

Bowdle, TA: Drug Administration Errors From the ASA Closed Claims Project. *ASA Newsletter* 67(6): 11-13, 2003.

## Full Text

Drug administration errors appear to be a major source of iatrogenic harm to hospitalized patients. A recent study estimated that drug-related errors occur in one out of five doses given to patients in hospitals.<sup>1</sup> Administration errors were found to account for 38 percent of drug-related errors,<sup>2</sup> and the annual cost of drug-related errors was estimated to be approximately \$2.8 million for a 700-bed teaching hospital.<sup>3</sup> While there is relatively little information about drug administration errors made by anesthesiologists, the available data suggest that anesthesia-related drug administration errors are relatively common. In a survey of anesthesiologists in New Zealand, 12.5 percent of anesthesiologists responding to the survey reported having harmed patients by a drug administration error.<sup>4</sup> A subsequent prospective study of 7,794 anesthetic procedures in New Zealand found an overall incidence of drug administration error of 0.75 percent, based upon self-reporting by anesthesiologists.<sup>5</sup>

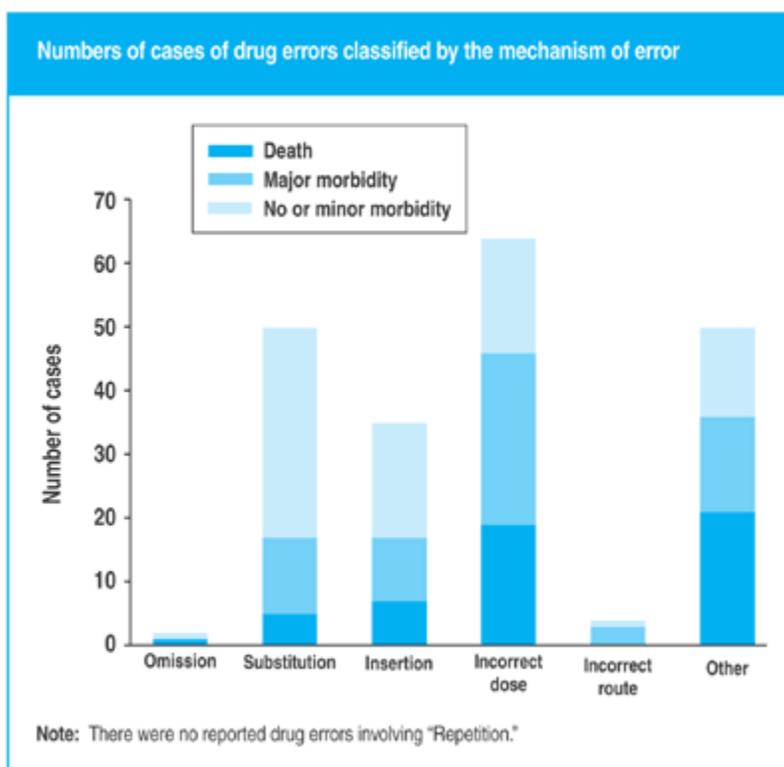
In order to obtain additional information about drug administration errors in the anesthesia care setting, we reviewed the cases of drug administration error contained in the ASA Closed Claims Project database. There were 205 drug errors, representing about 4 percent of the total database of 5,803 cases. The proportion of the database composed of drug errors has been roughly constant, standing at 4 percent for the 1980s and 1990s.

For the purposes of this article, we have classified the drug errors into the following categories (after Webster, et al.<sup>5</sup>):

- Omission — drug not given
- Repetition — extra dose of an intended drug
- Substitution — incorrect drug instead of the desired drug; a swap
- Insertion — a drug that was not intended to be given at a particular time or at any time
- Incorrect dose — wrong dose of an intended drug
- Incorrect route — wrong route of an intended drug
- Other — usually a more complex event not fitting the categories above

Out of 205 claims for drug errors, there were only two cases of "omission," four cases of "incorrect route" and no cases of "repetition." There were 50 cases of "substitution" (24 percent), 35 cases of "insertion" (17 percent), 64 cases of "incorrect dose" (31 percent) and 50 cases of "other" (24 percent) [Figure 1]. The "other" cases were generally complex, with drug administration error usually being one of several issues. Drug infusions were involved in 30 cases (15 percent).

