

## **Impact of COVID-19 on the association between pulse oximetry and arterial oxygenation in patients with acute respiratory distress syndrome**

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Managing patients with acute respiratory distress syndrome (ARDS) requires frequent changes in mechanical ventilator respiratory settings to optimize arterial oxygenation assessed by arterial oxygen partial pressure (PaO<sub>2</sub>) and saturation (SaO<sub>2</sub>). Pulse oximetry (SpO<sub>2</sub>) has been suggested as a non-invasive surrogate for arterial oxygenation however its accuracy in COVID-19 patients is unknown. In this study, we aimed to investigate the influence of COVID-19 status on the association between SpO<sub>2</sub> and arterial oxygenation. We prospectively included patients with ARDS and compared COVID-19 to non-COVID-19 patients, regarding SpO<sub>2</sub> and concomitant arterial oxygenation (SaO<sub>2</sub> and PaO<sub>2</sub>) measurements, and their association. Bias was defined as mean difference between SpO<sub>2</sub> and SaO<sub>2</sub> measurements. Occult hypoxemia was defined as a SpO<sub>2</sub> ≥ 92% while concomitant SaO<sub>2</sub> < 88%. Multiple linear regression models were built to account for confounders. We also assessed concordance between positive end-expiratory pressure (PEEP) trial-induced changes in SpO<sub>2</sub> and in arterial oxygenation. We included 55 patients, among them 26 (47%) with COVID-19. Overall, SpO<sub>2</sub> and SaO<sub>2</sub> measurements were correlated ( $r = 0.70$ ;  $p < 0.0001$ ), however less so in COVID-19 than in non-COVID-19 patients ( $r = 0.55$ ,  $p < 0.0001$  vs.  $r = 0.84$ ,  $p < 0.0001$ ,  $p = 0.002$  for intergroup comparison). Bias was + 1.1%, greater in COVID-19 than in non-COVID-19 patients (2.0 vs. 0.3%;  $p = 0.02$ ). In multivariate analysis, bias was associated with COVID-19 status (unstandardized  $\beta = 1.77$ , 95%CI = 0.38–3.15,  $p = 0.01$ ), ethnic group and ARDS severity. Occult hypoxemia occurred in 5.5% of measurements (7.7% in COVID-19 patients vs. 3.4% in non-COVID-19 patients,  $p = 0.42$ ). Concordance rate between PEEP trial-induced changes in SpO<sub>2</sub> and SaO<sub>2</sub> was 84%, however less so in COVID-19 than in non-COVID-19 patients (69% vs. 97%, respectively). Similar results were observed for PaO<sub>2</sub> regarding correlations, bias, and concordance with SpO<sub>2</sub> changes. In patients with ARDS, SpO<sub>2</sub> was associated with arterial oxygenation, but COVID-19 status significantly altered this association.