Management with a pulmonary artery catheter did not reduce all-cause mortality in critically ill patients

Harvey S, Harrison DA, Singer M, et al. **Assessment of the clinical effectiveness of pulmonary artery catheters in management of patients in intensive care (PAC-Man): a randomised controlled trial.** Lancet. 2005;366:472-7.

Clinical impact ratings: Hospitalists ★★★★★☆ Critical Care ★★★★★☆

QUESTION

In critically ill patients, does management with a pulmonary artery catheter (PAC) reduce hospital all-cause mortality?

METHODS

Design: Randomized controlled trial (Pulmonary Artery Catheters in Management of patients in intensive care [PAC-Man] trial).

Allocation: Concealed.*

Blinding: Unblinded.*

Follow-up period: Until discharge from the acute hospital or up to 3 months after the recruitment phase ended.

Setting: 65 intensive care units (ICUs) in the United Kingdom.

Patients: 1041 patients admitted to an adult ICU who were identified by the treating clinicians as patients who should be managed with a PAC. Exclusion criteria included elective admission for preoperative optimization and presence of a PAC on admission.

Intervention: Management with (n = 519) or without (n = 522) a PAC. The timing of insertion and subsequent clinical management were at the discretion of the treating clinician.

Outcomes: All-cause mortality before final discharge from an acute hospital ward.

Secondary outcomes included ICU and 28-day all-cause mortality, length of stay in the original ICU, total length of stay in an acute hospital ward, and organ days of support in the original ICU after randomization.

Patient follow-up: 97% (mean age 65 y, 58% men) (intention-to-treat analysis).

MAIN RESULTS

The groups did not differ for any outcome (Tables 1 and 2).

CONCLUSIONS

In critically ill patients, management with a pulmonary artery catheter did not reduce hospital all-cause mortality.

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*See Glossary.

Table 1. Management with vs without a pulmonary PAC in critically ill patients at 3 months†

Outcomes	PAC	No PAC	RRI (95% CI)	NNH
Hospital all-cause mortality	68%	66%	4% (−5 to 14)	Not significant
ICU all-cause mortality	60%	57%	5% (−5 to 16)	Not significant
28-d all-cause mortality	62%	60%	3% (−6 to 14)	Not significant

†ICU = intensive care unit; PAC = pulmonary artery catheter. Other abbreviations defined in Glossary; RRI, NNH, and CI calculated from data in article.

Table 2. Management with vs without a pulmonary PAC in survivors compared with nonsurvivors

Outcome	Population	PAC	No PAC	Difference	P value‡
Median length of stay in the ICU (d)	Survivors	12.1	11.0	1.1	0.26
	Nonsurvivors	2.6	2.5	0.1	0.71
Median length of stay in the hospital (d)	Survivors	34	40	−6	0.43
	Nonsurvivors	3	3	0	0.90
Median organ days of support in the ICU	Survivors	19	19	0	0.32
	Nonsurvivors	9	8	1	0.74

‡All differences were not significant (Wilcoxon rank-sum test for difference in distribution).

COMMENTARY

Device-delivered hemodynamic variables have been considered necessary to guide therapy in critically ill patients (1). However, the PAC-Man trial by Harvey and colleagues did not show any benefit from PAC use. The mortality rate of 69% in the PAC-Man trial was higher than anticipated, indicating that only seriously ill patients had been randomized and that the results may apply primarily to these patients.

This trial stands out because of its large sample size and high participation rate. However, the delay from ICU admission to randomization (> 16 h) raises concerns about whether earlier placement of the PAC could be beneficial (2). The lack of a specific management protocol could also have influenced the findings. PAC monitoring in high-risk surgical patients using specific management protocols may improve outcomes (3).

The complication rate of 10% in the PAC group raises important concerns that the complication-related time and resources could be better spent in other ways. However, the detrimental outcomes may not emanate from the use of a PAC per se but from our lack of knowledge about appropriate use of information received from the PAC. In the PAC group, 73% of patients were already receiving inotropic or vasoactive drug treatment before PAC use and the most frequently reported changes in therapy after PAC insertion were infusion of fluids (42%)

and introduction of vasoactive drugs (32%). Both of these interventions may be ineffective or even harmful and could explain the lack of benefit in PAC patients.

While effective therapies and interventions are much needed for critically ill patients, introducing potentially harmful interventions is an even greater concern. This trial suggests that PACs (or the treatments they lead to) are not beneficial; however, it leaves room for many explanations for the findings.

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