DEM Journal Club

# Article Appraisal

**Article:** Emergency Department use of Apneic Oxygenation Versus Usual Care During Rapid Sequence Intubation: A Randomized Controlled Trial (The ENDAO Trial)

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**Resident Reviewer Name(s) and Residency Affiliation:** Jocelyn Andruko PGY-1, Kevin O'Riordan PGY-3

**Faculty Methodology/Bio-statistics Resource Person:** Dr. Garth Hunte

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## Background and Study Objective(s):

Apneic oxygenation (AO) and its utility in the ED has been a hotly debated strategy since initial studies done in the OR showed that it may increase the time to desaturation following paralytic administration for young healthy adults. While early studies seemed promising, most were done in the OR, were small in size, and showed only modest benefits. Most recently, the FELLOW trial, the first major RCT done in the ICU, showed that AO made no difference in hypoxemia rates when compared to usual practice. However, until the ENDAO trial, no RCT had yet been done to show the efficacy (or lack thereof) of AO on meaningful ED patient outcomes.

## Study Design:

This randomized control trial took place at a single, academic, urban ED in New York City. Apneic oxygenation, meaning nasal canula at >15lpm flush flow rates, was compared against usual practice (that is, no AO) in a population of consecutively selected adults requiring intubation, randomized to either study group in cohorts of 4, 8, or 12.

Of the 262 patients assessed for eligibility, 56 were excluded for cardiac or traumatic arrest, failure to receive adequate preoxygenation (a minimum of 3 minutes at 100% FiO2), or awake intubation, and a further 6 were not assessed due to incomplete data, which was prematurely terminated due to cross-over. Data was collected by independent and trained observers who were blinded to study outcomes, and the first 10% of the study population had primary investigators collecting data to compare against the trained observers.

Primary outcome was defined as the lowest mean SpO2 during apnea, or within the next two minutes, and secondary outcomes studied were first pass success rate, time to desaturation of SpO2 <90% and of <80%, average time to desaturation <93%, mortality within 24h, and mortality within that hospitalization. Apnea time was defined as time from laryngoscope insertion to either EtCO2 confirmation of tube placement, or resumed assisted ventilation. This study was powered to detect a 5% difference in lowest mean SpO2.

## Results:

Patient demographics were similar between groups and well delineated in this trial. Patients of average age 55 and an average 13 minute preoxygenation were then intubated by >90% residents, most for a pulmonary issue, with a near even split between direct and video laryngoscopy. Over 70% of patients were successfully intubated within 60 seconds, 90% by 100 seconds, and the longest in this trial took 195 seconds. First pass intubation success was not obtained in only 22 patients (11% of total study population).

No statistical difference was shown in any of the primary or secondary outcomes, including apnea time (64 vs. 58 seconds), lowest mean SpO2 (92% vs. 93%), rate of SpO2 <90% (17% vs. 15%) and <80% (3% vs. 4%), mortality within 24h (4% vs. 2%) and total mortality (14% vs. 16%).

## Validity of Results:

This study was well designed for its primary endpoint. It was well randomized to minimize bias, and had tight confidence intervals for all of its primary and secondary outcomes. Thus, we believe this was a valid study design to answer the question of differences in desaturation rates between apneic oxygenation and usual care.

## Generalizability of Results:

Herein lies the crux of the study for two main reasons.

The first is the study setting. As this study was conducted in a single academic centre in NYC with primarily resident intubators, this study may not be generalizable to the community setting.

Second, intubation was performed very well in this study. Patients had excellent pre-oxygenation methods, and first pass success was good. Thus, you could make an argument that patients were not allowed to get to a point where apneic oxygenation would make a clinically significant difference. The longest apnea time in this study was 3 minutes and 15 seconds, while the anesthesia studies didn't see any differences in oxygen saturation during apnea until the 3 minute and 45 second mark.

Additionally, we were not given any variables regarding hemodynamic stability in the article, thus we are not aware of exactly how sick these patients were. Not many patients actually experienced desaturation during intubation, and raises the possibility of a type 2 error in this negative study. In the ICU studies, the patients included were quite sick and did show an absolute improvement in oxygen saturation, peri-intubation arrest, and mortality with apneic oxygenation.

This begs the question: did this study address the subset of sick patients in the ED that will desaturate quickly despite optimal pre-oxygenation and might benefit from a longer period before desaturation during intubation? Following that, does apneic oxygenation in these patients lead to any clinically significant difference in outcomes? We are not convinced that this question is answered by this trial.

## The Bottom Line:

This study is a well conducted RCT on the use of apneic oxygenation during intubation as an intervention to prevent desaturation. It showed there was no difference between the apneic oxygenation and the usual care groups, however the journal club raised some concerns regarding the general applicability of this study. The main concern was that this cohort of patients was likely not as sick and as a result the intervention of apneic oxygenation was not adequately tested. It was agreed that despite this negative trial, journal club participants would continue using apneic oxygenation for its theoretic benefits due to the low cost and non-invasive nature of the intervention.