheter in the first 24 hours only.

A large randomized controlled trial was performed in high risk American Society of Anesthesiologists (ASA) class III or IV patients undergoing cardiac, vascular or orthopaedic surgery (Sandham et al, 2003). Goal-directed therapy guided by a pulmonary artery catheter was compared

to standard intraoperative management without a pulmonary artery catheter. The pulmonary artery catheter group had a higher rate of pulmonary embolism.

The use of pulmonary artery catheter-derived data during and after coronary artery bypass graft surgery led to more clinical interventions and no overall clinical benefit, suggesting that pulmonary artery catheter insertion could be safely delayed until an identified clinical need arose (Djaiani et al, 2006).

## Evidence supporting pulmonary artery catheter use

In 2004, an observational cohort study was conducted examining the relationship between severity of illness and use of a pulmonary artery catheter (Chittock et al, 2004). The results demonstrated that use of a pulmonary artery catheter might reduce mortality in the sickest patients.

A retrospective analysis of 53 312 trauma patients showed that pulmonary artery catheter use was associated with reduced mortality in patients who were elderly, acidotic or had higher injury severity scores (Friese et al, 2006). These studies suggest that more severely ill patients may benefit from therapies initiated as a result of pulmonary artery catheter-derived data.

## Neither harm nor benefit?

The PAC-Man trial enrolled over 1000 patients randomized to clinical management with or without a pulmonary artery catheter (Harvey et al, 2005). Timing of insertion and management were at the discretion of the treating physician. There was no difference in mortality between the two groups.

A meta-analysis of 13 randomized controlled trials demonstrated neither an increase in mortality or hospital stay, nor a significant benefit that could be attributed to the use of a pulmonary artery catheter (Shah et al, 2005).

## Conclusions

The effect of the pulmonary artery catheter on patient outcome has not yet been

convincingly demonstrated. Routine use of the pulmonary artery catheter is not supported by good quality evidence. The decision to insert a pulmonary artery catheter should be case-specific and taken in conjunction with sensible weighting of benefits *vs* risks for each individual patient. Although there is a legion of less invasive alternatives for cardiac output monitoring, there are clinical conditions where pulmonary artery catheter insertion should be considered (acute pulmonary hypertension and severe tricuspid valve regurgitation).

The majority of trainees in intensive care and anaesthesia have had little, if any exposure to the use of a pulmonary artery catheter. It is therefore important that pulmonary artery catheter-derived data are interpreted by clinicians experienced in their use to ensure maximum benefit and minimum morbidity for the patient. **BJHM**

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