ONLINE EXCLUSIVE

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Supplemental oxygen: More isn't always better

A recent study says that in certain populations, supplemental oxygen above certain levels can increase mortality.

PRACTICE CHANGER

Do not use liberal oxygen therapy (SpO_2 > 96%) in acutely ill adults, as it is associated with increased all-cause mortality.[1]

STRENGTH OF RECOMMENDATION

A: Based on a systematic review and meta-analysis of 25 randomized controlled trials.

Chu DK, Kim LH, Young PJ, et al. Mortality and morbidity in acutely ill adults treated with liberal versus conservative oxygen therapy (IOTA): a systematic review and meta-analysis. *Lancet*. 2018;391:1693-1705.

ILLUSTRATIVE CASE

A 60-year-old woman who is generally healthy except for a history of recurrent urinary tract infections presents to the emergency department with fever, hypotension, and altered mental status, meeting criteria for septic shock. During her resuscitation, supplemental oxygen is administered. Standard treatment calls for a minimum SpO_2 (saturation of peripheral oxygen) > 90%. What should your SpO_2 goal be?

Use of supplemental oxygen in the acute care of the critically ill adult is a common practice in pre-hospital, emergency department (ED), and hospitalized settings.[2,3] Despite their prevalence, guidelines about appropriate oxygen concentration and target SpO_2 levels are often conflicting or vague.[3-5]

Excessive oxygen supplementation in acute illness may be harmful and cause increased risk of hypercapnic respiratory failure, delayed recognition of clinical deterioration, and oxygen toxicity.[2,6] The perception of oxygen safety persists despite these findings, and it likely contributes to the ongoing practice of liberal oxygen supplementation in the acutely ill adult.[2,7,8]

STUDY SUMMARY

Liberal supplemental O_2 linked to increased mortality

The Improving Oxygen Therapy in Acute illness (IOTA) study was a systematic review and meta-analysis of 25 randomized controlled trials (RCTs) that compared liberal vs conservative oxygen strategies for acutely ill adults (N = 16,037; median age = 64 years; range = 28-76 years). Patients with sepsis, critical illness, stroke, trauma, myocardial infarction, or cardiac arrest, and patients who had emergency surgery were included. Studies were excluded if they involved patients who had chronic respiratory illness or psychiatric diseases, were receiving extracorporeal membrane oxygenation, were undergoing elective surgeries, were being treated with hyperbaric oxygen therapy, or were pregnant.

The outcomes studied were mortality (in-hospital, at 30 days, and at the longest follow-up) and morbidity (disability measured by the modified Rankin Scale at longest follow-up, risk of hospital-acquired pneumonia, risk of any hospital-acquired infection, and hospital length of stay).

Liberal supplemental oxygen, above an

SpO_2 range of 94% to 96%, increased mortality during inpatient stays (relative risk [RR] = 1.21; 95% confidence interval [CI], 1.03-1.43; N = 15,071), at 30 days (RR = 1.14; 95% CI, 1.01-1.29; N = 15,053), and at longest follow-up (RR = 1.10; 95% CI, 1.00-1.20; N = 15,754; median = 90 days; range = 14,365 days). There was no difference in morbidity outcomes between groups.

While it's difficult to define a specific target SpO_2 range, the number needed to harm when using a liberal oxygen approach (SpO_2 > 96%) resulting in 1 death was 71 (95% CI, 37-1000).

WHAT'S NEW

High-quality evidence points to the dangers of liberal O_2 therapy

This comprehensive meta-analysis is the first high-quality evidence to suggest that liberal use of oxygen in acutely ill adults above a specific SpO_2 level increases all-cause mortality. Previous small RCTs and observational studies have examined the effect of liberal oxygen only on specific presenting conditions, thus making more generalizable conclusions challenging.[9-12]

CAVEATS

Varied definitions of "liberal" and "conservative"

This review included studies with variable ranges of SpO_2 defined as liberal vs conservative supplementation. However, in all of these, SpO_2 above 96% was correlated with unfavorable outcomes.

The study excluded 2 potentially important patient groups: patients with chronic respiratory diseases and pregnant patients. Increased oxygen supplementation in patients with chronic respiratory diseases in noncritical settings has been shown to be deleterious.[13-15] While this study does not address the issue of oxygen supplementation in acutely ill patients with chronic respiratory disease, use should be considered with caution. The results from this study may not be generalizable to women who are pregnant.

CHALLENGES TO IMPLEMENTATION

Reversing the tide

Liberal oxygen administration continues to be practiced in many health care settings. The main challenges to implementing the conclusions of this study are these pervasive practices. JFP

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