

Prefilled Syringes of Epinephrine and Compatibility with Intravenous Tubing

This bulletin highlights an incident that occurred in an acute care facility during a cardiac arrest. The facility shared with ISMP Canada information about the incident and internal follow-up with the intent of alerting all facilities to the possibility of this problem and of sharing process enhancements that have been made.

Medication Incident

A male cardiac patient in his early 50s, who was undergoing electrocardiographic monitoring, experienced a cardiac arrest. Resuscitation measures were initiated immediately, however the cardiac arrest cart was found to contain only prefilled syringes of epinephrine 1 mg/10 mL intended for intracardiac administration (Figure 1), rather than the LifeShield prefilled syringes of epinephrine 1 mg/10 mL (Figure 2) that were to have been stocked on the cart. In contrast to the LifeShield syringes, which are compatible with needleless intravenous (IV) tubing, intracardiac prefilled syringes are incompatible with needleless IV tubing, and therefore the epinephrine could not be administered. The physician in charge of the cardiac arrest team administered an alternative medication, the

patient's cardiac rhythm was stabilized within 45 minutes and he did not suffer permanent harm.

Although epinephrine 1 mg/mL ampoules were available on the cardiac arrest cart, the members of the cardiac arrest team were unable to quickly determine the dilution required. Furthermore, although adapters for needleless IV tubing (to make the tubing compatible with a syringe with a needle) may have been available on the cardiac arrest cart, this option was not considered at the time of the resuscitation.

All cardiac arrest carts in the facility were checked during follow-up to this incident. Although no other intracardiac syringes were found, *a number of the carts were found to be unintentionally stocked with an incorrect epinephrine product, specifically prefilled syringes with a needle* (Figure 3), rather than the intended LifeShield prefilled syringes (Figure 2). Staff members at the facility believe that this incidental finding was crucial in helping to avert similar critical incidents.

Learning from this incidental finding also informs considerations that may come into play in the event that one of the epinephrine products is back-ordered. In this



Figure 1: Prefilled syringe of epinephrine 1 mg/10 mL for intracardiac administration has a nonremovable 8.7 cm (3.5 inch) needle attached. From left to right: outer package, syringe, and cartridge.



Figure 2: LifeShield prefilled syringe of epinephrine 1 mg/10 mL, has a "shield" surrounding the nonremovable 3.81 cm (1 inch) needle. The product has a luer-lock tip, which makes it compatible with needleless IV tubing. From left to right: outer package, syringe, and cartridge.

situation, the manufacturer typically offers an alternative product; for example, if the LifeShield product (Figure 2) is on back-order, hospitals with needleless systems may temporarily receive the epinephrine syringes with the attached needle (Figure 3). When this happens, facilities need to have a strategy to ensure that the appropriate adapters are available to allow compatibility with their standard IV tubing, and ensure that staff are aware of availability and are familiar with the use of the adapters.

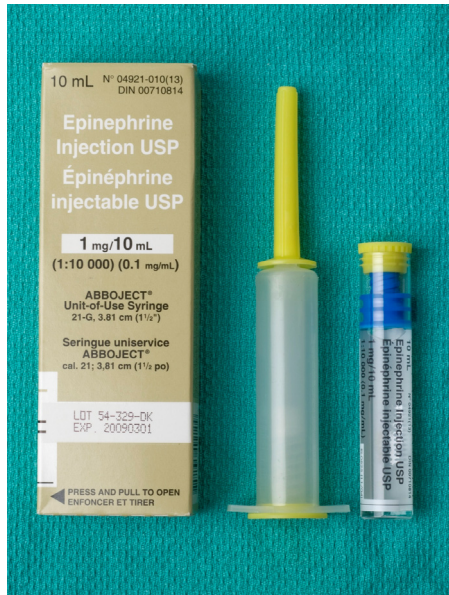


Figure 3: Prefilled syringe of epinephrine 1 mg/10 mL, has a nonremovable 3.81 cm (1.5 inch) needle. This syringe is not compatible with needleless IV tubing. From left to right: outer package, syringe, and cartridge.

