

Evaluation of a Point of Care Chemistry Device for Use in Cardiopulmonary Bypass and Extracorporeal Membrane Oxygenation

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BACKGROUND: Point-of-care testing of blood gases, electrolytes, and hemoglobin is important in critical care, especially during cardiopulmonary bypass (CPB) and when monitoring patients on ECMO. There are potential interferences inherent to both CPB and ECMO including temperature variances and fluids used during ECMO. This study compared the EPOC POC chemistry analyzer (Alere) to both another POC device, the Opti-CCS (Opti Biomedical), and to the ABL800 (Radiometer).

Methods: This study was performed at St. Louis Children's Hospital in St. Louis, MO. All samples were venous or arterial whole blood. Comparisons were made in the operating room on 20 consecutive patients undergoing CPB. Samples drawn for clinically indicated purposes were analyzed first on an OPTI device, and then repeated on an EPOC device. These comparisons were performed by three trained perfusionists. Similarly, evaluation of the EPOC device for ECMO monitoring was accomplished by comparing samples from 15 consecutive patients on placed on ECMO. Samples drawn for clinically indicated purposes were analyzed first in the SLCH core laboratory on an ABL800 (Radiometer) and then repeated on the EPOC. These comparisons were completed by two trained medical technicians.

RESULTS: Nine analytes were evaluated. Range of analytes was: pH (6.8-7.71), pCO₂ (21.3 - 71.1), PO₂ (37.7 – 448), SO₂ (38.1 – 100), Na (136-165), K (1.6-9.0), ionized Ca (2.0 – 5.41), hemoglobin (5.8 – 20.6), and hematocrit (17.0 – 61.9). The best performing analyte in both CPB and ECMO scenarios was K, with a slope of 1.035 when compared to the OPTI and 0.947 when compared to the ABL800. Na, hemoglobin, and hematocrit the least agreement compared to the other instruments, as well as the most variability. Compared to the Opti, the slopes and biases for these analytes were: Na (0.77, -3.2), hemoglobin (0.77, -0.36), hematocrit (0.76, -1.73). Compared to the ABL800, the slopes and biases were: Na (1.151, -0.8), hemoglobin (1.34, -0.05).

Conclusion: The EPOC evaluates some analytes well in patients on CPB or ECMO. However, there are potential clinically important differences in hemoglobin, hematocrit and Na. This potential limitation should be considered when choosing a POC device for use in these clinical settings.