Learning From Others: A Case Report From the Anesthesia Incident Reporting System

Anesthesia Quality Institute
ANESTHESIA INCIDENT REPORTING SYSTEM (AIRS)

Review of unusual patient care experiences is a cornerstone of medical education. Each month, the AQI-AIRS Steering Committee abstracts a patient history submitted to the Anesthesia Incident Reporting System (AIRS) and authors a discussion of the safety and human factors challenges involved. Real-life case histories often include multiple clinical decisions, only some of which can be discussed in the space available. Absence of commentary should not be construed as agreement with the clinical decisions described. Feedback regarding this article can be sent by email to the AIRS Committee: **airs@asahq.org**. Report incidents or download the AIRS mobile app at **www.aqiairs.org.**

Case Presentation

A member of an anesthesia care team attempted delivery of nitrous oxide via nasal cannula for a patient who was not tolerating MAC anesthesia. This was accomplished by connecting a nasal cannula to the inspiratory limb of the anesthesia machine. The patient continued to not tolerate MAC, so the team member then converted to GA by inserting an LMA. The SpO_2 soon decreased to the 80s and help was summoned. The attending anesthesiologist, who did not know about the earlier nitrous oxide use, noted difficult bag ventilation via the LMA despite an adequate seal and that the anesthesia machine was not recording appropriate tidal volumes. The LMA was removed, and the patient was easily intubated with a MAC 3 blade. The saturation continued to decrease with apparently inadequate ventilation. The ETT was removed and mask ventilation attempted with slightly improved SpO_2. Patient was easily re-intubated but SpO_2 remained persistently low in the 70s. The anesthesiologist then noted that the inspiratory limb of the anesthesia machine was ***not*** *connected to the anesthesia circuit, but still connected to the nasal cannula. Once the inspiratory limb was reconnected, all issues resolved with easy ventilation and normal oxygenation.*

Discussion:

The specialty of anesthesiology has a long tradition of improvised equipment for anesthesia gas delivery to address unmet needs, and an equally long history of unintended problems created by such improvisations. "MacGyver" approaches to the airway by anesthesiologists have produced innovations now considered standard, including the endotracheal tube and the laryngeal mask airway (LMA.)[1] The ASA Closed Claims Project found that anesthesia gas delivery claims have declined from 4 percent in the 1970s to 1 percent of claims in the 2000s. For claims between 1990 and 2011, five involved "improvised delivery devices in spontaneously breathing patients," including "oxygen delivery tubing, mask or nebulizer placed at the end of the endotracheal tube."[2] There are two published case reports of tension pneumothorax due to an improvised T-piece in an intubated, spontaneously breathing patient. In both cases, the resulting complete seal prevented gas from escaping except into the pleural and mediastinal spaces.[3,4] Miraculously, both patients survived.

In the present case, connecting a nasal cannula to the inspiratory limb of the anesthesia circuit created the conditions for the events that followed. Connection of the nasal cannula at the Y-piece would have been visually obvious and forced disconnection before use of the circuit for general anesthesia. When a nasal cannula is connected using an adapter to the inspiratory limb of the anesthesia machine, the gas flow is forced through the tiny aperture of the nasal prongs. At high fresh gas flows, most of the flow cannot escape through the inspiratory limb and instead goes to the expiratory limb. The expiratory check valve prevents gas flow from escaping to the circuit, leaving the adjustable pressure limiting (APL) valve and the reservoir bag as the only exits. Testing of this scenario by an AIRS committee member found that even with the APL valve open, the reservoir bag inflates.

The initial anesthesia team member showed poor judgment by altering the anesthesia circuit during the case. The events that occurred after the patient desaturated offer more lessons. The patient had one LMA placed followed by two successful intubations. Only after the second intubation did the attending anesthesiologist realize the issue was not with the patient, but that ventilation was insufficient and there was no supplemental oxygen being delivered to the patient. This is an example of anchoring bias.

Anchoring bias is a type of cognitive bias where the first piece of available information becomes a psychological "anchor" for future decisions. The initial anchor has a very strong effect on all future estimates. In a study of cognitive errors in anesthesiology, surveyed faculty felt that anchoring was the most common.[5] Anchoring bias is quite powerful. People have been found to be susceptible to anchoring bias even when forewarned; and the "anchoring heuristic" has shown that even when a person adjusts an initial estimate to accommodate new information, the adjustment tends to be quite small.

A tragic past example of anchoring bias also involved gas delivery. In 2002, a cardiac catheterization lab in Connecticut connected oxygen tubing to a hard-to-see gas receptacle. Several patients were then given "oxygen" by mask, which was actually nitrous oxide. One patient died, but her cause of death was attributed to age and frailty. It was only after a second patient died that the gas switch was revealed.[6,7]

There is no proven method for resisting anchoring bias. The most common recommendation is to teach "metacognition" and "debiasing" techniques, which allow cognitive self-monitoring. These techniques train anesthesiologists to think about thinking. One self-monitoring strategy is the "rule of three," which requires an anesthesiologist to consider at least three alternative explanations before accepting a diagnosis and to reassess that diagnosis if the first three treatments fail. Another strategy is the trauma axiom, "the most commonly missed injury is the second," which encourages anesthesiologists to perform a complete secondary survey. Finally, the "rule out worst case" strategy is designed to ensure that rare but devastating diagnoses are included in the differential.[8] However, none of these strategies have ever been shown empirically to actually prevent cognitive biases from occurring in predisposing situations.

When faced with difficulty in oxygenation, the first diagnostic question should be, "Is this problem with the equipment or with the patient?" If an initial survey shows that oxygen supply is sufficient and breathing circuit is connected, then eliminate the equipment factor by switching to a self-inflating manual ventilation device. When the problem lies within the patient, hypoxia can be due to airway, breathing, circulation or drug-induced problems, each of which should be assessed and treated in turn.

What can anesthesiologists take away from this case? First, be aware of what anchoring bias is and how it may manifest in the O.R. The present example shows that focusing on loss of airway patency as a cause of desaturation is an anchor that can easily occur. Second, realize that it is possible to consciously mitigate bias by identifying potential cognitive errors for yourself and other team members who are working on a clinical problem. Think aloud, identifying possible anchors. Then discuss alternative causes not linked to those anchors. An emergency checklist for hypoxia may help anesthesia professionals avoid the potential pitfalls, consider all appropriate interventions and broaden their differential diagnosis.

Anesthesiologists working with high stakes and under time pressure must quickly come to a clinical assessment. Being aware of anchoring bias is an important part of that process.

References:

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