

Improving Cardiac Surgery: Does Continuous Blood Gas Monitoring Have a Role to Play?

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INTRODUCTION

The CDI-500 (Terumo Cardiovascular Systems Corp., Ann Arbor, MI) in-line blood gas monitoring device has been in clinical practice for more than a decade. Few randomized studies have evaluated the value of this device with respect to improved perfusion management. We routinely use automated continuous quality indicator programs at our institutions to assess perfusion management.

AIM

The aim of this study was to investigate in a prospective randomized trial the role of in-line blood gas monitoring in the improvement of blood gas management during cardiopulmonary bypass (CPB), using continuous quality indicators.

METHODS

One hundred patients were randomized into two groups before entering the operating room. Group 1 received our standard CPB blood gas management, with intermittent blood gases measured on an ABL700 blood gas machine (Radiometer, Copenhagen, Denmark). Continuous blood gas measurements from the CDI-500 were recorded at 20-second intervals on our data management system; however, the perfusionist was blinded to these measurements.

Group 2 received our standard CPB blood gas management; in addition to continuous blood gas measurements visible on the CDI-500, the alarm system activated and the data recorded on our data management system.

Perfusion management for all cases was guided by institutional protocols; specifically, pCO₂ was targeted within the range of 35–45 mmHg. The study was approved by the Bellbury Human Research Ethics Committee.

RESULTS

There were no differences between the groups in any preoperative factors, procedure types, intraoperative factors, or clinical outcome measures (ventilation time, length of stay, renal failure, mortality). There was a significant reduction in the percentage of CPB that pCO₂ was outside of protocol in group 2 compared with group 1 (Mann-Whitney *U* test; $z = -2.0446$; $p = .041$). This was most apparent for pCO₂ > 45 mmHg, which was 2.5% in group 1 (median, average 10.4%; range, 0%–80%) compared with 1.1% in group 2 (median, average 2.7%; range, 0%–40%; $z = -2.947$; $p = .003$), resulting in 84% quality indicator compliance in group 2 compared with 62% in group 1 ($p = .013$).

DISCUSSION

Continuous blood gas monitoring with the CDI-500 results in significantly improved blood gas management as determined by adherence to institutional protocols.

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