

Title: Racial Bias Within Pulse Oximetry Saturation Measurement

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Student's Role: Assisted with study design, assisted with data acquisition, collaborated on data analysis, drafted and collaborated on data presentation.

Background

Pulse oximetry is a ubiquitous measurement in health-care settings, and is a critical measurement, assessing oxygen perfusion status and guiding oxygen therapy. There is an ongoing discussion as to whether pulse oximetry measurements are accurate in patients with darker skin colors highlighted by a recent study showing higher rates of occult hypoxemia (defined as an arterial oxygen saturation [SaO₂] of <88% while having a peripheral oxygen saturation [SpO₂] of 92 to 96%) in Black patients compared to White patients, based on self-reported race.¹ This report triggered an FDA Safety Communication emphasizing the interpretation and limitations of pulse oximetry particularly in the monitoring of patients with COVID-19 infections. Thus, it is important to uncover more about this possible bias in measurement that may contribute to inequities in healthcare. However, race is not binary and there is a wide range of graded skin colors.² This project aims to investigate further into this issue by evaluating whether a correlation exists between darker skin color and the incidence of occult hypoxemia using a retrospective review that includes a more specific measurement of skin color.

Methods

Following Human Subjects Research Committee approval, electronic medical records and previous clinical trial data were used to collect basic demographic information, including reported race and ethnicity as well as skin color (assessed using the NIS Massey and Martin Skin Color Scale), arterial blood gas (ABG) SaO₂ and PaO₂ values and the corresponding SpO₂ values for each ABG value. All PaO₂ values less than 125 mm Hg were identified and the corresponding SaO₂ and SpO₂ values were compared. The collected data was used to analyze the incidence of occult hypoxemia and correlations with skin pigmentation.

Results

Massey scale measurements were collected as standard assessments in a series of contracted research protocols. Ratings were available in a total of 936 patients. The number of patients at each rating varied widely from 435 (Massey 0,1,2) to 445 (Massey 3,4,5) and 47 (Massey 6,7,8,9,10). For each patient, all ABG values for the initial and any subsequent hospitalizations were extracted from the medical records. Corresponding SaO₂ and SpO₂ values for each PaO₂ values ≤ 125 mmHg are currently being collated.

Conclusions

The potential for a clinically significant influence of skin tone on the accuracy of oxygen saturation measurements merits careful evaluation. The retrospective design in this review precludes a focused assessment of specific skin color tones, but may provide guidance for subsequent prospective evaluations.

References

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