Does Finger Used for Pulse Oximetry Measurements Make a Difference?

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Purpose/Hypothesis: Pulse oximeters are commonly used to non-invasively measure patients’ percent of oxygen saturation (SpO2) and heart rate (HR). In clinical practice the index and middle fingers are most commonly used but little research is available on inter-digit differences in pulse oximetry measurements. The purpose of this study was to compare the accuracy and error rate of pulse oximeter measurements obtained on all 5 digits.

Number of Subjects: We evaluated 3 different pulse oximeter models on all digits of 32 study participants. Study inclusion criteria: age 21-75, able to walk on a treadmill at slow speeds, and intact sensation. Study exclusion criteria included: previous diagnosis of peripheral arterial, peripheral venous disease, ischemic stroke, coronary artery disease, acute myocardial infarction, coronary revascularization, or diabetes, resting HR >120 bpm, presence of an exercise testing contraindication (American College of Sports Medicine Guidelines), or diminished peripheral circulation.

Materials/Methods: The 3 pulse oximeters evaluated included the Crucial CMS50DL, ChoiceMed MD 300C12, and Nonin Onyx Vantage. Different oximeter models were placed on one hand with the identical model placed on the other hand (oximeter pairs). A photograph was taken of each hand to obtain simultaneous readings of all oximeters. Oximeter measurements were taken 30 seconds after placement on a digit. If an oximeter reading was not available after 30 seconds an error was recorded. The oximeters were rotated through all fingers and thumb on the same hand.

All measurements were taken after >10 minutes of rest. The mean of measurements obtained with oximeter pairs was used for data analysis. Single factor analysis of variance, was used to determine differences for SpO2 and HR measurements taken on all 5 digits. Chi square was used to evaluate difference in error rate among the 5 digits. The alpha level was set at 0.05.

Results: No significant difference was found for SpO2 or HR measurements among the 5 digits for any of the pulse oximeters. The thumb and pinky had greater error rates than the index, middle, and ring fingers. The greatest difference between means for all 3 oximeter models was 2.2% for SpO2 measurements and 2.2 bpm for HR measurements.

Conclusions: We found that the 3 pulse oximeter used in the study did not perform equally
well on all 5 digits based on number of error readings, defined as when an oximeter was unable to obtain a reading after 30 seconds of placement. Pulse oximeter measurements taken on the index, middle and ring fingers were less prone to error readings. The difference among mean SpO2 and HR measurements was small and in most clinical circumstances would not be considered a clinically important difference.

**Clinical Relevance:** The results of this study suggest that pulse oximetry measurements should be taken at the index, middle, or ring fingers and that measurement taken at these middle digits are equivalent.