

## Limitations to the use of non-invasive pulse co-oximetry in the emergency department

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Carbon monoxide poisoning (COP) causes 15,000 emergency department(ED) visits and 500 deaths each year in the United States. A non-invasive alternative to traditional blood testing is available which could simplify the diagnosis of COP while reducing patient discomfort and costs. Pulse co-oximetry readings (SpCO) from a non-invasive monitor (Masimo Rad-57) were compared to standard laboratory blood testing (COHb) in the ED. The study population was a prospective sample of adult patients who received COHb testing while in the ED for evaluation of possible COP. Research staff measured three SpCO levels within fifteen minutes of the blood draw, and the average of these readings was compared to COHb, considered the gold standard test. The two measurements were compared using a mean-difference (Bland-Altman) analysis, and correlation was measured by linear regression. During the four-month period from September 2009 - January 2010, 38 adult patients had COHb testing ordered by the ED provider. 24 patients (59%) had concurrent measurement of SpCO levels and were included. COHb levels among the twenty four subjects ranged from 0.2 to 34.9 with a median of 5.9. The average SpCO level for each patient ranged from 0 to 44, with a median of 0.5. Correlation between COHb and SpCO was  $r=0.541$ . Sensitivity of the SpCO monitor to detect elevated COHb ( $\geq 10\%$ ) was 67%, and specificity was 85%. The mean-difference analysis showed the difference between measurements generally increased as mean levels increased. This analysis identified significant limitations to the use of SpCO testing in the ED. The low sensitivity and moderate specificity of the device raise concerns about using SpCO as a diagnostic tool in the absence of blood testing. While SpCO may provide important screening information, providers must consider the possibility of misdiagnosis if non-invasive SpCO is used as a substitute for laboratory measurement of COHb.