

Mackenzie Gabler
Journal Club
Emergency Medicine Block 9
March 2017

Clinical Question:

Should we use a restrictive strategy for supplemental oxygen in COPD, myocardial infarction, and in ICU patients?

Discussion Articles:

1. Girardis M, Busani S, Damiani E, et al. Effect of conservative vs conventional oxygen therapy on mortality among patients in an intensive care unit: the Oxygen-ICU randomized clinical trial. *JAMA*. doi:10.1001/jama.2016.11993

Stub D, Smith K, Bernard S. Air Versus Oxygen in ST-Segment-Elevation Myocardial Infarction. *Circulation*. 131(24):2143-50. 2015.

Austin MA, Wills KE, Blizzard L, et al. Effect of high flow oxygen on mortality in chronic obstructive pulmonary disease patients in prehospital setting: randomised controlled trial. *BMJ*. 341:c5462. 2010.

Background Reading:

<http://rebelem.com/is-too-much-supplemental-o2-harmful-in-copd-exacerbations/>
<http://lifeinthefastlane.com/cc/oxygen-saturation-targets-critical-care/>
<http://lifeinthefastlane.com/cc/oxygen-haemoglobin-dissociation-curve/>
<http://lifeinthefastlane.com/cc/oxygen/>

Journal Club Worksheet:

Pato, M.T.; Cobb, R.T.; Lusskin, S.I.; Schardt, C. Journal club for faculty or residents: A model for lifelong learning and maintenance of certification. *Int. Rev. Psychiatry* **2013**, *25*, 276–283.

Discussion:

The goal of this journal club was to expose residents to the literature regarding hyperoxia and to help residents in their approach to and understanding of emergency medicine literature. In regards to the later goal, we reviewed academic literature that provided several methods to improve journal club. Some of the literature suggests that providing a worksheet for residents to fill out prior to journal club that is then review helps them not only retain the information but it gives an effective guide for reading and understanding evidence-based literature. Pato et al. had an excellent worksheet that we distributed to the residents.

A plethora of literature exists regarding potential risks of hyperoxia and many emergency department conditions such as COPD exacerbations, neonatal respiratory distress, ischemic strokes, cardiac arrest, acute coronary syndromes, and traumatic brain injuries and even more recently, in patients admitted to the ICU. We know that hyperoxia leads to many physiologic problems such as cellular injury, impaired immune response, hypercapnea, respiratory depression, cardiac vasoconstriction, decreased cerebral blood flow, and impaired erythropoiesis to name a few; however, the link between these issues and patient outcomes is unclear. We decided to look at three commonly cited papers that addressed three different types of patients that our residents commonly

encounter: patients with COPD exacerbations, critical care patients in the ICU, and patients with STEMIs.

The Giardis article is a single center, prospective, random control trial that asked "is a conservative oxygen strategy more beneficial than a conventional strategy in ICU patients?" The conventional group used a FiO_2 of at least 40% for a PaO_2 to 150 mm Hg and SpO_2 between 97-100%. The conservative group used a PaO_2 of 70-100 mm Hg and a SpO_2 of 95-97%. Briefly, they found that there was a statistically significant difference in ICU mortality. This study was underpowered and was stopped early do to a local earthquake; however, overall it was a fairly well done study. The bottom line is that more research needs to be done but targeting oxygen therapy may lead to decreased mortality in ICU patients.

The Austin article was a non-blinded randomized control trial that hypothesized pre-hospital high flow oxygen leads to worse outcomes in COPD exacerbations when compared to titrated oxygen. The control group had standard therapy of high flow oxygen at 8-10 L/min via facemask with bronchodilators at 6-8 L/min. The treatment group received titrated O_2 via nasal prong with a goal SpO_2 of 88-92% with bronchodilators delivered with compressed air. The researchers found a statistically significant difference in mortality in the intention to treat group. This paper was also well done and certainly leads ED physicians to question EMS practices of high flow oxygen and risk to COPD patients but it also was subject to significant bias and lacks generalizability.

The Stub article was a multi-center, prospective, non-blinded randomized control trial that asked does withholding supplemental oxygen in normoxic patients with STEMI have an effect on myocardial infarct size? This study compared room air to 8 L/min oxygen provided for patients with ST segment elevation infarcts in the ED. They found that a statistically significant difference in the secondary outcome of infarct size based on CMR at six months post STEMI. This paper also had bias as it was not blinded and did lack generalizability. However, it certainly raises the question of whether we are doing our patients a disservice by providing supplemental oxygen when they present with chest pain and no hypoxia.

In summary, these papers are very important for us to understand as they are discussed in academics are often cited and have even been used to establish emergency medicine practice guidelines. Certainly each paper has its problems, but it seems clear that there is a link between patient outcomes and hyperoxia. The bottom line is we need more research but in the meantime, we should tailor oxygen therapy to patients' needs and avoid hyperoxia when possible. In most patients, an oxygen saturation of 92-96% is appropriate but in patients with COPD, a goal of 88-92% is appropriate.