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Check the Bags

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The Case

A 50-year-old man with new atrial fibrillation was placed on a diltiazem drip in the emergency department for rate control. After arriving at the cardiac care unit (CCU), he was noted to be hypotensive and a saline bolus was ordered. The nurse asked a coworker to get her a bag of saline and went to check on another patient. When she returned to the first patient's bedside, she noticed that an intravenous (IV) bag was already hanging from the IV pole, and thought that her coworker must have placed the saline bag there. Believing the patient required a rapid saline infusion, she opened the IV up, and the solution infused in rapidly. At that moment, her coworker arrived with the 500 cc saline bag, which caused the patient's nurse to realize, in horror, that she had given the patient an IV bolus of more than 300 mg of diltiazem. The patient suffered severe bradycardia, which required temporary transvenous pacemaker placement and calcium infusion. Luckily, there was no permanent harm.

The Commentary

This case study raises several troubling issues. A patient was given an inadvertent overdose of diltiazem during a hypotensive episode due to a miscommunication involving two nurses. Intravenous diltiazem can cause bradycardia, hypotension, and reduced myocardial oxygen consumption, all serious side effects in an already unstable patient.

Reported error rates for the administration phase of medication procedures are significant, ranging from 26% to 36%.(1,2) With respect to intravenous medication preparation and administration, the possibilities for error are magnified compared with oral agents. In one large study, the investigators reported an overall error rate of 49% for intravenous medications, with 73% of those errors involving bolus injections.(2)

Providers are likely to encounter at least four complications specific to intravenous drug administration. First, the drug can be infused too quickly or too slowly, unlike oral agents, which have only one rate of administration. Second, IV pumps used to control the rate of administration can fail to operate properly or can be set up incorrectly by a nurse. Third, preparation of the drug can lead to error, as when the drug is added to an incompatible solution or mixed using the wrong ratio of drug-to-IV solution. And finally, the

medication can be given through the wrong port, such as into the right atrium rather than into a peripheral vein.

Intuitively, one might guess that the critical care environment would be the site of more medication-related errors than less acute units. In one study that compared intensive care unit (ICU) with non-ICU medication-related errors, preventable adverse drug events were twice as common in ICUs as in non-ICUs.(3) However, when these data were adjusted for the number of drugs used or ordered (Figure), there were no differences between the settings. The fact that the patient-to-nurse ratio in the ICU is usually less than or equal to 2:1, while a single nurse on a medical-surgical unit may be responsible for 5 to 10 patients, may mitigate the risk of drug errors in the critical care setting.

The Institute for Safe Medication Practices cites the "five rights" of medication use (right patient, drug, time, dose, and route) as touchstones to aid in the prevention of errors (www.ismp.org). In this case, following the five rights may have prevented the overdose. However, one must also recognize that many processes used to prevent errors are more difficult to design and implement in critical care units because of the rapidity with which nurses and physicians must act. Therefore, the basics of safe drug administration practice take on even greater importance. Building in manual redundancies (such as verbal read-backs, similar to those used when administering blood transfusions) may help when there are variances to standard protocol, such as an IV bolus. The high error level documented in IV bolus infusions (2) provides important support for reviewing hospital policies related to their administration.

System failures also contributed to the error in this case. If the patient was unstable enough to require a 500 cc bolus of saline, why did the nurse leave the room to check on another patient? Was the staffing inadequate? Workforce issues have been an enormous concern in recent years as nursing shortages reach crisis proportions. Nurses are stretched thin, and the shortage is felt most acutely among specialty nurses. The clinical impact of staffing shortages on increased mortality and ‘failure-to-rescue’ have been noted.(4) A survey conducted by NurseWeek/A-ONE (5) found that 65% of RNs felt the shortage impeded their ability to maintain patient safety. Although specific figures regarding the extent of shortages in critical care are not available, the American Association of Critical Care Nurses states that requests for registry and traveling nurses have increased substantially across the country, with a 45% increase for adult critical care, 50% for Pediatric/Neonatal ICUs, and 140% for Emergency Departments.(6) In the past, most ICUs accepted only experienced nurses (with more than 2 years clinical post-graduate experience) as staff. However, this requirement of previous experience is often waived in times of staff shortages. Although new graduates usually participate in hospital ICU training programs, the learning curves are steep and new nurses may become overwhelmed, leading to errors in communication and execution.

