Intravenous Potassium Given Epidurally
Getting to the ‘Route’ of the Problem
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**Problem:** A nurse accidentally infused intravenous (IV) potassium chloride injection by the epidural route into a postoperative hypokalemic patient. She had intended to connect the IV tubing from the potassium chloride solution to the maintenance IV infusion line by the Y-site port. Instead, she connected the potassium infusion to a Y-site located on the patient’s epidural line through which fentanyl (e.g., Sublimaze, Janssen) and bupivacaine (e.g., Marcaine, AstraZeneca) were being infused. The patient received a total of 20 mEq of potassium in 50 mL of solution over two hours, and the nurse then disconnected the solution.

A short while later, an anesthesia staff member arrived and discontinued the epidural line. Afterward, the nurse went into the patient’s room to hang another dose of potassium and realized that she must have connected the previous infusion to a Y-site on the epidural tubing. The anesthesiologist and the admitting surgeon were immediately notified. Fortunately, the patient did not experience any symptoms during or after the potassium infusion, and interventions, other than frequent monitoring, were deemed unnecessary.

At first glance, the underlying cause of this error seems clear—the improper use of IV tubing with access ports for an epidural infusion. However, an examination of why this error occurred in a facility that typically used special epidural tubing without access ports led to the discovery of other important causal factors, as follows.

**Inadvertent continuation of a standing order.** For patients with epidural infusions in place for analgesia, postanesthesia care unit (PACU) staff members typically attach special tubing without a port during the immediate postoperative period. In this case, the surgery was performed during the evening on a weekend, and recovery took place in the intensive-care unit (ICU), not the PACU. While the patient was in the ICU, an anesthesiologist noticed that the epidural catheter was leaking. He capped it, telling the nurse that he wasn’t sure if he’d be using it later. The patient was soon transferred to a medical-surgical floor. Standing orders for epidural analgesia, which had been placed on the patient’s chart in anticipation of use during the postoperative period, remained in effect.

**Faulty procedure and improper tubing.** Usually, when the floor nurse receives a patient with an epidural infusion, the proper tubing is already attached. In fact, no patients had ever come to the floor before with an epidural access site capped. When the patient in this example complained of pain, the nurses decided to start the epidural analgesic according to the standing orders. In their preparation, they read a recently written policy and procedure for epidural analgesia that, unfortunately, did not mention the need for special tubing without access ports. In this case, epidural tubing was not available in the unit’s supplies. Thus, regular IV tubing was used to connect the epidural analgesia. Later, the potassium infusion was accidentally piggybacked into the epidural infusion line.

**Lack of awareness about the new double-check policy.** The hospital had a rigorous policy regarding independent double checks on high-alert medications that included IV potassium infusions in concentrations greater than 60 mEq/L. If the policy had been followed as written, the nurse would have shown a colleague at the bedside exactly where she was going to attach the IV potassium infusion. However, the double-check policy had been implemented only a few weeks before the error occurred. At that time, most nurses were unfamiliar with the policy’s scope. Most thought that the policy only required two nurses to double check the drug’s label and dose against the patient’s medication administration record. The nurses did not realize that in addition to performing the double checks, they were supposed to go into the room to track the tubing to the site of injection, among other bedside checks.

**Safe Practice Recommendations:** The use of yellow-lined tubing without injection ports for epidural infusions has become a standard in most hospitals in order to differentiate its appearance from typical IV tubing and to prevent the inadvertent administration of drugs intended for the IV route. This tubing, with restrictive access, is a primary error-prevention strategy that should be clearly described in all policies, procedures, and standardized order sets related to epidural infusions.

Some hospitals, like the one described, also have a policy stating that for high-alert drugs such as potassium chloride (greater than 60 mEq/L), an independent double check is required, particularly at the bedside, so that the patient, the pump settings, and the line attachment, as well as the drug and the dose, can be verified. Unfortunately, it is easy to see how several deeper system failures actually thwarted both of these safety practices, which were not fully utilized in this hospital. For example, in addition to shoring up the more obvious error-reduction strategies mentioned earlier, the hospital needs to improve its procedure for handoffs between caregivers and for reconciling medication orders upon transfer of patients—this applies to personnel who attend recovering postoperative patients on weekends and evenings. Had the transferring nurse reviewed the patient’s orders and the prescribed medications with the receiving nurse, someone might have detected the inadvertent...
continuation of the epidural analgesia order.
Several steps can be taken to help prevent mixups involving IV and epidural lines:

- Changes should be made in the way that new policies and safety practices related to high-alert drugs are communicated to all members of the health care team, including evening and night staff personnel. When an established procedure is being modified, it is advisable to document training by having each trainee demonstrate the concept being taught.
- Epidural infusions should be started only by health care professionals with demonstrated competency, typically anesthesia and PACU staff members.
- IV pumps and epidural pumps should be placed on opposite sides of the patient’s bed to separate the two infusion systems.
- Hospital personnel should use a brand or a model of pump for epidural infusions that differs from the one used for IV infusions.
- The pump should be clearly labeled with the words “Epidural Only.”
- A neon sticker with the label “Epidural” should be placed on the tubing. (Such labels are often included with the special epidural tubing.)
- During the simultaneous administration of IV and epidural infusions, dual-channel pumps should be avoided.
- Clinical staff members should be informed of the risk of mix-ups between epidural and IV infusions.

The reports described in this column were received through the ISMP Medication Errors Reporting Program (MERP). Errors, close calls, or hazardous conditions may be reported on the ISMP Web site (www.ismp.org) or communicated directly to ISMP by calling 1-800-FAIL-SAFE or via e-mail at ismpinfo@ismp.org.