

Airway and Pulmonary Optimization in the Early Postoperative Period

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Structured Abstract

Background

Hypoxia in the early postoperative period can be the result of a various number of causes. Anesthesia providers must be able to quickly identify possible causes of hypoxia and apply appropriate pulmonary interventions. Potential causes of hypoxia can result from residual neuromuscular blockade from paralytic agents, respiratory depression from narcotic administration, laryngospasm, or an airway obstruction. Upper airway anatomy consists of cartilage and bone structures of the nose and mouth, followed by the soft tissue of the oropharynx and hypopharynx, and ending at the glottic opening of the vocal cords. The soft tissue of the oropharynx is prone to collapse in the anesthetized patient and may be further compromised by obesity, airway edema, obstructive sleep apnea, and external compression. In response to this risk of airway collapse, anesthesia providers must quickly be able to recognize an airway obstruction and employ airway and pulmonary interventions. Each potential cause of hypoxia necessitates a different intervention in order to optimize gas exchange. Inability to adequately recognize the source of hypoxia can result in devastating consequences leading to cyanosis and anoxic brain injury. A patient that experienced an airway obstruction in the postoperative period required an oral airway device and a two handed jaw thrust maneuver in order to improve gas exchange and ultimately reverse the hypoxia. Key indicators leading the anesthetist in identifying the airway obstruction consisted of difficult bag mask ventilation, snoring, decreasing SpO₂, and cyanotic lips. Additional interventions to improve gas exchange included applying continuous positive pressure ventilation in the recovery room with a CPAP machine and raising the head of the bed. Understanding the continuation of airway management in the early postoperative period is key in preventing adverse pulmonary complications.

Clinical Question

Does anesthesia provider recognition and rapid identification of potential causes of hypoxia in the early postoperative period reduce the number and severity of adverse respiratory events?

Evidence Based Discussion

Evidence leading to hypoxia stems from various factors such as medication administration, patient position during surgery, or patient specific physiological characteristics. Obstructive sleep apnea involves the collapse of the pharyngeal airway and can delay the return of normal airway tone. Interventions for supporting an obstructed airway include using an oral airway, head tilt chin lift, and the two handed jaw thrust maneuver. The overuse of narcotics intra-operatively can lead to respiratory depression resulting in hypoxia in the early postoperative period. Narcan administration

is used to reverse respiratory depression, yet this is less ideal due to the unfavorable side effects such as pulmonary edema, analgesia reversal, and possibility of re-narcotization. Residual neuromuscular blockade can persist at the conclusion of a surgical procedure despite adequate reversal administration with glycopyrrolate and neostigmine. This can result in decreased respiratory effort and hypoxia. Despite having 4/4 twitches on train of four nerve monitoring, 70-75% of receptors can still be blocked. Responding to commands with eye opening, moving all 4 extremities, and the absence of fade on tetanus lead the anesthetist to believe a different cause of hypoxia. Patient position related to the steep Trendelenburg position increases facial and laryngeal edema which can further enhance an airway obstruction in the early postoperative period. Increased secretions combined with a decreased airway passage from edema can be evidence of an airway obstruction.

Translation to Practice

Unexpected respiratory complications can arise in the immediate postoperative period despite providing great intra-operative care. Preparation for unexpected pulmonary and airway complications begins prior to the time of the event. Anesthesia providers must be competent in their understanding of the causes of hypoxia and in their ability to recognize and distinguish between the different causes that lead to pulmonary and airway deoptimization. Applying this approach to managing a patient's post emergence care may reduce negative outcomes or pulmonary adverse events. Identifying possible causes of hypoxia and knowing what interventions to implement prior to the adverse event is a necessary skill to incorporate into one's practice. One way to effectively limit potential causes of hypoxia can be to integrate opioid sparing techniques toward the end of surgery with medications that cause less respiratory depression but adequate analgesia. Ensuring full reversal of paralyzing agents and reducing residual neuromuscular blockade should be integrated for every procedure requiring muscle relaxation. Investigation of future research of airway management specifically targeting extubation criteria and maintaining ventilation in the 15 minutes after extubation is an area that can be studied. Extubating in the reverse Trendelenburg position to promote a more patent airway, utilizing a pulse oximeter in transport from the operating room to the recovery room, and extubating all patients awake have all been proposed or suggested as ways to optimize airway management during emergence and throughout the immediate postoperative period. Future research into airway optimization practice protocols or a decision algorithm may be considered to help anesthesia providers improve their recognition skills of potentially adverse pulmonary events.

Keywords: hypoxia, airway obstruction, sleep apnea, postoperative

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