Figure 1

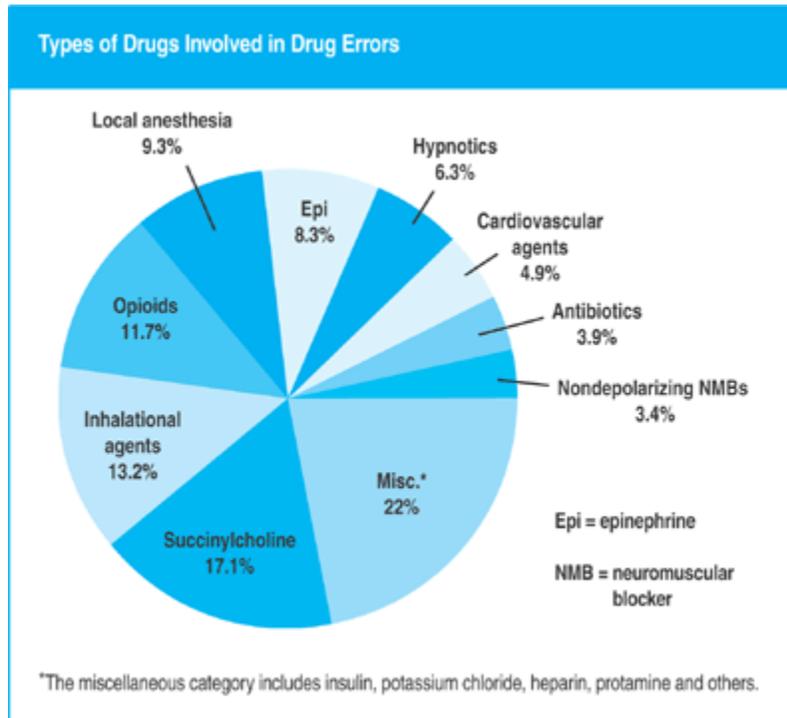


Errors involving drug infusions were diverse in nature. Of the 30 cases of error related to drug infusions, 14 involved succinylcholine. Although the use of succinylcholine infusions may be less common since the advent of shorter-acting, nondepolarizing muscle relaxants, there is a relatively recent claim (from 1995) related to succinylcholine infusion. There were two cases of protamine infusions administered inadvertently while patients were on cardiopulmonary bypass that resulted in death or major morbidity.

Drug administration errors frequently resulted in serious problems. There were immediate and major physiologic effects associated with the drug administration error in 97 cases (47 percent) [Figure 1]. There were 50 deaths (24 percent) and 70 cases (34 percent) with major morbidity (serious, long-lasting or permanent injury), similar to other types of claims within the ASA Closed Claims database.

A wide variety of drugs were involved in errors [Figure 2]. Two drugs in particular were most commonly involved. Succinylcholine was involved in 35 cases (17 percent), and epinephrine was involved in 17 cases (8 percent).

**Figure 2**



Twelve of the 35 cases involving succinylcholine resulted in patients being awake while paralyzed, due to succinylcholine boluses given prior to induction agents, or succinylcholine infusions that were started inadvertently in awake patients. Succinylcholine was administered to five patients with a previous history of definite or probable pseudocholinesterase deficiency, resulting in prolonged neuromuscular blockade. Hyperkalemic cardiac arrest occurred in two paraplegic patients and a patient with Guillain-Barré syndrome who received succinylcholine. Succinylcholine infusions were involved in 14 of the 35 succinylcholine-related cases.

Drug administration errors involving epinephrine were particularly dangerous, with death or major morbidity resulting in 11 of the 17 epinephrine-related cases. Six of the 17 cases involving epinephrine were caused by ampoule swaps where epinephrine ampoules were confused with ampoules of the intended drugs. Drugs that were interchanged with epinephrine were ephedrine (two cases), pitocin (three cases) and hydralazine (one case). An informative case report describing the nearly fatal results of inadvertent epinephrine administration due to an ampoule swap has been published.<sup>6</sup>

There were 19 cases of intraoperative awareness (9 percent). Of the 19 cases of intraoperative awareness, 14 involved inadvertent administration of a muscle relaxant to an awake patient. In 12 cases, the muscle relaxant was succinylcholine; in two cases, it was vecuronium. A patient who received vecuronium instead of cefazolin developed post-traumatic stress disorder as a result of being paralyzed while awake. The remaining five cases of awareness not related to inadvertent administration of a muscle relaxant were either unexplained (one case), related to omission of an induction agent (one case) or were apparently related to inadequate doses of general anesthetic agents (three cases).

ASA Closed Claims Project reviewers judged the care to be "less than appropriate" in 84 percent of the drug error claims, a substantially higher percentage than for the nondrug error claims in the database. Care was judged to be "less than appropriate" in only 35 percent of the nondrug error claims. Payments were made to plaintiffs in 72 percent of the drug error claims compared to 52 percent of the nondrug error claims.

Bar coding of anesthesia-related drugs in the operating room has been described recently,<sup>7</sup> and there are commercially available products that link bar code readers to computerized information systems designed for anesthesiologists. Whether these systems are effective in preventing drug administration errors is unknown at the current time. A recent proposal by the Food and Drug Administration (FDA) [www.fda.gov/oc/initiatives/barcode-sadr/fs-barcode.html](http://www.fda.gov/oc/initiatives/barcode-sadr/fs-barcode.html) to require standardized bar codes on all prescription drugs could facilitate bar coding at the point of care. It would appear essential to include drug infusion as well as bolus administration in any anesthesia point-of-care computerized drug administration system as 15 percent of drug error cases in the ASA Closed Claims Project involved drug infusion.

In summary, claims related to drug errors from the ASA Closed Claims Project database were classified according to mechanism. The most common distinct mechanisms were substitution, insertion and incorrect dose. Drug errors also were a factor in claims that involved multiple problems in patient management (classified as "other"). A wide variety of drugs was involved, but succinylcholine and epinephrine were the most significant individual drugs.

## References

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