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Accuracy of pulse oximeters in detecting hypoxemia in patients with chronic thromboembolic pulmonary hypertension.

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PURPOSE: Pulse oximetry is routinely used to continuously and non-invasively monitor arterial oxygen saturation (SaO2). When oxygen saturation by pulse oximeter (SpO2) overestimates SaO2, hypoxemia may be overlooked. We compared the SpO2 - SaO2 differences among three pulse oximeters in patients with chronic thromboembolic pulmonary hypertension (CTEPH) who spent their daily lives in a poor oxygen state.
MATERIAL AND METHOD: This prospective observational study recruited 32 patients with CTEPH undergoing elective cardiac catheterization. As we collected arterial blood samples in the catheter laboratory, SpO2 values were simultaneously recorded. Three pulse oximeters were used on each patient, and SpO2 values were compared with oximetry readings using a blood gas analyzer. To determine the optimal SpO2 value by which to detect hypoxemia (SaO2≦90%), we generated receiver operating characteristic (ROC) curves for each pulse oximeter.
RESULT: The root mean square of each pulse oximeter was 1.79 (OLV-3100), 1.64 (N-BS), and 2.50 (Masimo Radical). The mean bias (SpO2 - SaO2) for the 90%-95% saturation range was significantly higher for Masimo Radical (0.19 +/- 1.78% [OLV-3100], 0.18 +/- 1.63% [N-BS], and 1.61 +/- 1.91% [Masimo Radical]; $p<0.0001$). The optimal SpO2 value to detect hypoxemia (SaO2≦90%) was 89% for OLV-3100, 90% for N-BS, and 92% for Masimo Radical.
CONCLUSION: We found that the biases and precision with which to detect hypoxemia differed among the three pulse oximeters. To avoid hypoxemia, the optimal SpO2 should be determined for each pulse oximeter.