Correspondence

Pulmonary artery catheters. Use them - but with due care

I read with interest the article "Pulmonary artery catheterisation – A problem swept under the carpet"[1] and the accompanying editorial "Pulmonary catheter versus new technology".[2] These articles confirm that Australian intensivists remain as divided as rest of the world over the utility of Swan-Ganz catheters. While Steele & Bihari make a strong case for the use of new non-invasive technologies to replace the invasive pulmonary artery (PA) catheter, Clarke feels that the PA catheter is user-friendly and gives valuable information which supplements the clinical findings in making management decisions.

This debate has been provoked recently by Connors et al,[3] in a study that showed by using matching analysis and propensity score, the PA catheter patients had an increased 30 day mortality (odds ratio 1.24, 95% confidence interval 1.03 - 1.49). This article and it's accompanying editorial[4] generated much discussion, with various authors[5,6] pointing out the numerous limitations. For example, the propensity score may have failed to match two study groups for disease severity, there were no data on the incidence of shock and/or use of inotropes, and patients in the study group were four times more likely to receive a PA catheter than patients in comparable European intensive care units.

The fact remains that in spite of all the limitations, this is the only study involving a large number of diverse categories of critically ill patients which has come close to a randomised controlled trial (if you exclude studies of supranormal oxygen delivery). While intensivists the world over have argued for and against the use of PA catheters, the fact is that PA catheters are so firmly established in the practice of haemodynamic monitoring that it would be difficult to do without them (or to perform a prospective randomised controlled trial investigating their value). So the question really is, in light of the available evidence that it can cause potential harm to some patients, can we make more sensible use of the PA catheter?

One of the important questions concerning mortality associated with the PA catheter is 'what causes this increase in mortality?' It would appear that there are many factors, although the major reasons include, inappropriate interpretation and use of data in patient management, PA catheter related septic complications and probable overuse of PA catheters (one of the criticisms of Connors study).[5] There are other catheter related complications which may also rarely lead to mortality (e.g. ventricular tachycardia/fibrillation and PA rupture).

The question is then, 'How then can we reduce these complications?'

Firstly, there must be an improvement in the interpretation of PA data. In a multicentre study of physicians' knowledge of the pulmonary artery catheter, 496 physicians in 13 hospitals in the United States of America and Canada answered a 31 question multiple choice exam.[7] The mean test score was 20.7 (67% correct answers). This score was associated significantly with level of training, frequency of insertion of PA catheters, and frequency of using PA catheter data in patient management. It was disturbing to note that 47% of respondents were unable to determine pulmonary capillary wedge pressure from a clear tracing and 44% of respondents could not identify the determinants of oxygen delivery. The authors concluded from this study that deficiencies in PA catheter knowledge may lead to inappropriate therapeutic decisions which could have a negative impact on patient outcome. While there are no published data regarding physicians' knowledge of PA catheters in Australasian intensive care units, it is unlikely that this would be different.

Furthermore, before the intensivist can interpret PA catheter data, the intensive care nurse has to obtain the data by performing cardiac output measurements, interpreting the PA, central venous and pulmonary artery occlusion (wedge) pressure waves and ensuring technical accuracy of the information. Mistakes can be made in zeroing, patient positioning, volume and temperature of injectate and inserting the wrong computation constant. In one study in which a 37 item questionnaire was performed by 168 critical care nurses, the average correct score was 56.8%.[8]

Secondly, there must be a reduction in the incidence of PA catheter related infections. In various studies published since 1979, the incidence of colonisation of PA catheters has ranged from 5.9 to 29% and that catheter related bacteremia has had a reported incidence of up to 4.6%.[9] Risk factors for catheter colonisation in studies that employed multivariate models include use of PA catheters in neonates and younger children, placement with reduced barrier precautions (relative risk 2.1), placement in an internal jugular vein rather than subclavian vein (relative risk 4.3), heavy cutaneous colonisation at the insertion site (relative risk 5.5) and prolonged catheterisation (e.g. longer than 3 days - relative risk 3.8 to 14.4). Exposure of the catheter to

bacteremia or candidemia originating from remote site of infection, heavy colonisation of the insertion site, catherisation exceeding 4 days and difficulty in insertion were associated with increased risk of catheter related blood stream infection. It would appear that to reduce the incidence of PA catheter related infection, one should use the subclavian vein, use maximal barrier precautions and remove the catheter by day 4 except under unusual circumstances as the percentage of patients with a PA catheter related bacteremia increased from 0% at 3 days to 7% at > 6 days of catheterisation.[9]

In view of recently published data on the PA catheter, practical guidelines for day to day use of PA catheters are necessary. While an evidence based consensus statement was published after the Connors' Study by the society of Critical Care Medicine,[10] many on this side of the world have found it too cumbersome for practical use. Australasian associations like the ANZICS clinical trials group and the Australasian Academy of Critical Care Medicine should form an expert panel on the use of the PA catheter. The guidelines should include recommended indications, contraindications and training requirement for intensivists and intensive care nurses. The panel should also help develop robust trials to look at the Australasian experience in PA catheters and before introducing any newer technologies compare the use of these newer technologies with the PA catheter.

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