High-performing anesthesia practices continually strive to improve patient outcomes and operational efficiency. The Practice Quality Improvement Committee (PQIC) of the Anesthesia Quality Institute (AQI) is charged with facilitating this process. The committee will contribute occasional pieces to the *ASA Monitor* that highlight a real-world quality improvement challenge and the steps taken by the anesthesia practice to resolve it. We hope these case studies will be useful to other groups experiencing similar issues. Feedback regarding these presentations can be sent to the PQIC care of Lance Mueller: **l.mueller@asahq.org**.

LEARNING FROM OTHERS:

A Case Study From the Anesthesia Quality Institute

Collection of data is all well and good, but improvement in patient outcomes requires the ability to turn information into action. The AQI Practice Quality Improvement Committee (PQIC) will collect and present examples of this principle so that all of us can learn from those who are doing it well. Learn more about quality improvement at **www.aqihq.org/quality.aspx**.

Case 2015-2: Knowing What We Already Know

The Problem

This case study is set at a university hospital and begins with a report through the internal adverse incident reporting system. A 24-year-old woman with a history of bipolar disorder presented for open reduction and internal fixation of a right femur fracture sustained when she was struck by a motor vehicle. The initial laboratory screen demonstrated serum potassium of 3.0 mEq/L at the time of admission, but the last value – just before transport to the O.R. – was 2.3 mEq/L. Only the original value was seen on the preoperative assessment in the anesthesia information management system (AIMS). The patient underwent an uneventful general anesthetic.

The rapid response team was called that evening when the patient experienced shortness of breath accompanied by numbness, tingling and weakness of the extremities. Repeat labs were significant for a serum potassium of 1.7mEq/L, calcium of 3.5 mg/dL (lab normal 8.5-10.5 mg/dL) and phosphorus of 0.8 (lab normal 2.5-4.5 mg/dL). The patient was transferred to the ICU for central line placement, electrolyte repletion and monitoring. Additional history was significant for episodic fasting with poor nutritional intake, along with alcohol consumption prior to the accident. The patient was treated with nutritional supplements and discharged uneventfully.

The Data

The case was discussed in a multidisciplinary morbidity and mortality meeting with both surgeons and anesthesiologists present. The facts of the case were confirmed, including the observation that the most current lab results were not easily available to the team in the O.R. Although this was a single event, it became rapidly apparent that it was due to a practice-wide issue. Among the root causes of the incident was a lack of connectivity between the laboratory's critical value alert system and the AIMS. The lab had correctly reported the abnormal preop potassium level, with an alert, but this data did not propagate into the previously completed anesthesia preop assessment. There was no easy way to review the most recent patient lab values in the O.R. and no alerting of abnormal values.

This kind of problem is characteristic of so-called "freestanding" AIMS. These systems have historically been designed by anesthesiologists, for anesthesiologists, and therefore offer a more intuitive user interface, easy customization and ready access to the data being captured. The trade off comes in the need to maintain interfaces with other components of the system-wide electronic health care record (EHR), such as the lab system. This requires ongoing surveillance of dozens of different software systems, from multiple different vendors, and can rapidly become an overwhelming challenge. In reaction to this problem, the market for EHRs in the past five years has swung toward "enterprise" systems where the hospital corporation buys a single global product from a single vendor. Interface challenges are reduced, at the cost of a less-specific fit for any given group of users.

The Solution

After collecting feedback from the M&M conference participants, the anesthesia department quality manager worked with the institution's information technology experts to create a two-pronged solution. First, anyone opening a patient's chart in the AIMS for the first time will see an up-to-the minute summary of lab data, with abnormal values highlighted (Figure 1). And second, an alert was added to the electronic "whiteboard" seen by all providers in the O.R. The institution reports that this solution required 26.5 hours of developer time to create. From incident to completion of the AIMS reconfiguration took about one month.

