With Oxygen, Could Less be More?

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Studies raise questions about delivering more oxygen than needed.

In 2016, two trials were published in which researchers examined established uses of supplemental oxygen. These results raise questions about our current practices.

A multicenter U.S. trial included 738 patients with chronic obstructive pulmonary disease (COPD) and mild-to-moderate resting hypoxemia (oxyhemoglobin saturation [SpO₂], 89%–93%) or moderate exertional hypoxemia (SpO₂ <90% for ≥10 seconds, but ≥80% for ≥5 minutes during a 6-minute walk test). Patients were randomized to supplemental oxygen or no supplemental oxygen. During 18 months of follow-up, investigators found no differences between groups in mortality, hospitalization rates, quality of life, or lung function (NEJM JW Gen Med Dec 1 2016 and N Engl J Med 2016; 375:1617).

In another trial, investigators from Italy randomized 480 intensive care unit (ICU) patients to supplemental oxygen, titrated to oxygen saturation goals between 94% and 98% or between 97% and 100%. Patients in the lower oxygen-saturation group were significantly less likely to die in the ICU. This study had limitations (e.g., single center, stopped early due to a local earthquake), but the results support earlier trials that suggested harm with higher partial pressures of oxygen and oxygen saturations (NEJM JW Gen Med Dec 1 2016 and JAMA 2016; 316:1583).

Taken together, these two studies give us pause regarding traditional assumptions about use of supplemental oxygen. For outpatients with COPD, older research suggested that right heart failure occurred less frequently when chronic hypoxemia was avoided. However, the U.S. study suggests that this benefit is not conferred when we prescribe home oxygen to COPD patients with mild-to-moderate hypoxemia; moreover, the study calls into question the practice of trying to induce an exercise SpO₂ of ≤88% (a threshold required by some insurers to justify home oxygen therapy). The Italian trial reinforces a practice that should be the ICU standard but is not always followed: Wean the oxygen early and aggressively once a patient is stabilized. Although we might find it reassuring to see an oxygen saturation of 100% on the monitor, this level is not necessary and potentially is harmful to our patients. As we learn more about the potential harms of too much oxygen, we might find that targets even lower than 94% to 98% make sense.

**Comment:** The traditional BVM method is uncomfortable for patients because someone has to hold the mask tightly over the patient’s face. Also, in my experience, this method is rarely used correctly, in that everyone seems to feel a compulsion to squeeze the bag, which risks filling the stomach with air and increasing the incidence of vomiting and aspiration.

This study shows that high-flow oxygen through a nonrebreather mask is not inferior to the BVM approach. However, it is unknown if optimizing preoxygenation influences patient outcomes, so it’s hard to know what to recommend — a nonrebreather mask at 15 L/minute might be adequate for most intubations. Having read this study, I will no longer preoxygenate with a BVM. Instead, I will use a nonrebreather mask at 15 L/minute and then will open the oxygen valve to maximize flow during the last 3 minutes (or 8 tidal volume breaths for cooperative patients).