Anesthesia Quality Institute®
American Society of Anesthesiologists®

Anesthesia Incident Reporting System (AIRS)

Case 2022-09: The Unknown Unknowns and Their Consequences

A 9-year-old girl with an intracranial neoplasm presented for a routine MRI with and without contrast to evaluate her disease status. She had been treated at our facility for years and came for an MRI every 3-6 months. Multiple past anesthetics (inhalational induction, TIVA with propofol, nasal cannula, natural airway) for MRI with and without contrast were uneventful.

The mother reported "there was that one time when she was being treated at another hospital that her blood pressure got low, and they thought it was a reaction to the contrast or the anesthesia." A couple of oncology notes vaguely mentioned experimental treatment there with no further details. There was never any mention of complications during an MRI at an outside hospital.

Anesthesia was induced with nitrous oxide and sevoflurane, and a peripheral I.V. was placed. Propofol infusion was started, and nasal cannula was placed. Vital signs were stable, and the patient was moved from the induction room to the MRI scanner.

When MultiHance® (gadobenate dimeglumine) contrast was injected, there was rapid onset of hypotension and loss of pulses. Ephedrine, then 10 mcg/kg epinephrine, was administered. A code was called, and CPR initiated. The child's rhythm deteriorated multiple times to PEA followed by brief returns to a perfusing rhythm, followed again by PEA despite treatment with epinephrine. There were no urticaria, no rash, and ventilation was easy, but diphenhydramine, solumedrol, and ranitidine were given for suspected anaphylaxis.

She was transported to the PICU with continuing recurrences of PEA and ongoing CPR. Despite maximal aggressive treatment, she developed anisocoria, intractable metabolic acidosis, and severe coagulopathy.

An in-depth review by our anesthesiology department included contacting the other hospital. We learned that three years earlier she had an MRI with MultiHance contrast there and developed severe hypotension requiring bolus dose epi and PICU overnight. The MRI the next day with ProHance® (a different gadolinium formulation) was uneventful. None of this information was in our medical record.

Some of our more astute readers may recognize that a similar case, in different form and with different emphases, has been presented before. There are many lessons to be learned from events like this, however, and we will focus on very different ones in this discussion.

The anesthesia team that cared for this child witnessed the very rapid onset of cardiovascular collapse immediately following the administration of a paramagnetic contrast agent and quickly initiated therapy while going through the differential diagnosis. While many of the hallmarks of anaphylaxis were not present, they recognized that the proximate and probable event causing the arrest was the administration of the gadolinium contrast and treated the event appropriately. A cognitive aid was used to assist in the management of this case, something that should be considered by any anesthesiologist who faces a critical event. Cognitive aids have been shown to be of immense value during crises in medicine and in other high-stakes, high-risk environments during rapidly evolving critical events (*Anesth Analg* 2013;117:1149-61). Cognitive aids have been shown to improve performance during simulated anesthetic crisis events, particularly those that are uncommon (*Anesth Analg* 2006;103:551-6). The Pedi Crisis app®, developed by the Society for Pediatric Anesthesia and available free for both iPhone and Android, is an extremely useful and well-designed cognitive aid for critical events in pediatric patients and should be on the smartphone of any anesthesiologist who cares for children (*Anesth Analg* 2019;129:1635-44).

The root events that led to this terribly tragic outcome, of course, are not unique to pediatrics. In the past decade, we have witnessed an extraordinarily rapid migration from paper-based charting to the electronic medical record (EMR), spurred and accelerated by the financial incentives (and punitive measures) of the HITECH Act and related legislation. A major goal of these actions was to stem the ever-worsening isolation of critical medical information residing in the individual charts of independent institutions and to allow for effective transfer of clinical data unencumbered by the location or accessibility of a paper chart.

That singular advantage of the EMR is unfortunately often not translated to reality, due to technical problems of interoperability between different EMR vendors, data security stipulations that inadvertently hamper access to critical health information, and the difficulty of wading through a seemingly endless list of poorly categorized and tagged notes, data, and flowsheets, the contents of many of which cannot be ascertained without opening the file itself. Even with networks coming online that create health information exchanges to share information between different EMRs at the vendor level (see carequality.org/), the actual information that is mapped

correctly remains limited and persists as a primary failure mode. In our case, the key allergy information, the crucial information that the team needed to avoid this critical event, was missing and neither accessible to the anesthesia team nor clearly known to the child's parents. This may have been the case because the earlier episode occurred when records were still on paper. If so, the information was most likely transferred to an electronic record only as an archived PDF file, as the patient had by then moved out of town and was no longer an active patient in the system. These files are nearly impossible to search efficiently, allowing critical information to be easily overlooked. Furthermore, because there is very limited commonality between different EMRs, even the presence of an allergy alert or chart at the other institution was not known to the reporting clinicians, for there is no automated communication between EMRs from different vendors to alert users of their existence (*J Healthc Inf Manag* 2008;22:8-9). The goal that automation and informatics can simplify information-sharing has not yet been accomplished with any degree of reliability, and one cannot rely on technology to supplant person-to-person communication, especially about potentially critical events.

Although compared with many other specialties there is likely a greater proportion of anesthesiologists who are proficient and sophisticated in medical informatics and computing, most of us are not system-level informaticists, and fewer still are experts in the architecture of health care information systems interoperability, blockchain solutions for information sharing, and the like. If the stated purpose of this column is "learning from others," how can the practicing anesthesiologist make a dent in this enormously complex systemic problem? We would like to suggest that there are many ways to do so in your daily practice, and none of them require any computer knowledge at all. Here are a few of them:

1. Write clear notes! Don't be dissuaded by the inadequacies of pick lists and boilerplate auto text. Add a concise descriptive note in plain English, after the fact if needed, that describes what happened, what you did that was successful or not, and offers clear and helpful guidance to the next clinician who may take care of your patient.
2. EMRs generally have a problem list that is too often poorly maintained and full of outdated or inaccurate information. Do your part to keep these up to date and accurate. The problem list can be extremely useful when accurate and nothing but a waste of time and a source of misinformation when not.
3. If you are involved in advising your hospital on the configuration or optimization of your EMR, think carefully about how you format those data fields, files, and templates. Seek help from real experts, if necessary. Most often you will *not* find them at the vendor, as they rarely employ true content and practice experts. You will not be able to alter the fundamentals of a poor user interface, but you may be able to find a way to display information in a way that enhances your ability to use the chart as a medical communication tool and not just a storage bin of regulatory junk. Perhaps your EMR implementation allows tagging that as a critical note. The problem list is another place to highlight critical information.
4. Communicate with your patients and give them a letter or card describing their special problem when indicated or recommend that they obtain a medical ID bracelet. Aids like wallet cards describing a difficult airway, MH, or anaphylactic reaction can be lifesaving. ■

Each month, the AQI-AIRS Steering Committee abstracts a patient history submitted to AIRS and authors a discussion of the safety and human factors challenges involved. Absence of commentary should not be construed as agreement with the clinical decisions described. Reader feedback can be sent to **airs@asahq.org**. Report incidents or download the AIRS mobile app at **www.aqiairs.org.**