Therapy guided by pulmonary artery catheter for high-risk surgical patients was not better than standard care

Sandham JD, Hull RD, Brant RF, et al. **A randomized, controlled trial of the use of pulmonary-artery catheters in high-risk surgical patients.** N Engl J Med. 2003;348:5-14.

QUESTION

In older, high-risk patients having urgent or elective major surgery, is therapy guided by a pulmonary artery catheter (PAC) more effective than standard care?

DESIGN

Randomized (allocation concealed*), blinded (outcome assessors only),* controlled trial with 12-month follow-up.

SETTING

19 centers in Canada.

PATIENTS

1994 patients ≥ 60 years of age (mean age 72 y, 71% men) at high risk for perioperative mortality or morbidity with American Society of Anesthesiologists class III or IV risk scheduled for urgent or elective major abdominal, thoracic, vascular, or hip fracture surgery. Follow-up was 100% at hospital discharge and 92% at 1 year.

INTERVENTION

Patients were allocated to therapy guided by a PAC (placed before surgery) (n = 997) or standard care (no PAC) (n = 997). The PAC group received prioritized goal-directed treatment according to physiologic goals: oxygen delivery index 550 to 600 mL/min per m^2 of body surface area, cardiac index 3.5 to 4.5 L/min per m^2, mean arterial pressure 70 mm Hg, pulmonary–capillary wedge pressure 18 mm Hg, heart rate < 120 beats/min, and hematocrit > 27% based on highest value obtained. Patients had a minimum 24-hour postoperative stay in the intensive care unit. Thromboprophylaxis with low-dose heparin was used in almost all patients (standard group 90.9% and catheter group 88.1%).

MAIN OUTCOME MEASURES

In-hospital mortality from any cause. Secondary outcomes were 6- and 12-month mortality and in-hospital morbidity (myocardial infarction, left ventricular failure, arrhythmia, pneumonia, pulmonary embolism, renal and liver insufficiency, and line sepsis).

MAIN RESULTS

Analysis was by intention to treat. The groups did not differ for in-hospital mortality (Table). More patients in the PAC group than the standard care group had a pulmonary embolism (8 vs 0 events [0.8% vs 0%], P = 0.004). The groups were similar for other secondary outcomes.

CONCLUSION

In older, high-risk patients having urgent or elective major surgery, therapy guided by pulmonary artery catheter had in-hospital mortality and 6- and 12-month morbidity and mortality rates similar to those in patients managed with a central venous catheter receiving standard care.

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*See Glossary.

Therapy guided by a pulmonary artery catheter (PAC) vs standard care for high-risk surgical patients†

Outcome	PAC	Standard care	RRI (95% CI)	NNH
In-hospital mortality	7.8%	7.7%	1.3% (–25 to 37)	Not significant

†Abbreviations defined in Glossary; RRI, NNH, and CI calculated from data in article.

COMMENTARY

Although the PAC has been a bastion of critical care practice for decades, its purported value has recently become controversial. In a large observational study, Connors and colleagues failed to show benefit and even suggested harm (1). Other studies questioned which patients should receive the catheter, how data obtained from the catheter should be measured and interpreted, and what actions should be taken in response.

The study by Sandham and colleagues is a well-done multicenter trial addressing whether routine preoperative use of PACs in high-risk, noncardiac surgery patients influences hospital mortality. However, one concern is that the stated physiologic goals of cardiac index and oxygen delivery were primarily achieved in the postoperative period. Given the mortality benefit shown by Rivers and colleagues (2) with early goal-directed therapy and by Boyd and colleagues (3) with preoperative increases in oxygen delivery, earlier achievement of the stated goals may have improved outcome.

Although legitimate, this concern does not invalidate the findings by Sandham and colleagues. The study reflects a broad "usual care" approach. As such, it allows us to conclude that routine preoperative use of PAC in noncardiac surgery patients is not indicated. We therefore recommend discontinuation of this practice outside the research environment.

In hemodynamically unstable patients with sepsis and the adult respiratory distress syndrome or patients having cardiac surgery, questions remain about whether the PAC is helpful or harmful. In such patients, diagnosis and management may well be aided by information gleaned from the PAC. Randomized trials are ongoing to assess these issues.

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References

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