Supplementary Online Content

Ruppel H, Makeneni S, Faerber JA, et al. Evaluating the accuracy of pulse oximetry in children according to race. *JAMA Pediatr*. Published online March 20, 2023. doi:10.1001/jamapediatrics.2023.0071

eMethods.

This supplementary material has been provided by the authors to give readers additional information about their work.

eMethods.

Cohort, Data Sources, and Variable Definitions

We included patients who underwent a cardiac catheterization procedure at our free-standing children's hospital between January 2016 – May 2021 with the following characteristics:
- An arterial blood oxygen saturation (SaO_2) measurement obtained from a location reflective of systemic arterial saturation (descending aorta, femoral artery, systemic ventricle) during the catheterization procedure
- Patient received general anesthesia during the catheterization procedure
- Patient was age 1-17 years at time of catheterization procedure. We did not include patients under 1 year old in an effort to avoid unrepaired ductal-dependent lesions.
- Patient's race documented in the electronic health record (EHR) was either Black or African American (Black/AA) or White

For purposes of analysis, we used one procedure per patient. For patients with multiple procedures during the study period, we included the earliest. We extracted the systemic SaO_2 measurements and corresponding timestamp from the cardiac catheterization report. For any patient with multiple systemic SaO_2 measurements, we extracted the first measured value. From the anesthesia record, we extracted the pulse oximetry (SpO_2) value documented during the same minute as the SaO_2 timestamp. SpO_2 data are integrated at 1-minute intervals into anesthesia record in the EHR. We excluded patients for whom no pulse oximetry data were available or for whom there was no SpO_2 value with an exact timestamp match to the SaO_2 measurement (n = 15).

We extracted race from the self-report field in our EHR. Patients/families are able to select more than one race. For the purposes of this study, we included those who selected only one race—either "Black or African American" or "White". We extracted additional clinical characteristics to describe the cohort and/or to use as covariates in the linear regression model: age; sex; cardiac diagnoses; blood pressure; temperature; hemoglobin; and medications.

For the linear regression model, we operationalized variables as follows:
- Age in years at the time of cardiac catheterization procedure
- Low blood pressure (binary): Blood pressure was extracted from the EHR based on timestamp as close to SaO_2 measurement time as available. All patients had at least one measurement within the catheterization procedure start and end time. Low blood pressure was defined as systolic blood pressure < 70+2(age in years) for patients 1-10 years old, and <90 for patients over 10 years old.
- Temperature < 36 degrees Celsius (binary): Temperature was extracted from EHR based on timestamp as close to SaO2 measurement time as available. All patients had at least one temperature within the catheterization procedure start and end time.
- Hemoglobin (g/dl) was extracted from EHR based on timestamp as close to SaO2 measurement time as available. Four patients were missing data and we used mean values to impute the missingness.
- Pre-procedure antihypertensive or vasodilator use (binary): presence of cardiac catheterization documentation indicating that patient was on antihypertensive or vasodilator prior to procedure.

Linear Regression Model

We used a multivariable linear regression model to test the relationship between race (Black/AA or White) and bias ($SpO_2 - SaO_2$), after adjusting for clinical characteristics (age, sex, low blood pressure, low temperature, hemoglobin, and pre-procedure antihypertensive or vasodilator use). We examined the fit of the final multivariable regression model by examining residual plots and also checked for multicollinearity using the set of covariates chosen. The relationship between race and bias stratified by categorized SpO_2 was obtained by stratifying the predicted values from the multivariable model by $SpO_2 \geq 92\%$, SpO_2 84-91%, and $SpO_2 <84$.