Contributing Factors

The medication incident and associated findings represented a valuable learning opportunity for the hospital, as they uncovered weaknesses in processes for ordering, stocking, and dispensing the various types of prefilled syringes for epinephrine. The hospital identified a number of factors that led to the stocking of incorrect prefilled syringes of epinephrine on its cardiac arrest carts:

- The prefilled syringes of epinephrine for intracardiac administration were inadvertently provided by the pharmacy department to nursing staff to replace expired LifeShield syringes of epinephrine.
- Despite subsequent routine checks of the cardiac arrest carts by other nursing staff, the presence of the incorrect product went unnoticed.
- The word “intracardiac” does not appear on the external package for the intracardiac product (Figure 1). Although the package for the intracardiac product is significantly larger than the packages for other prefilled syringes, this difference may be apparent only in a side-by-side comparison (as in Figure 4). In this instance, the mix-up went unnoticed by the pharmacy, the nurse who received the product from the pharmacy and restocked

the cardiac arrest cart, and the nurses who subsequently performed routine checks of the contents of the cart.

- The respective storage areas in the pharmacy for the intracardiac and LifeShield products had the same label: “epinephrine 1 mg/10 mL”.

In addition, several factors were determined to have contributed specifically to the incidental finding that syringes incompatible with needleless IV tubing had been stocked on some cardiac arrest carts:

- Prefilled syringes of epinephrine incompatible with needleless IV tubing were inadvertently ordered from the manufacturer and placed in pharmacy stock.
- The similarity in packaging for the different epinephrine products (Figure 4) increased the likelihood that staff members (including pharmacy staff, and the nurses in various patient care areas who routinely checked the cardiac arrest carts) would not identify the error.
- The brand name “LifeShield” appears on the outer package of this type of prefilled syringe (Figure 2), but it is possible that the presence or absence of this name would be noted only in a side-by-side comparison (Figure 4).



Figure 4: The outer packaging for the 3 types of prefilled syringes of epinephrine 1 mg/10 mL discussed in this safety bulletin.

Recommendations

In collaboration with the hospital where this incident occurred, ISMP Canada shares the following recommendations:

- Review the need for intracardiac prefilled syringes of epinephrine.
 - The facility is reviewing its need for prefilled syringes of epinephrine intended for intracardiac administration.

- Check supplies of epinephrine products to ensure that the correct (i.e., intended) prefilled syringe product(s) are stocked.
- Check to ensure that pharmacy storage labels clearly indicate the type of prefilled product stored (e.g., epinephrine 1 mg/10 mL prefilled - LifeShield).
- Review the pharmacy purchasing and inventory systems to minimize the risk of inadvertently ordering incorrect epinephrine products.

Review procedures for receiving medications in pharmacy. In many cases, pharmacy staff will check the Drug Identification Number (DIN) to ensure that the correct product is received or dispensed, but this measure is ineffective when several products have the same DIN, as in the incident reported here. The inventory system should flag the receiver that more than one product with the same DIN number is available.

- Review processes for re-stocking the cardiac arrest carts.
 - The hospital is investigating the possibility of modifying their cardiac arrest carts to accommodate sealed, standardized trays for medications. This would allow dedicated staff to restock the carts.
- Review the information used (e.g., checklists) for stocking and checking cardiac arrest cart contents to ensure correct products are clearly identified.
- Share information about this problem as widely as possible, to increase awareness among healthcare practitioners, including pharmacy, nursing, and physician staff, as well as facility arrest teams (in all critical care areas, including the emergency department) and rapid response teams.
 - Use this example in training (or in simulations) involving arrest teams, to enhance their ability to deal with unexpected events.

- Ensure that adapters are available on carts so that needleless tubing can accept a needle, and provide education about the use of such adapters to pharmacy, nursing, and physician staff. Although training in the use of needleless systems and adapters is common when needleless systems are implemented, it may be less common after these systems are in place for many years.

In follow up to this incident, ISMP Canada has contacted Hospira, the manufacturer of the epinephrine products described in this article. The company is in the process of reviewing product labelling for its complete portfolio and will specifically enhance the distinctions among various epinephrine products available in prefilled syringes.

Acknowledgements

ISMP Canada gratefully acknowledges expert review of this bulletin by (in alphabetical order):

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