Hyperoxia is associated with adverse outcomes in the cardiac intensive care unit: insights from the Medical Information Mart for Intensive Care (MIMI-III) database

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Background: Hyperoxia produces reactive oxygen species, apoptosis, and vasoconstriction, and is associated with adverse outcomes in patients with heart failure and cardiac arrest. Our aim was to evaluate the association between hyperoxia and mortality in patients (pts) receiving positive pressure ventilation (PPV) in the cardiac intensive care unit (CICU).

Methods: Patients admitted to our medical center CICU who received any PPV (invasive or non-invasive) from 2001 through 2012 were included. Hyperoxia was defined as time-weighted mean of PaO2 $>$120mmHg and non-hyperoxia as PaO2 $\leq$120mmHg during CICU admission. Primary outcome was in-hospital mortality. Multivariable logistic regression was used to assess the association between hyperoxia and in-hospital mortality adjusted for age, female sex, Oxford Acute Severity of Illness Score, creatinine, lactate, pH, PaO2/FiO2 ratio, PCO2, PEEP, and estimated time spent on PEEP.

Results: Among 1493 patients, hyperoxia (median PaO2 147mmHg) during the CICU admission was observed in 702 (47.0%) pts. In-hospital mortality was 29.7% in the non-hyperoxia group and 33.9% in the hyperoxia group ((log rank test, p=0.0282, see figure). Using multivariable logistic regression, hyperoxia was independently associated with in-hospital mortality (OR 1.507, 95% CI 1.311–2.001, p=0.00508). Post-hoc analysis with PaO2 as a continuous variable was consistent with the primary analysis (OR 1.053 per 10mmHg increase in PaO2, 95% CI 1.024–1.082, p=0.0002).

Conclusions: In a large CICU cohort, hyperoxia was associated with increased mortality. Trials of titration of supplemental oxygen across the full spectrum of critically ill cardiac patients are warranted.