

Prefilled syringes of epinephrine and compatibility with intravenous tubing: Learning from an incident

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Abstract

Epinephrine is a medication typically used in emergency situations. It is kept in cardiac arrest carts, as well as in critical care medication storage areas. Critical care practitioners need to be able to administer it in a timely manner, not only to patients in critical care, but also to patients in other care areas when responding as part of a cardiac arrest team. In this article, the authors highlight information from an ISMP Canada Safety Bulletin in which an incident involving the wrong epinephrine product stocked in an arrest cart went unnoticed until it was needed for a patient experiencing a cardiac arrest. Lessons are shared to reduce the possibility of a similar recurrence.



Figure One: 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. (Photograph used with permission from ISMP Canada.)

This article reprints, with permission, information from a recent **ISMP Canada Bulletin** and highlights an incident that occurred in a critical care area during a cardiac arrest (ISMP Canada, 2008 June 30). 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 enhancements that have been made.

Medication incident

A male cardiac patient in his early fifties, who had electrocardiographic (ECG) monitoring in situ, 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 One), rather than the LifeShield prefilled syringes of epinephrine 1 mg/10 mL (Figure Two) 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



Figure Two: 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. (Photograph used with permission from ISMP Canada.)

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 Three), *rather than the intended LifeShield prefilled syringes* (Figure Two). Staff members at the facility believe this incidental finding was crucial in helping to avert a similar critical incident.

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 situation, the manufacturer typically offers an alternative product, for example, if the LifeShield product (Figure Two) is on back-order, hospitals with needleless systems may temporarily receive the epinephrine syringes with the attached needle (Figure Three). 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.

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 dis-



Figure Three: 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. Used with permission from ISMP Canada. (Photograph used with permission from ISMP Canada.)

persing 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 One). 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 Four). 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.



Figure Four: The outer packaging for the three types of prefilled syringes of epinephrine 1 mg/10 mL discussed in this article. (Photograph used with permission from ISMP Canada.)

- The similarity in packaging for the different epinephrine products (Figure Four) 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 Two), but it is possible that the presence or absence of this name would be noted only in a side-by-side comparison (Figure Four).

Recommendations

In collaboration with the hospital where this incident occurred, ISMP Canada shared multiple recommendations in its safety bulletin (ISMP Canada, 2008 June 30). The following recommendations are an excerpt of those identified in the bulletin that are applicable to critical care areas:

- 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.
- Review processes for restocking the cardiac arrest carts.
 - The hospital is investigating the possibility of modifying its 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 health care practitioners (e.g., nursing, physician and pharmacy staff).
 - Use this example in training (or simulations) involving arrest teams (and rapid response teams), to enhance their ability to deal with unexpected events.
- Ensure that adapters are available on cardiac arrest carts so that needleless tubing can accept a needle, and provide education about the use of such adapters to nursing, physician, and pharmacy 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.

Critical care practitioners consider the multiple possibilities of changes that can occur in a patient’s clinical status in response to disease states and treatments. Such preparedness can assist practitioners to proactively prevent complications and to respond to clinical changes that may occur in patients in a timely and effective manner. Similarly, the intent of this article is to raise awareness among critical care practitioners to the various epinephrine prefilled syringe products available and to facilitate preparedness for prompt recovery in the event a sim-

ilar incident recurs. More importantly, it is hoped that the information empowers critical care practitioners to take a lead role to ensure robust systems-based processes exist within their organizations so that an unexpected compatibility issue between a patient’s IV tubing and the prefilled syringes of epinephrine available to a practitioner does not occur. ☹

This article was written using materials from ISMP Canada, with permission. Colour photos (Figure One, Two, Three, and Four) available at: <http://www.ismp-canada.org/download/ISMPC2008-04EpinephrinePrefilledSyringe.pdf>

ISMP Canada gratefully acknowledges the valuable lessons learned and information reported by professionals in the Canadian health care community that can then be shared to enhance medication system safety. All ISMP Canada Safety Bulletins available from <http://www.ismp-canada.org/ISMPCSafetyBulletins.htm>.

ISMP Canada is a national voluntary medication incident and ‘near miss’ reporting program founded for the purpose of sharing the learning experiences from medication errors. Implementation of preventative strategies and system safeguards to decrease the risk for error-induced injury and thereby promote medication safety in health-care is our collaborative goal.

Medication Incidents (including near misses) can be reported to ISMP Canada:

- (i) through the website http://www.ismp-canada.org/err_report.htm or
- (ii) by phone: 416-733-3131 or toll free: 1-866-544-7672.

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- Institute for Safe Medication Practices Canada. (June 30). **ISMP Canada Safety Bulletin**, 8(4), 1–3. Retrieved August 29, 2008, from <http://www.ismp-canada.org/download/ISMPC2008-04EpinephrinePrefilledSyringe.pdf>