A recent Food and Drug Administration (FDA) report listed a number of human factors associated with medication errors. Performance deficit (as opposed to knowledge deficit), such as seen in this case, was the human factor listed most commonly (30%). Poor communications contributed another 16% to total errors.(7) Thus, this case illustrates a common source of error—a problem of performance related to poor communication.

This case study also provides an opportunity to evaluate mistakes on the personal level. A serious, commonly identified shortcoming of the current medical system is the fear of disclosing errors. When errors

occur, the responsible staff member should be an active participant in an evaluative process aimed at preventing similar errors from recurring. Results of the evaluation on an individual, unit, and hospital level should be shared with the entire hospital so that similar errors might be prevented in the future. The tradition of morbidity and mortality conferences, used commonly by physicians, has not been adopted by nursing staff and might be an appropriate strategy if it provided a blame-free environment in which mistakes and system level issues could be discussed openly.

Take-Home Points

Specific measures to prevent errors in situations similar to this case might include:

- Standard policy typically dictates the use of IV pumps on all vasoactive drips. (Because it was not specifically noted in this case study, we are compelled to state the obvious.)
- Standard policy usually dictates that vasoactive drugs be infused through a site dedicated to only that drug. Therefore, at least one other separate IV site should be used for other fluids and medications. This practice eliminates the need to use the high risk IV and the potential for an inadvertent overdose.
- More obvious labeling of 'high risk' IV drips (eg, bigger, brighter labels; duplicate labeling on IV bag, pump, monitor).
- Independent double-checks of bolus fluids by nurses prior to administration.
- Reevaluation of staffing requirements if a patient becomes unstable so that the patient–nurse ratio can be appropriately adjusted.
- Participation of nurses as well as physicians in morbidity and mortality conferences.

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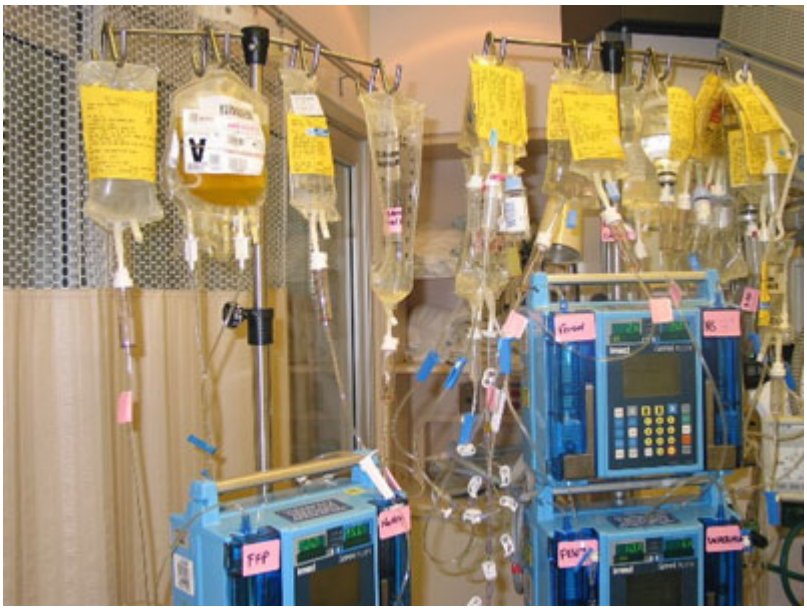
Figure

Figure. An Illustration of the Large Number of IV Medications Administered to Some ICU Patients



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