Assessing Racial Bias in Pulse Oximetry Using Graded Skin Tone Scale

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Background

- Pulse oximetry is ubiquitously used in medicine to assess oxygenation status
- Multiple recent studies report a bias in pulse oximetry measurement between white patients and other racial/ethnic groups
- Race/ethnicity is likely not an accurate predictor of skin color
- The purpose of this study is to examine the accuracy of pulse oximetry with different skin colors using a standardized scale

Methods

1. IRB approval obtained
2. ABG SaO2 collected from pulmonary blood gas lab
3. Patients screened for PaO2 > 125 and age < 18
4. SaO2 time paired 5-minute average SpO2, Massey-Martin skin tone rating (MMSTS)
5. SaO2 – SpO2 compared between MMSTS groups using Kruskal-Wallis statistical test and Spearman Correlation

Masimo pulse oximeter monitors appear to be accurate in different skin tones

Download the Abstract

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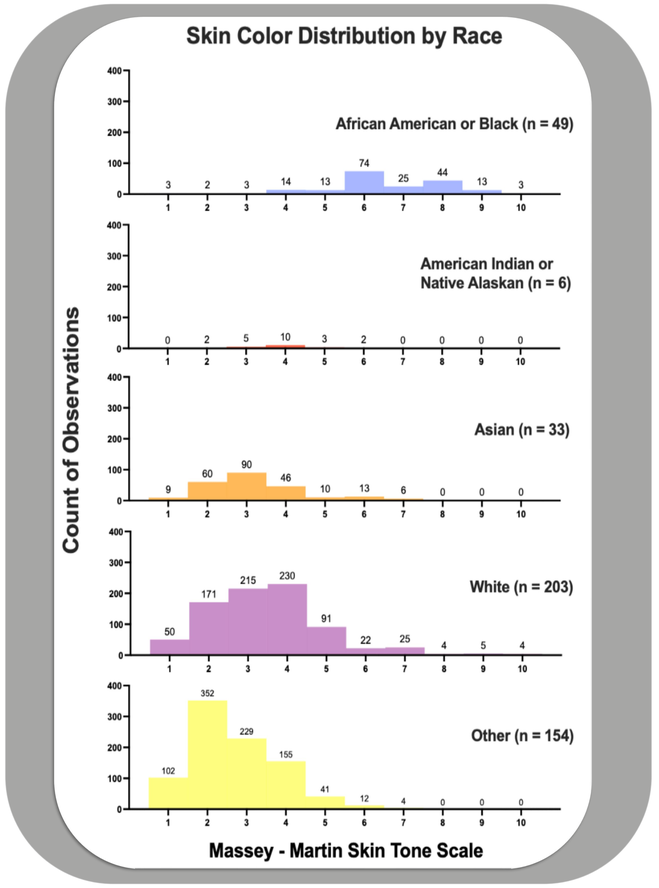
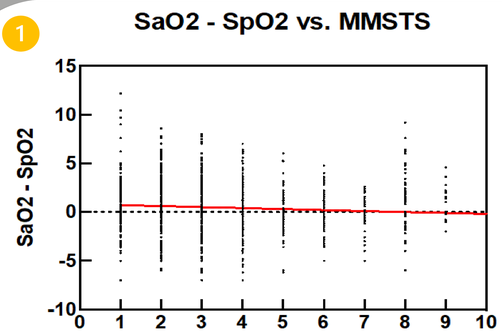
Discussion

Race and ethnicity correlate poorly with skin color. Despite a statistical significance difference in SaO_2 – SpO_2 across all MMSTS, it is unclear if there is a clinical significance to these findings as there is no trend between SaO_2 – SpO_2 and MMSTS.



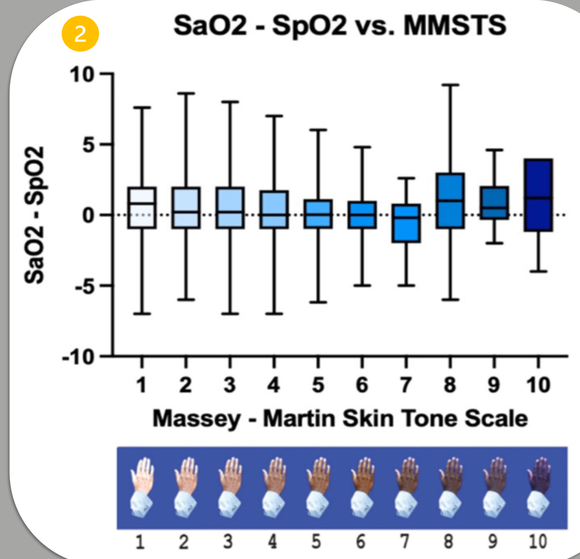
Results

1



MMSTS	1	2	3	4	5	6	7	8	9	10	Overall
Number of Observations	164	587	542	455	158	123	60	48	18	7	2162

2



Statistical Significance

1
r = -0.07967
p = 0.0002

2
H = 29.77
p =.00005

MMSTS Groups
1 & 5 p = 0.035
1 & 7 p = 0.039

Limitations

- Low amount of high Massey score patients in the UC Davis hospital population
- Study conclusions only limited to Masimo monitor and algorithms
- Next step: Extend study to capture higher Massey score and lower saturation pulse ox data observations

References

1. Sjoding et al, *N Engl J Med*. 2020;383(25):2477-2478.
2. Fawzy, et al., JAMA Internal Medicine 2022;182(7):730-738
3. Massey, Douglas S., and Jennifer A. Martin. 2003. The NIS Skin Color Scale.

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