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 **airs@asahq.org**. Report incidents or download the AIRS mobile app at **www.aqiairs.org**.

Case 2017-12: Into the Woods …

"And take extra care with strangers, even flowers have their dangers, and though scary is exciting, nice is different than good."

We attempted to monitor a patient in the radiation oncology treatment facility with a monitor that had been brought there this morning. A bad cable initially prevented the monitor from displaying the SpO_2. After replacing the cable, the monitor displayed a waveform and numeric readout. We then attempted to monitor $ETCO_2$ but saw neither a waveform nor a numeric display. The anesthesia technician brought down another monitor that did not work. We were then told that the capnographs had been sent out for repair, but when they came back, they still did not work. We spent over 30 minutes troubleshooting, and still were unable to monitor $ETCO_2$.

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During an otherwise uneventful MRI on a Saturday morning, the anesthesia resident asked to enter the scanner room to evaluate the patient. She was told that the scan had to be completed first. When she finally got access to the patient, she discovered that the anesthesia machine had lost power. The lights on the anesthesia machine were off and the bellows was not moving. The patient's vital signs were stable. The anesthesia resident immediately started hand ventilating the patient, switched to a TIVA anesthetic, and called for help. The anesthesia tech had set up the machine in the morning, but did not plug it in. It had been running on battery power, which eventually ran out. After it was plugged in, the machine started working again. Fortunately, there was no harm done to the patient. At that point, we realized that a ferromagnetic anesthesia supply cart had been brought into the MRI suite when the anesthesia tech was setting up. We later found out that an MRI technologist had even helped the anesthesia technician bring the cart into the scanner room. A second MRI technologist who came to help discovered that the cart was ferromagnetic and removed it immediately. There were no injuries.

The perils of anesthesia in remote locations have been highlighted in a study of the ASA Closed Claims Project database. Patients receiving anesthesia care in remote locations claims were older and sicker. Claims for death were more common, as were respiratory events; inadequate oxygenation or ventilation were the most common specific event. Not surprisingly, adverse events were more likely to be preventable with improved monitoring. These problems aren't limited to general anesthesia: Half of the claims in remote locations involved monitored anesthesia care.[1] The two cases in this report highlight some of the problems that anesthesia providers face when we've been sent off to practice in the wilderness of the procedure suites.

"Non-operating room anesthesia (NORA) is the fastest-growing area of anesthesia practice, so we will all be spending more time in remote locations.[6] Some of the challenges associated with working outside of the O.R. are easy to resolve. Making a special effort to communicate our concerns to technologists and proceduralists who may not be familiar with anesthesia care can certainly help."

Caring for patients in remote locations may be every anesthesiologist's least favorite assignment. We're typically asked to either sit in a dark room at the patient's feet or in a control room where we have little or no access to the patient at all. The equipment is old and unfamiliar, the workspace is cramped and dark, and help is far away. Portable anesthesia machines and monitors make it difficult to access or record to an electronic health record. Charting on paper, or through an ad hoc interface, can increase the risk of errors (such as charting on the wrong patient) and always adds to the stress of working in this environment.

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Added to these challenges is usually extreme production pressure: Diagnostic and interventional equipment can cost millions of dollars, and patients are often scheduled well into the evening hours. Anesthesia machine problems or a prolonged induction (say, due to a difficult airway) can throw the schedule off for the rest of the day, raising the ire of the staff. This is not to say that we should simply bow to the pressure of the proceduralists in these settings, but rather to illustrate the fact that we must fit ourselves into the local workflow while practicing safely and advocating for our patients.

In the first case, the anesthesia team was asked to care for a patient with monitors that had malfunctioned in prior cases and were simply put back on the shelf instead of being sent for repair. The second case involved several hazards: An MRI-safe anesthesia gas machine (with which the team was likely unfamiliar) was not plugged in. Unbeknownst to the anesthesiology attending or resident, it was operating on battery power … until the batteries ran out. Because the gas machine was out of the team's line of sight, nobody knew that the patient was no longer being ventilated. The only solution is to be sure that the machine is plugged in and functioning before leaving the room and to make an extra effort to place it where it can be seen from the control room. It is also important to approach monitors with caution. Few anesthesiologists are as familiar with their MRI safe physiologic monitors as they are with the systems used everywhere else in the hospital. Differences can include default alarm limits and the presence or absence of features such as respiratory gas monitoring. Because sensors used by MRI safe monitors are usually wireless, they too require a battery that can stop working, usually at the worst possible time. Everyone who works in remote locations should make themselves familiar with the quirks of their associated anesthesia equipment before caring for a patient.

Capnography is clearly an important component of patient safety during procedural sedation. A recent systematic review that included 13 randomized, controlled trials demonstrated that capnography decreased the number of episodes of respiratory compromise and hypoxemia in this patient population.[2] Newly introduced technologies may augment patient safety for patients receiving anesthesia or sedation in remote locations. One recent study compared impedance ventilation monitoring to end-tidal CO_2 monitoring in patients undergoing procedures in the endoscopy suite. The authors concluded that impedance monitoring might have higher sensitivity for detecting hypo-ventilation and therefore provide an earlier warning.[3] Capnography is, of course, part of the ASA's standards for general anesthesia.

Everyone who works in a procedure suite should understand how to protect him or herself from radiation, and we all know (or should know) where the lead aprons are stored. MRI scanners also carry unique hazards for the physicians and staff who work around them. It goes without saying that bringing a ferromagnetic cart into the MRI suite is potentially life-threatening. Fortunately, it did not become a projectile, but this again highlights the need for everybody in the MRI suite to be careful and to watch each other. In this case, the cart was brought into the room by an MRI technologist, who is usually the one responsible for identifying unsafe equipment. Projectiles aren't the only hazard to personnel who work around a strong magnetic field. The magnetic field associated with an MRI scanner will induce an electric current in the people who are moving through it.[4] Physiologic responses can include headaches, nausea, vertigo and loss of balance, and visual effects (usually flashing lights). Attention, cognition and working memory may also be impaired.[5] The only solution is to stay away from the scanner whenever possible and to try to move slowly (less than 1 m/s) when working near the MRI scanner. We should always understand and mitigate the occupational hazards of working in a new location (radiation oncology, for example) before agreeing to care for a patient there.

Non-operating room anesthesia (NORA) is the fastest-growing area of anesthesia practice, so we will all be spending more time in remote locations.[6] Some of the challenges associated with working outside of the O.R. are easy to resolve. Making a special effort to communicate our concerns to technologists and proceduralists who may not be familiar with anesthesia care can certainly help. We should all become familiar with the equipment we will be using, and we should always be sure that it works before initiating patient care. Some problems (like production pressure) will probably only get worse. New technology may help us to prevent some incidents or near-misses. Sometimes, however, the only thing that stands between our patients and a critical event is vigilance, the watchword of our specialty.

As Little Red Riding Hood said, "Oh dear, how uneasy I feel." (With apologies to Stephen Sondheim.)

References:

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