



Air Pollution and Anesthesia Outcomes

A Literature Review

Isabelle Lawrence, SAA



Introduction

In an industrialized world, there is a significant impact on global air quality. Unfortunately, this does not come without cost. Air pollution is linked to cardiovascular disease, pulmonary disease, congestive heart failure, arrhythmias and mortalities (Landrigan, 2018). With an increase in emissions, there is an imminent increase in these complications. Furthermore, there are significant disparities, as low to middle income communities are significantly more at risk than others in being subjected to worse air quality (Landrigan, 2018). This is an unfair disadvantage to these populations, as moving is not always an option, and many people are not aware that their environment is costing them their health. In anesthesia, having preexisting conditions is usually a risk factor for complications during surgery. Anesthesia providers should be understanding of this problem and be advocates for better air quality policies in their communities. The goal of this review is to analyze the extent to which air quality affects patient populations, and where this overlaps with the increase in negative outcomes in anesthesia. Anesthesia providers need to be aware of how air pollution is not only detrimental to the planet, but to the people they are trying to treat and keep hemodynamically stable in the operating room. Anesthesia associations might even find it beneficial to come up with questions for the risk of air pollution in their patients, allowing for perioperative risk to be evaluated and acted upon. With the knowledge from this study, Anesthesia providers, out of any healthcare providers, will be advocates for maintaining good air quality, as they know more than anyone how these issues can lead to a domino effect of negative health outcomes for patients.

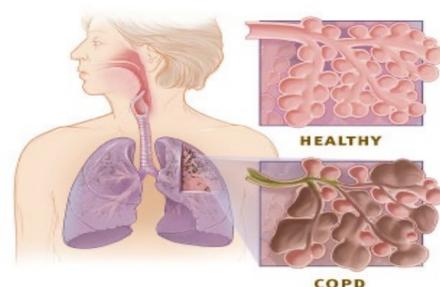


Figure 1. COPD in Healthy vs COPD Patients.
Reference: <https://asthma.bsd.uchicago.edu/sample-page/chronic-obstructive-pulmonary-lung-disease-copd/>

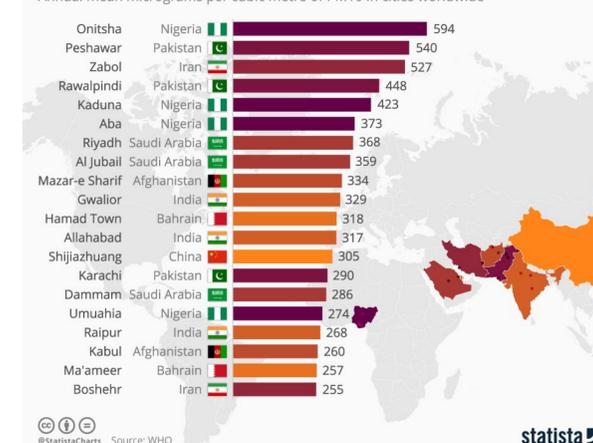
Review of Literature

Respiratory stability is a huge factor for patient outcomes in general anesthesia. It is critical for patients to be properly ventilated throughout operations, and respiratory diseases make that significantly more difficult. Chronic obstructive pulmonary disease, for example, is a risk factor for early tracheal re-intubation after surgery, and it also increases a patient's chance for postoperative mortality (Mills, 2018). Smoking is another risk factor because of how it decreases oxygen carrying capacity of hemoglobin, leading to a much higher likelihood of oxygen desatting perioperatively (Miller, 2018). This can be compared to air pollution, as it is also a preventable issue. Unfortunately, the prevention is not just in the hands of one person, and as people who smoke may know the risks, those who live around significant air pollution might not know that they are even being put at risk. The Clean Air Act in the US proved that decreased emissions has a significant impact, with there being less hospital admissions for respiratory conditions since its implementation (Schraufnagel, 2018). During the Covid-19 pandemic, there were many halts to productions that would contribute to air pollution. With this, we saw an increase in global air quality, for example, in New York and Los Angeles, PM25% (Small particles in the air used as a measure of how polluted the air is) fell 25-30% lower than it was the year before the 2020 pandemic (Landrigan, 2020). Ambient NO2% is another indicator of air pollution, and it has been found that COPD exacerbation, cystic fibrosis, and pneumonia and their mortality is significantly related to long term exposure to high long-term average NO2 & PM25 concentrations (Goeminne, 2013). With all of this information combined, we can see that there is a huge, and unnecessary, risk of living with significantly poor air quality. For this exact reason, there are designated areas for smoking so that people who do not wish to smoke, do not have to suffer consequences of smoking. Clean air for everyone is just as significant.

Discussion/Conclusion

Respiratory wellness is vital to anesthesia providers, maintaining a patient's airway and ventilation during operations being one of the main parts of the job. Air pollution can exacerbate existing respiratory issues and cause complications in the operating room, making it extremely difficult for providers to keep patients stable. There are many preoperative evaluations that give anesthesia a glimpse at how difficult keeping a patient stable may be. For example, the STOP-BANG questionnaire for likelihood of obstructive sleep apnea and therefore increased difficulty in intubation, myocardial infection, and even pulmonary emboli (Mills, 2018). These types of questionnaires allow for the providers to predict outcomes and provide the best care for the needs of each patient. It is possible that a similar investigation into the air quality of a patient's area or working conditions may be of similar significance. Knowledge of these issues will inspire more providers to be vocal about air pollution in their area. With a decrease in air pollution, there will decrease people presenting with respiratory issues that will exacerbate other diseases and create problems for the patients and providers alike. Furthermore, until air pollution is no longer relevant, there might be benefits in adding air quality to the list of preoperative knowledge that an anesthesia provider might use to predict risk. Further research is needed to conclusively determine that air quality could be used as a significant predictor of perioperative pulmonary complications.

The 20 Worst Cities Worldwide For Air Pollution
Annual mean micrograms per cubic metre of PM10 in cities worldwide



Reference: <https://www.statista.com/chart/4887/the-20-worst-cities-worldwide-for-air-pollution/>

Contact

Isabelle Lawrence
SAA
Nova Southeastern University – Fort Lauderdale
ll204@mynsu.nova.edu

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