easily made and treatment of this condition would not be promptly initiated.

Geneviève Arcand MD
André Denault MD FRCPC
Sylvain Bélisle MD FRCPC
Normand Tremblay MD FRCPC
Robert Blain MD FRCPC
Pierre Couture MD FRCPC
Peter Sheridan MD FRCPC
Philippe Sahab MD FRCPC
Norman Searle MD FRCPC
Jean Taillefer MD FRCPC
Montreal, Quebec

References

1 *Jacka MJ, Cohen MM, To T, Devitt JH, Byrick R.* The appropriateness of the pulmonary artery catheter in cardiovascular surgery. Can J Anesth 2002; 49: 276–82.
2 *Shoemaker WC, Appel PL, Kram HB, Waxman K, Lee TS.* Prospective trial of supranormal values of survivors as therapeutic goals in high-risk surgical patients. Chest 1988; 94: 1176–86.
3 *Boyd O, Grounds RM, Bennett ED.* A randomized clinical trial of the effect of deliberate perioperative increase of oxygen delivery on mortality in high-risk surgical patients. JAMA 1993; 270: 2699–707.
4 *Wilson J, Woods I, Fawcett J, et al.* Reducing the risk of major elective surgery: randomised controlled trial of preoperative optimisation of oxygen delivery. BMJ 1999; 318: 1099–103.
5 *Polonen P, Ruokonen E, Hippelainen M, Poyhonen M, Takala J.* A prospective, randomized study of goal- oriented hemodynamic therapy in cardiac surgical patients. Anesth Analg 2000; 90: 1052–9.
6 *Rhodes A, Cusack RJ, Newman PJ, Grounds RM, Bennett ED.* A randomised, controlled trial of the pulmonary artery catheter in critically ill patients. Intensive Care Med 2002; 28: 256–64.

Reply:

We thank Dr. Arcand et al. for their letter and interest in this topic.[1,2] We agree that the pulmonary artery catheter (PAC) is a diagnostic tool with no intrinsic therapeutic value per se. Its value lies in the skill of its user and the purpose to which it is applied.

Evaluation of the PAC as Arcand et al. indicate, has been fraught with highly variable results both supporting and condemning its use. This illustrates well the difference between efficacy [use under optimal conditions such as in a randomized controlled trial (RCT)] and effectiveness (use under everyday circumstances). To explain this disparity, two major issues need to be considered.

First, evaluation of the PAC is difficult due to the extensive variability in the skill of users in everyday circumstances. Iberti et al.[3] were first to document the difficulty that nearly 50% of clinicians had with estimation of the pulmonary artery occlusion pressure (PAOP), a finding which was also seen by Gnaegi et al.[4] We also documented a disagreement rate of nearly 50% in PAOP interpretation among anesthesiologists.[5] Since the PAC is a technology, its optimal use requires the comprehension of multiple components of knowledge and their application. Assessment of the efficacy of the PAC using a RCT will require demonstrated standardization of the knowledge base necessary for effective use as a prerequisite. While the RCT is an excellent tool for the evaluation of well-delineated interventions in specific circumstances, application of the RCT to assessment of the PAC represents a much larger undertaking than simply assigning patients at random to either receive the PAC or not, or to receive 'goal-directed' care or not.

Second, the RCT requires that clinical equipoise exists. In our study, clinicians were in extremely strong agreement, based on their experience, that the benefits of the PAC exceeded any potential harm in several scenarios, most of which involved ventricular impairment or unstable angina. They indicated strongly (90%) that they would refuse to allow such patients to be assigned at random to receive the PAC or not. Clearly, clinical equipoise did not exist.

Clinicians agreed that the PAC was not indicated in the patient with preserved ventricular function or stable angina undergoing elective aortocoronary bypass or abdominal aneurysm resection. It has been suggested that this group of patients might be appropriate for a RCT of the efficacy of the PAC in cardiac surgery.[6] Aside from the fact that clinicians agreed that the PAC is unnecessary in these scenarios, mortality in elective cardiac surgery in this population ranges from 1–2%.[7] Assuming that a shift of 0.5% in absolute mortality is clinically significant, approximately 2,000 patients in total would be needed to detect this difference. While possible in theory, this represents a labourious, time-consuming, multicentre undertaking, of which the most substantial benefit would be to demonstrate equivalence in outcome with and without the PAC, proving that which clinicians already know.

Instead of encouraging investigative effort to pursue RCTs that are likely to be unhelpful, we would recommend focusing on improving the knowledge base of capacities of the PAC by users. Moreover, the technologies in use deserving systematic evaluation and the related clinical questions are too numerous to perform RCTs to address each of them. What could be considered are surrogates of the RCT to answer relevant clinical questions, including

careful observational studies and carefully-constructed surveys of clinicians regarding their best practice, and synthesis of published and unpublished evidence.

Michael J. Jacka MD FRCPC MSc
Marsha M. Cohen MD FRCPC MSc
J. Hugh Devitt MD FRCPC MSc
Teresa To PhD
Robert Byrick MD FRCPC
Toronto, Ontario

References

1 *Arcand G, Denault A, Belisle, et al.* The appropriateness of the pulmonary artery catheter in cardiovascular surgery (Letter). Can J Anesth 2002; 49: 1001–2.
2 *Jacka MJ, Cohen MM, To T, Devitt JH, Byrick R.* The appropriateness of the pulmonary artery catheter in cardiovascular surgery. Can J Anesth 2002; 49: 276–82.
3 *Iberti TJ, Fischer EP, Leibowitz AB, Panacek EA, Silverstein JH, Albertson TE.* A multicentre study of physicians' knowledge of the pulmonary artery catheter. Pulmonary Artery Study Group. JAMA 1990; 264: 2928–32.
4 *Gnaegi A, Feihl F, Perret C.* Intensive care physicians' insufficient knowledge of right-heart catheterization at the bedside: time to act?. Crit Care Med 1997; 25: 213–20.
5 *Jacka MJ, Cohen MM, Devitt JH, To T, Byrick R.* Confidence of anesthesiologists in PAOP interpretation. Crit Care Med 2002 (in press).
6 *Naylor CD, Sibbald WJ, Sprung CL, Pinfold SP, Calvin JE, Cerra FB.* Pulmonary artery catheterization. Can there be an integrated strategy for guideline development and research promotion? JAMA 1993; 269: 2407–11.
7 *Christakis GT, Lichtenstein SV, Buth KJ, Fremes SE, Weisel RD, Naylor CD.* The influence of risk on the results of warm heart surgery: substudy of a randomized trial. Eur J Cardiothorac Surg 1997; 11: 515–20