

Dear ladies and gentlemen, dear ADVOS users and interested parties,

we are pleased to present you another issue of our ADVOS Literature Service. We regularly select one or more papers from international journals which might be of interest to you in connection with our ADVOS procedure. This month we have selected the following:

MORTALITY AND MORBIDITY IN ACUTELY ILL ADULTS TREATED WITH LIBERAL VERSUS CONSERVATIVE OXYGEN THERAPY (IOTA). A SYSTEMATIC REVIEW AND META-ANALYSIS.

Chu et al.

OXYGEN TREATMENT IN INTENSIVE CARE AND EMERGENCY MEDICINE.

Grensemann et al.

Background

Critically ill patients are commonly provided with supplemental oxygen for different indications. Even if the administration of oxygen might be a lifesaving procedure for severe hypoxemic patients, different studies suggest that an excessive oxygen exposure is common in current clinical practice, which could result in adverse events.

In this new issue of the literature service, we comment on two extensive reviews on the role of oxygen therapy and the consequences of hyperoxia.

Methods

The search strategy differs between both reviews, but in essence, a search for randomized clinical trials in commonly used medical data bases (e.g. Medline, Embase) and repositories for clinical trials (e.g. Cochrane, clinicaltrials.gov, DKRS) was performed. Trials for oxygen therapy using different strategies (i.e. liberal vs. conservative) or for different indications (i.e. COPD, myocardial infarction, cardiogenic shock, post-resuscitation, stroke, ventilated intensive care patients) were analyzed.

Results

Chu et al. analyzed 25 randomized clinical trials comprising more than 16,000 patients. Mortality data were available for at least 15,000 patients. A liberal oxygen strategy increased the risk of death compared with a conservative strategy in hospital (19 randomized controlled trials, n=15,071, RR 1.21 [95% CI 1.03–1.43], p=0.020), at 30 days (14 randomized controlled trials, n=15,053, RR 1.14 [1.01–1.28], p=0.033), and at longest reported follow-up (median 3 months; 23 randomized controlled trials, n=15,755, RR 1.10 [1.00–1.20], p=0.044).

Greensemman et al. identified 13 trials and more than 17,000 patients divided into COPD (1 trial, 405 patients), myocardial infarction (5 trials, 7458 patients), post-resuscitation (only 1 pilot trial and 2 cohort studies), stroke (3 trials, 8343 patients) and intensive care patients (3 trials, 979 patients), where they did not find evidence indicating an advantage of oxygen supplementation in non-hypoxemic patients.

The authors conclude:

These two meta-analyses have shown that hyperoxia can increase mortality and morbidity. In fact, patients without hypoxia should not receive routine oxygen supplementation. In case that needed, the current commendations for the target range of oxygen therapy depend on the respective primary disease. In conclusion, in acutely ill adults, high-quality evidence shows that a conservative oxygen therapy is preferred and that supplemental oxygen might become unfavorable above a SpO₂ range of 94–96%.

We think that:

The dose-response relationship between oxygen saturation and mortality risk highlights the need to implement upper limits of acceptable oxygen saturation for safe oxygen supplementation in critically ill patients. Future research is required to identify the precise oxygen strategies that maximize benefit and minimize harm.

Several studies have shown that excessive oxygen (i.e. hyperoxia) can promote vasoconstriction, inflammation, and oxidative stress on pulmonary, cardiovascular, and neurological systems. Moreover, in COPD patients, hyperoxia may further decrease the respiratory drive, leading to increased hypercapnia.

The sigmoidal shape of the oxyhemoglobin dissociation curve indicates that even small changes in SpO₂ could be harmful because they lead to large increases in PaO₂ (check this video from minute 6 on for an easy explanation). In addition, factors such as CO₂ and acidemia affect also the affinity of oxygen binding for hemoglobin, reducing it in case of acidosis and hypercapnia. Therefore, the monitoring of the SpO₂ turns of major importance during treatments that can eliminate H⁺ and CO₂, as it is the case of ADVOS multi.

Finally, the current German clinical practice guideline for invasive ventilation recommends a PaO₂ and a SpO₂ target range of 60–80 mmHg and 90-94%, respectively.

If you have further questions or suggestions - please contact us at marketing@advitos.com.