Absence of Racial Bias In Pulse Oximetry Saturation Measurement

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Background

- Pulse oximetry is a ubiquitous monitor for assessing oxygenation and guiding therapy.
- There is ongoing discussion regarding the impact of darker skin colors on accuracy.
- A recent study showed higher rates of occult hypoxemia in Black patients compared to White patients[1] and triggered an FDA Safety Communication emphasizing potential limitations and inaccuracies of pulse oximetry including home monitoring of patients with COVID-19.
- Subsequent studies failed to confirm correlations between race and accuracy.[2]
- There is a wide range of graded skin colors independent of racial identity.[3]
- We investigated this potential for oximeter inaccuracy by evaluating correlations between skin color and occult hypoxemia using a retrospective review and a more discriminating assessment of skin color.

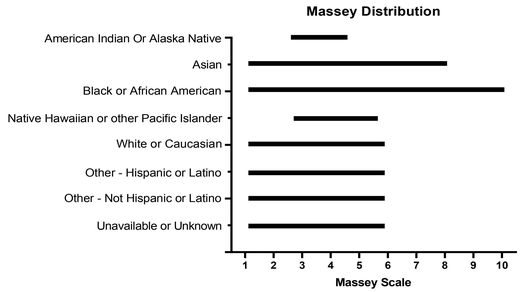
Methods

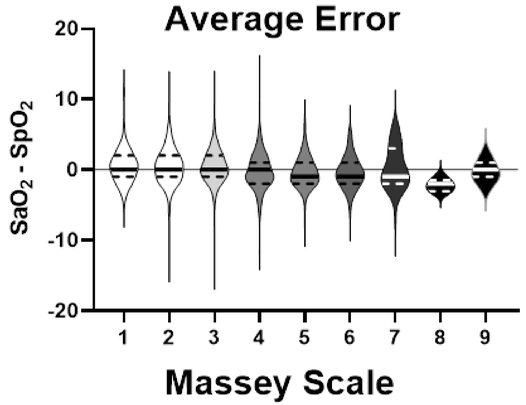
- Human Subjects Research Committee approved.
- Case Report Form review for demographic information, including race, ethnicity and skin color (Massey and Martin Skin Color Scale).
- EMR review for arterial blood gas PaO_2, SaO2 and the corresponding SpO_2 values.
- PaO_2 values less than 125 mm Hg were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

Results

- Data were available from 742 patients.
- 579 had ABG PaO_2 <125 mmHg

For the complete study population, skin color varied widely within each racial identity





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

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Results

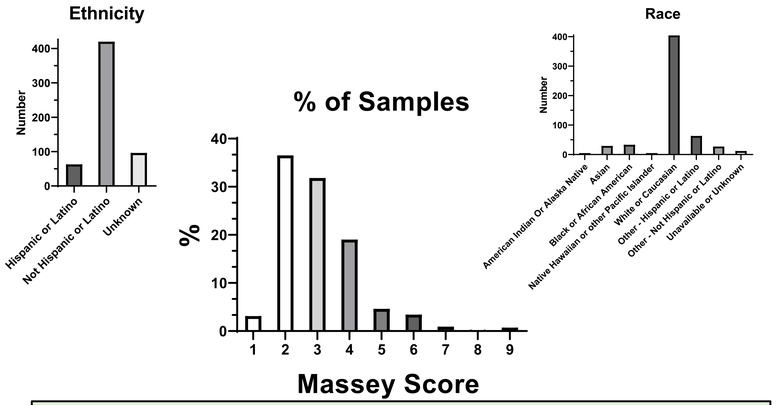
- For PaO_2 values ≤ 125 mmHg, observed differences between SaO_2 and SpO_2 fall within the expected range of accuracy for pulse oximeters.

Discussion

- No clinically significant increase in occult hypoxemia with respect to Massey Skin Scale.
- Race is not binary.
- Standardized skin color scale characterizes differences of the variable of interest better than patient identified race

Limitations

- This study population is skewed to lower skin color values
- Retrospective SaO_2 and SpO_2 values may lack optimal matching.



Conclusion

A prospective study designed to capture a diverse population and accurately time-match SpO_2 and SaO_2 values is required to address this question.

References

1. NEJM, 383(25), 2477–2478, 2020
2. Anaesthesia;77(2):143-152, 2021
3. The Source of the River: The Social Origins of Freshmen at America's Selective Colleges and Universities. Princeton: Princeton University Press, 2003