RACIAL BIAS WITHIN PULSE OXIMETRY SATURATION MEASUREMENT

Audrey Marlar, Bradley Knabe, Fatima Yusuf, Neha Vonter, Yasamin Taghikhan, Neal Fleming, MD, PhD
Department of Anesthesiology and Pain Medicine, University of California, Davis

Background

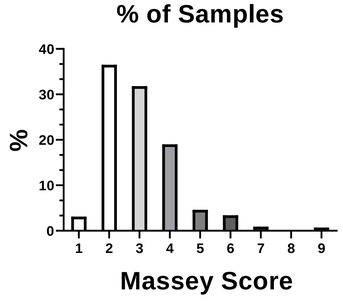
- Pulse oximetry is a ubiquitous measurement in health care used to assess oxygen perfusion status and guide oxygen therapy.
- There is ongoing discussion as to whether pulse oximetry measurements are accurate in patients with darker skin colors. A recent study showed higher rates of occult hypoxemia 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 monitoring of patients with COVID-19 infections
- Race is not binary. There is a wide range of graded skin colors[2].
- We investigated this issue by evaluating correlations between skin color and occult hypoxemia using a retrospective review and a more discriminating assessment of skin color.

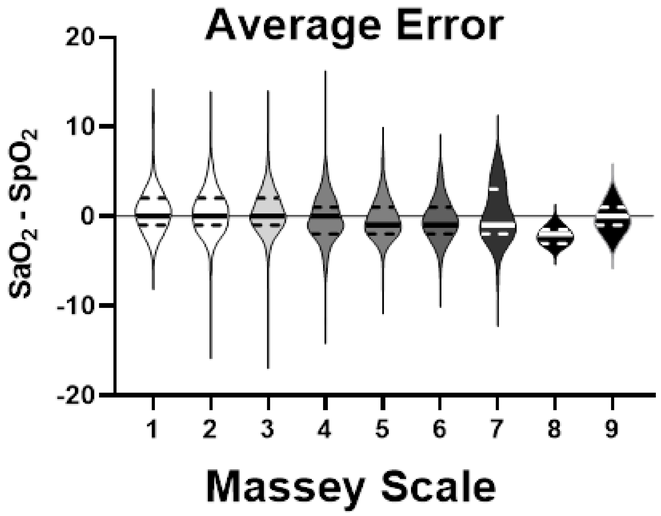
Methods

- Obtained Human Subjects Research Committee approval.
- EMR and Case Report Form review conducted to collect demographic information, including reported race and ethnicity as well as skin color (NIS Massey and Martin Skin Color Scale), arterial blood gas PaO_2, SaO2 and the corresponding SpO_2 values.
- PaO_2 values less than 125 mm Hg were identified and corresponding SaO_2 and SpO_2 values were compared.

Results

- Data were available from 742 patients, of which 579 had ABG PaO_2 <125 mmHg.
- The number of patients at each Massey rating varied widely.





No correlation found between incidence of occult hypoxemia and darker skin color

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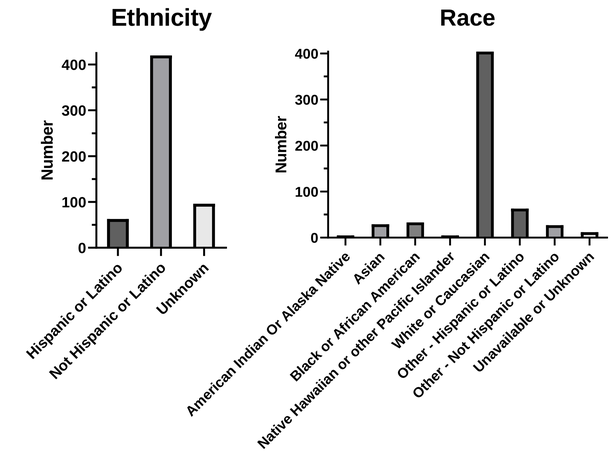
Results

- Race and ethnicity provide limited characterization of the population.
- For PaO_2 values ≤ 125 mmHg, any statistical differences fall within the expected range of accuracy for pulse oximeters.



Discussion

- These trends suggest no increase in occult hypoxemia with respect to Massey Skin Scale.
- Standardized skin color scale better characterizes differences than patient identified race
- Further research is needed to assess effect of skin color on SpO_2 measurement

Limitations / Next Steps

- Limitation: Lack of exact time-matched SpO2 values with corresponding SaO2 and PaO2 values; Massey scales are skewed to lower values
- Next steps: conduct prospective study to better assess matched real-time SpO2 values with ABG values.

References

1. Sjoding, M. W., Dickson, R. P., Iwashyna, T. J., Gay, S. E., & Valley, T. S. (2020). Racial Bias in Pulse Oximetry Measurement. *The New England journal of medicine, 383*(25), 2477–2478. https://doi.org/10.1056/NEJMc2029240
2. Massey, D. S., Charles, C.Z., Lundy, G., Fischer, M.J. (2003). *The Source of the River: The Social Origins of Freshmen at America's Selective Colleges and Universities*. Princeton: Princeton University Press.

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