

Evaluation of a New Pulse CO-Oximeter: Noninvasive Measurement of Carboxyhemoglobin in the Outpatient Pulmonary Lab and Emergency Departments.

Layne T., Snyder C., Brooks D., Enjeti S. *Respir Care*. 2006;51(11):1333.

Background

In the past, pulse oximeters have been unable to measure dyshemoglobins such as carboxyhemoglobin (COHb). We used the Masimo Rad-57, (a new eight-wavelength Pulse CO-Oximeter, which is designed to noninvasively measure COHb levels (SpCO) as well as traditional SpO₂ values) in clinical settings in the outpatient pulmonary lab to evaluate patient's smoking history and in the emergency department to evaluate burn victims from fires to find out the accuracy of the device and its clinical usefulness.

Methods

One hundred thirty six outpatients who presented to the outpatient pulmonary lab for arterial blood gas (ABG) draws were also monitored with the Pulse CO-oximeter for their SpCO level at the time of the blood draw. Prior to obtaining SpCO values, the patient's smoking history was recorded. The arterial blood sample was analyzed using an Avox 4000 CO-oximeter and the COHb results were recorded alongside the SpCO values from the Pulse CO-Oximeter. Using a SpCO level of 6% as a positive indication of smoking, we set out to test both the positive and negative predictive value of the Pulse CO-Oximeter in this setting. Also, in the emergency department, twenty-one patients who presented with burns or inhalation injuries from fires were monitored with the Pulse CO-Oximeter in addition to the standard monitors used on these patients in the emergency room. When ABG's were drawn, the COHb values from the blood CO-oximeter were recorded alongside the SpCO values from the Pulse CO-Oximeter.

Results

In the pulmonary lab study, there were 24 smokers, 112 non-smokers, 70 males, 66 females, with a mean age of 63.4 years. The COHb ranged from 0 to 14.1%, with a mean (\pm SD) of 1.6% (\pm 2.5%) in this population. The bias (COHb - SpCO) and precision were -0.65% and 1.8% respectively. Using a 6% SpCO as the threshold for predicting smoking, 11 tested positive for smoking, with 15 false negatives and 2 false positives. The calculated positive predictive value of the test was 82% and the negative predictive value was 88%. In the Emergency Room study, there were 15 males and 6 females with a mean age of 38.9 years, exposed to burns or inhalation injuries. The COHb ranged from 0 to 31% in this population. The bias (COHb - SpCO) and precision were -0.54% and 4.34% respectively.

Conclusion

The Pulse CO-Oximeter performed well in both the Pulmonary Lab and the Emergency Department environments, with an extremely small bias compared to CO-Oximetry measured COHb. Based upon this preliminary data, this 6% SpCO threshold may be acceptable to predict smoking history in patients in the pulmonary lab. When used according to manufacturer's instruction, the Pulse CO-Oximeter is quite reliable at detecting elevated CO levels in patients presenting to either the pulmonary lab or the emergency department.

