Fatalities After Inadvertent Injections Of Topical Epinephrine

Matthew Grissinger, RPh, FASCP

Mr. Grissinger, an editorial board member of P&T, is Director of Error Reporting Programs at the Institute for Safe Medication Practices in Horsham, Pa. (www.ismp.org).

Problem: Two deaths occurred after the misadministration of epinephrine.

Case 1
A patient in a Canadian hospital died after receiving an injection of epinephrine 1:1,000 from a syringe that a surgical nurse and surgeon thought contained a local anesthetic. During a procedure, the surgeon had requested lidocaine 1% with epinephrine 1:100,000 for injection as a local anesthetic. He was handed a syringe containing what he thought was the requested medication. The surgeon injected the medication into the surgical site. Immediately afterward, the patient experienced a cardiac arrhythmia leading to cardiac arrest. Despite full resuscitation measures, the patient died. Information gathered afterward indicated that the syringe had contained epinephrine 1 mg/mL (1:1,000) intended for topical use. The hospital staff collaborated with ISMP Canada to issue a country-wide bulletin to draw attention to the event and to encourage a call to action for all hospitals to prevent similar errors.

Case 2
A similar event occurred more than 15 years ago in the U.S. A 7-year-old boy died during a tympanomastoidectomy after receiving a fatal dose of epinephrine. The incident was mentioned in the 10-minute video Beyond Blame. In the 1996 case, epinephrine 1:1,000 was accidentally poured into a cup on the sterile field labeled “lidocaine with epinephrine.” This cup should have been used for soaking pledgets (a type of sterile gauze packing) with epinephrine, but the pledgets were never added. The surgical technician drew 3 mL from the cup labeled lidocaine with epinephrine, but the syringe actually contained 3 mg of epinephrine. That syringe was used to infiltrate the ear, causing the child’s cardiac arrest.

Contributing Factors
In Case 1, epinephrine was drawn into a syringe and was mistaken as the local anesthetic to be injected. Because epinephrine 1 mg/mL for topical use was on back order in the pharmacy, epinephrine 1 mg/mL for injection was provided to be used in the operating room (OR). As a result, the nurse used a needle and syringe to withdraw the contents from the vial instead of directly pouring the epinephrine from the manufacturer’s container into the sterile open container with the pledgets. The syringe containing epinephrine 1 mg/mL was not labeled.

Usually, topical epinephrine and the local anesthetic for injection are prepared before the start of the procedure. However, the OR nurse was interrupted after drawing epinephrine 1 mg/mL into a syringe, and she placed the syringe on the back table. Later, when the surgeon requested the local anesthetic for injection, the nurse placed the 1-mg/mL syringe on the stand beside the OR table, believing that it contained the injectable anesthetic.

Safe Practice Recommendations: The most forthright ways to avoid errors involving epinephrine are to always label syringes and containers and discard unlabeled products. Case 2 involved a substitution error. Topical epinephrine was poured into a container labeled “lidocaine and epinephrine.” Therefore, all facilities that perform procedures requiring topical epinephrine 1 mg/mL (1:1,000) should review their processes and consider the following recommendations:

1. Differentiate. Epinephrine for topical use should always be supplied in a pour-bottle (in a vial with a peel-off cap) (Figure 1). If pour-bottles from manufacturers are not available or are on back order, the pharmacy should be requested to prepare ready-to-use doses in pour-bottles or topical syringes. The expected change in appearance should be communicated to all affected service personnel. The staff should never take the risk of withdrawing a topical medication into a parenteral syringe.

2. Provide clear labels. The word “topical” should appear on the labels of all containers that hold a solution intended for topical application.

3. Distinguish processes. Distinct processes should be developed for preparing and handling epinephrine for topical application. In particular, drugs such as epinephrine that are intended for topical use should not be placed into a parenteral syringe. Conversely, a drug intended for injection (e.g., a local anesthetic) should not be placed into an open container.

4. Separate processes. Drugs intended for topical use should be stored and prepared in distinctly separate areas from areas used for storing and preparing injectable drugs. Some surgeons also inject (infiltrate) the surgical site with local anesthetic before scrubbing and gowning for ear, nose, and throat procedures. Subsequent infiltration is seldom needed, but if it is required, additional local anesthetic should be withdrawn directly from the vial.

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5. **Verify.** Local anesthetics for injection should be kept in their original vials. The medications should be withdrawn into a syringe, which should be labeled immediately before use. This allows the surgeon to verify the drug by comparing the vial and syringe label.

6. **Simplify.** If possible, vials of topical epinephrine should be replaced with presoaked epinephrine pledgets prepared in advance of medical procedures.

7. **Limit access.** Multiple-dose vials of injectable epinephrine 1 mg/mL should not be stocked in the OR, because these look very similar to the 30-mL vials of topical epinephrine. Although this problem is not directly related to the most recent fatality, health care practitioners have often expressed concerns about the similarities between the pour-bottles of topical epinephrine and vials of injectable medications (Figure 2; see also Figure 1 on page 496). The pour-bottles have a rubber stopper held in place by a metal ferrule and a tab that, when pulled, removes the metal ferrule, yielding a “pour-bottle” format. However, the rubber stopper and metal ferrule give the pour-bottle an appearance that strongly resembles a vial of injectable drug.

The similarities have led to mix-ups between local anesthetics with epinephrine and vials of topical epinephrine. The rubber stopper has also encouraged some practitioners to use a parenteral needle and syringe to withdraw topical epinephrine. The ISMP and ISMP Canada have alerted manufacturers to the potential risks associated with the packaging of the pour-bottles of topical epinephrine.