Learning From Others:

A Case Report From the Anesthesia Incident Reporting System

Anesthesia Quality Institute
ANESTHESIA INCIDENT REPORTING SYSTEM (AIRS)

Detailed review of unusual cases is a cornerstone of anesthesiology education. Each month, the AQI-AIRS Steering Committee will abstract a case and provide a detailed discussion based on a submission to the national Anesthesia Incident Reporting System. Feedback regarding this item can be sent by email to ***r.dutton@asahq.org****.*

Case 2012-1 – When Blood Pressure Equals "Patent Pending"

AA 55-year-old, ASA Physical Status II man presented for lumbar discectomy in the prone position. Toward the end of an otherwise uneventful general anesthetic, the provider administered 15 mg (0.5ml) of ketorolac from a brown vial with a grey top. The patient became rapidly bradycardic, and the noninvasive blood pressure cuff continuously recycled without producing useful data. The patient was observed to have a bounding arterial pulse, and manual blood pressure was measured at "patent pending" over 150mmHg (> 300/150 mmHg). A swift survey of the anesthesia cart revealed that the administered medication was in fact 5 mg of phenylephrine, from an identical brown vial with a grey top.

Upon recognizing the nature of the medication error, the anesthesiologist reacted quickly to correct the situation. A 200 mcg bolus of nitroglycerin was administered. Blood pressure normalized within 10 minutes and the case proceeded uneventfully. ECG and troponin measurement in the PACU were within normal limits, the patient's mental status was unimpaired and no clinical sequelae were noted.

Discussion:

Every experienced anesthesia provider has suffered the sudden sinking feeling that comes with recognition of a medical error. Whether blowing an intravenous line, puncturing the dura or giving the wrong dose of a drug, the technical nature of our specialty and the thousands of steps required to complete even a simple anesthetic make such events inevitable. Medication errors are one of the more common categories of mistakes, and one of the areas that most clearly illustrate the intersection between systems of practice and human factors.

In the case presented, the sudden change in vital signs was immediately noted by the anesthesiologist. The fact that it happened so abruptly in the middle of an otherwise stable procedure reduced the potential causes to a few, and the fact that blood pressure went suddenly up, rather than down, reduced the list even further. As in many sudden emergencies, the anesthesiologist was required to simultaneously pursue symptomatic support of the patient and diagnostic efforts to uncover the source of the problem. Prompt administration of a rapid-acting vasodilator was a reasonable maneuver, while asking the basic question, "What changed?" The first check was the surgical field, but this was unrevealing. The second thought was of the last anesthetic action taken. The drug substitution was discovered, which fit with the pathophysiology observed: extreme hypertension and reflex bradycardia. While the provider was reassured that the hemodynamic effects would be short-lived, there was also some anxiety for the potential deleterious consequences which could result. Fortunately in this case – as in most such events – transient phenylephrine overdose did not lead to stroke or myocardial ischemia. Recognition of the correct diagnosis helped the anesthesiologist avoid over-correction, which would have been a likely second complication in this scenario.

System Follow Up:

While increased human vigilance would have prevented this error, the safest possible system would rely on humans as little as possible. Humans, after all, are brilliant intuitive problem solvers but are easily distracted and are noted for their unreliability in repetitive processing (in the industrial engineering sense). Identical packaging of two commonly used medications was an obvious contributor to this error. In fact, this was not the first

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time such a mistake had occurred at this institution. However, a previous effort to change the packaging of phenylephrine was thwarted in the long-term by a national supply shortage of the medication. This led the hospital to re-purchase the brown-vial packaging as the only kind available. The quest for unique packaging for common medications has proven to be frustrating given the relatively limited palate of sizes, shapes and colors available to work with, and the human factor consequences of making any change in a familiar product. Indeed, some hospital systems have chosen to move in the opposite direction, providing only generic black-and-white labeling for all medications, on the theory that this will force the provider to examine the drug closely before administration. Universal color labeling for anesthesia medication syringes has taken a related tack, with induction agents all in yellow, relaxants in red, narcotics in blue and pressors in purple. While this does not absolutely prevent errors, it does tend to minimize the potential consequences by keeping most syringe swaps within the same class and effective dose of drug.

A second system issue, that the two medications were physically close to each other in the same drawer, was corrected by moving all potent cardiovascular agents to a more remote, but still readily accessible, location. A final system issue – that phenylephrine is traditionally provided in a concentration far higher than needed for the usual intermittent bolus administration – has not yet been addressed at any level. Re-packaging in the hospital pharmacy would be one approach, but is costly and potentially wasteful. Better would be the national availability of a more dilute concentration. This approach has worked to reduce errors with some medications (e.g., esmolol), but does have the unintended consequence of enabling a new kind of error when one concentration is substituted for another. This is known to be a contributor to administration errors with heparin and insulin, leading in a circular fashion to the idea that only a single concentration should be provided!

Finally, there is the possibility that technology could improve safety in this area. A few anesthesia practices use bar code systems that require scanning the label of any medication administered. If the label scanned was the one on the vial, this error would have been prevented. If the label was on a syringe already containing the wrong product, however, such a system would not have helped.

The Last Word

It is likely that medication errors will remain a part of our practice for as long as we administer drugs to patients. As a profession, we have made enormous strides in reducing the occurrence and severity of such errors, but no human system can ever be foolproof. This case illustrates one of the common ways in which such an error can occur, and emphasizes that provider vigilance is still the most important final check for any anesthetic therapy.