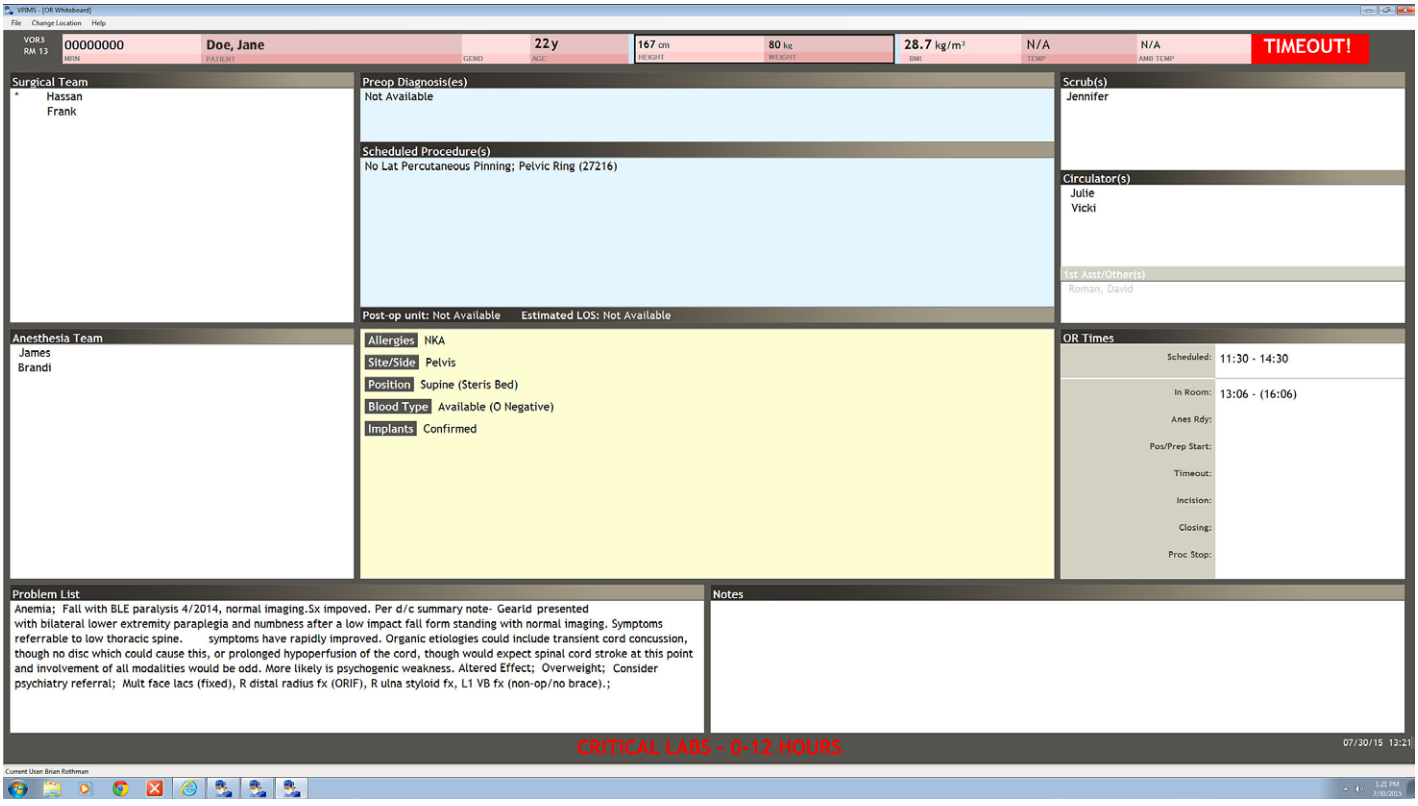

Figure 1

The Result

Although hard data are lacking, personnel believe that the changes made have led to heightened awareness of patient laboratory values at the time of surgery. There have been no further incidents reported in the one year since the change was made. Anecdotally, there have been a number of other cases reported where knowledge of up-to-the-minute laboratory values has led to improved patient care.

Discussion

There are several aspects of this practice QI story that are worthy of comment. The basic problem is a familiar one – critical patient information, although findable in one part of the electronic record, was not accessible to providers at the point of care. Had the patient experienced a lasting injury from this event, e.g., hypoxic brain injury following a cardiac arrest, it would have been difficult to defend the quality of care in a malpractice trial. The problem has several root causes. One is the quantity and density of data generated by modern health care, exacerbated by the need to rule out a wide variety of causes and conditions in the victim of high-energy trauma. Within the first 12 hours in the hospital, this patient had hundreds of diagnostic assessments, ranging from signs and symptoms on physical diagnosis to individual elements of routine lab work to plain radiographs to computed tomography slices (in multiple planes) to ultrasound exams. This is in addition to minute-by-minute monitoring of heart rate, respiration, blood pressure, oxygen saturation, pain level, temperature, fluid input and neurologic function. While such diagnostic intensity makes us smarter clinicians in some ways, it also greatly increases the clutter that we must sift through to find meaningful patterns.

A second issue was the information technology (IT) itself, and the incomplete interoperability between the laboratory system and the AIMS. Lab values were imported at the time the preop assessment was completed, but did not automatically update eight hours later when a new anesthesia team took the patient to the O.R. The new team would have to recognize the possibility that fresher lab values were available and then actively pursue them. Once in the O.R., the otherwise excellent status board used to summarize the patient's history and condition did not include a section for recent lab alerts. This is a symptom of the broader fragmentation of medical care into subspecialties, each with its own expertise and – not surprisingly – its own IT support. Radiologists, pathologists, intensivists and anesthesiologists have different IT needs and have evolved different software solutions to support their work. As this case well illustrates, the next swing of the health care pendulum is going to be toward methods for integrating care across multidisciplinary teams, centered on the patient. The Perioperative Surgical Home model is one facet of this swing; enterprise EHRs may be another, provided they can meet the requirements of their individual users.

For the practicing anesthesiologist the message is clear: there is no excuse for not knowing what is already known. Do your systems make this possible?