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 provide a detailed discussion based on a case submission to the Anesthesia Incident Reporting System (AIRS). Feedback regarding this item can be sent by email to **r.dutton@asahq.org**.

Report incidents in confidence or download the free AIRS mobile application (Apple or Android) at **www.aqiairs.org**.

Case 2015-5: Epi-Phenomenon

"The single biggest problem with communication is the illusion that it has taken place."

– George Bernard Shaw

Case Presentation

A 65-year-old man was scheduled for an elective open cholecystectomy and ventral hernia repair. The patient's past medical history included obesity, paroxysmal atrial fibrillation, hypertension, sleep apnea and a hemicolectomy for colon cancer. Shortly after induction of general anesthesia with propofol and fentanyl, the patient developed significant hypotension. Phenylephrine and ephedrine were administered, but the patient remained hypotensive. The attending anesthesiologist then asked the anesthetist to administer "a little" epinephrine. After administering the epinephrine, the patient's systolic blood pressure increased to over 300 mmHg. A bolus of nicardipine was given, and the patient's systolic blood pressure returned to 160 mmHg. The surgeon continued the procedure, and the patient's blood pressure was maintained during the case with a phenylephrine infusion and I.V. fluids. Subsequent recovery was uneventful.

Discussion

After the acute rise in blood pressure, the physician anesthesiologist determined that the anesthetist had taken a 1 mg per ml ampule of epinephrine from the anesthesia drug drawer and mixed the 1 mg with 4 ml of intravenous fluid. This yielded a concentration of 200 mcg of epinephrine per ml. The exact dose of epinephrine given was not recorded on the anesthesia record. Further questioning revealed that during his career, the anesthetist had rarely administered epinephrine in non-code situations and was not familiar with the appropriate dose that should have been used in this situation.

This case illustrates how quickly and unexpectedly a medication error can occur in an O.R. setting. Even an experienced physician anesthesiologist may get distracted and fail to provide clear instructions to others on the team. There appear to be three root causes for the medication error in this case. The lack of a standardized process for communicating and confirming verbally ordered medications in the O.R. among members of the anesthesia team resulted in the administration of an inappropriately large dose of epinephrine. This was compounded by the failure of the anesthetist to acknowledge that he did not know the correct dose of epinephrine for the clinical situation and, in spite of this, proceeded to give the drug. The unavailability of diluted, premixed epinephrine syringes resulted in a non-standard preparation, and therefore an unusually large dose was given. This latter root cause is common to medications that may be administered in widely divergent doses for different purposes; epinephrine is given in a large dose during the management of cardiac arrest or anaphylaxis, but also used in a dose two orders of magnitude lower for mixing with local anesthetic solutions or for transient inotropic support of patients with intact circulation.

In this case, the physician anesthesiologist, believing a 10 mcg dose would be used, did not specify the exact dose he wanted the anesthetist to administer. Ineffective team communication is a common cause of errors in the O.R.[1] In an observational study of 421 communication events during 48 surgical procedures, Lingard recorded 129 communication failures and categorized these into a framework that considered the content, audience, purpose and occasion. Approximately 36 percent of the observed miscommunication was classified as content errors in which critical information was missing or incomplete. This emphasizes the importance of team training regarding the methods to improve communication in the O.R.[2] Verbal orders for medications must be communicated in a standard and consistent fashion.

The person requesting that a drug be administered should state the medication name, dosage and route of administration. The individual administering the medication must then confirm the information by correctly repeating back all three parameters before the drug is given, as illustrated in the exchange below:

"Mr. Smith, please administer 10 micrograms of epinephrine, intravenously."

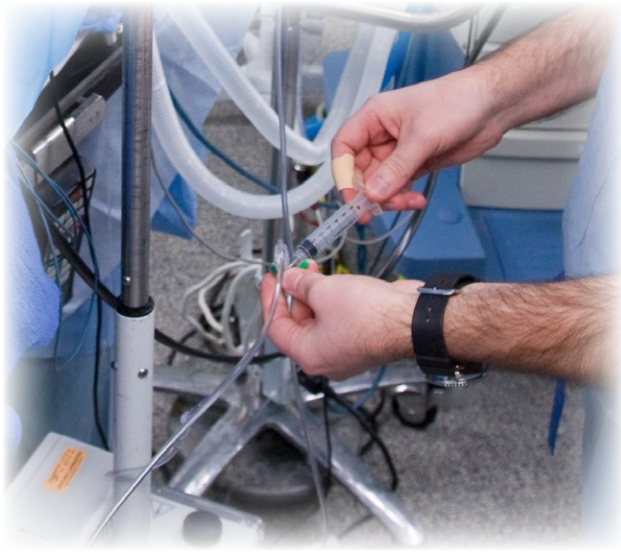
"I will give 10 micrograms of epinephrine intravenously. That will be 1 milliliter of our standard dilution of epinephrine."

"That's correct, thanks."

It is critical that when communicating with other team members such as surgeons and nurses, the same pattern, request and read-back confirmation, be used to ensure there is no ambiguity. In addition, team members should be empowered to speak up if they do not understand what they are being asked to do or if they are unfamiliar with a drug, a procedure or a technique. Rather than make an error, the "line should be stopped" to ensure that the correct action is taken.

In the O.R., anesthesia providers are unique in that they select, prepare, label and administer all the drugs needed during the procedure. As a result, some commonly known strategies to minimize errors in the prescription of drugs in hospitals, such as computerized physician order entry, are of less importance in the practice of anesthesia in the O.R. The lack of standardization with the medication ordering, drug administration and labeling processes in the O.R. increases the likelihood of medication errors.[3] Additionally, when the pharmacy purchases drugs from a new manufacturer, the packaging or concentration of the drug may differ from the previous version that was familiar to the anesthesia team.

An electronic anesthesia record keeping system combined with bar-code scanning capability and availability of prefilled syringes of commonly used medications has been shown to reduce medication administration and documentation errors.[4] Others have proposed the use of double-checking for all drugs administered during anesthesia by having confirmation by either a second individual or an electronic bar-code reader.[5] In the absence of these systems, other countermeasures to prevent a drug error, as occurred in this case, include providing pre-filled, pre-mixed syringes for the most commonly used anesthetic medications to minimize labeling and preparation errors. It is also important that each facility should identify high-risk medications such as epinephrine, phenylephrine and amiodarone that must be diluted prior to administration and adopt standardized concentrations that will be used by all clinicians. Cognitive aids such as laminated cards with the dosage and concentration of the most commonly used anesthetic drugs and emergency drugs should be placed in every anesthesia drug cart.



The Anesthesia Patient Safety Foundation held a consensus conference in 2010 to develop strategies to improve medication safety in the O.R.[6] Its recommendations can be grouped into the following areas: Standardization, Technology, Pharmacy/Prefilled/Premixed, and Culture. A summary of the discussion and recommendations from the conference can be found at **apsf.org/newsletters/pdf/spring_2010.pdf**.

While communication between fallible humans will never be perfect, errors can be reduced by designing systems that minimize the risk and by teaching (and practicing) patterns of communication that enhance understanding.

References:

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3. Mahajan RP. Medication errors: can we prevent them [editorial]? *Br J Anaesth.* 2011;107(1):3-5.
4. Merry AF, Webster CS, Hannam J, et al. Multimodal system designed to reduce errors in recording and administration of drugs in anesthesia: prospective randomized clinical evaluation. *BMJ.* September 22, 2011;343:d5543. doi: 10.1136/bmj.d5543.
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6. Eichhorn JH. APSF hosts medication safety conference: consensus group defines challenges and opportunities for improve practice. *APSF Newsl.* 2010;25(1):1.