Clinical Pathology Abstracts

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Potential contributors to error in oxygen saturation calculation using a POC assay

Oxygen saturation is important for measuring respiratory status and calculating cardiac output for patients. The gold standard for oxygen saturation (sO_2) is CO-oximetry, but other methods, which involve calculations rather than measurement of sO_2, are widely used because they enable point-of-care (POC) testing. The calculations use mathematical models based on average physiologic parameters to relate blood parameters, such as pH, pCO_2, and pO_2, to sO_2. Well-known discrepancies between calculated and measured sO2 have been reported in the literature. The authors conducted a study to investigate the accuracy of calculated sO_2 values by monitoring sO_2 on their hospital's POC instrument, the Abbott i-Stat (Abbott Point of Care), and comparing those values with values measured on a blood gas analyzer. They identified 3,323 sO_2 values for 1,180 patients using the ABL 800 Flex CO-oximeter (Radiometer). They then used those values to calculate an expected sO2 for the POC method. In 260 of the 3,323 comparisons, the calculated values differed from the measured sO_2 by 10 percent or more. The authors noted that 94 of the discrepant measurements occurred when the pO2 was less than 50 mm Hg. PH and bicarbonate were not good independent predictors of discrepancies but did shift to lower values in discrepant versus nondiscrepant cases. The authors concluded that decreases in pO_2 below physiologic normal were the biggest contributors to inaccuracies in i-Stat calculations and that discrepancies did not appear to be related to body temperature. The results suggest that the likelihood of discrepant sO_2 measurements from POC testing is 27 percent among patients with pO_2 of less than 50 mm Hg. Outcomes from this study are the most relevant for physicians who treat critically ill patients and rely on POC testing to monitor sO_2. The authors recommend direct measurement of sO_2 using a CO-oximeter for patients in whom pO_2 is less than 50 mm Hg.

Gunsolus IL, Love SA, Kohl LP, et al. Low pO_2 contributes to potential error in oxygen saturation calculations using a point-of-care assay. *Am J Clin Pathol.* 2018;149:82–86.

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Preanalytic factors associated with hemolysis in emergency department blood samples

Blood specimens drawn in the emergency department are commonplace and are reported to have a very high incidence of hemolysis. Hemolysis can affect the reliability of test results and can delay care and increase costs, as well as cause patient discomfort when repeat testing is required. The authors conducted a study to determine the effect of preanalytical factors, including straight stick, intravenous (IV) line, needle gauge, location of blood draw, syringe versus vacuum tube use, and tourniquet time, on hemolysis in blood samples drawn in the emergency department. They queried the electronic health record from an emergency department with 65,000 annual visits to determine potassium results and blood draw techniques for 54,531 samples in calendar year 2014. They used a hemolysis index to measure hemolyzed potassium and analyzed comparisons of hemolysis by blood sampling. The results showed an overall hemolysis of 10 percent and that the hemolysis among samples obtained from straight stick was significantly less than for samples obtained with an IV line, at 5.4 and 10.2 percent, respectively. For IV blood draws, the antecubital location had a significantly lower overall hemolysis compared with other locations. The authors concluded that their study confirms previous findings that straight stick and antecubital location are significantly associated with reduced hemolysis and indicates that shorter tourniquet time and larger gauge for IV draws were significantly associated with lower hemolysis. Improving the quality of the blood specimens received

from the emergency department will have a positive impact on efficiency and other quality outcome metrics.

Phelan MP, Reineks EZ, Schold JD, et al. Preanalytic factors associated with hemolysis in emergency department blood samples. *Arch Pathol Lab Med.* 2018;142:229–235.

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