

ISMP Canada Safety Bulletin

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Accidental Intravenous Infusion of a Heparinized Irrigation in the Operating Room

- Apply a distinct “For Irrigation Only” auxiliary label to all bags and bottles to be used for irrigation.
- Designate a space for staff to prepare medications without distractions. Ensure that all required supplies (including labels) are readily available.
- Segregate the storage of all bags and bottles intended for irrigation from those intended for intravenous administration. Use commercially available products whenever possible.
- Designate irrigation specific equipment (e.g., poles, tubing, connections and basins) for use with solutions intended for irrigation.
- Connect irrigation mixtures to the designated tubing while on the sterile field (i.e., do not hang on the pole without any tubing attached) whenever possible.

ISMP Canada received 2 reports describing similar incidents involving the inadvertent intravenous (IV) infusion of a heparinized* lactated Ringer’s solution intended for irrigation. These cases are shared to alert practitioners about this potential hazard and to raise awareness among healthcare providers of the prevalence of this type of wrong-route incident and the harm that can result. Strategies are proposed to optimize the safety of procedures for the preparation,

storage, and intraoperative use of irrigation fluids, especially those containing the high-alert medication heparin.¹

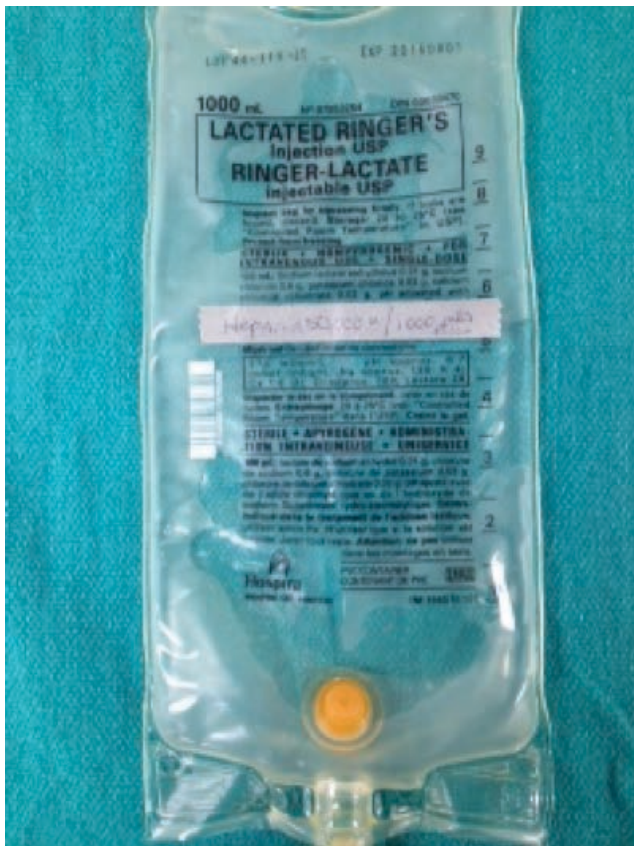
Medication Incidents

A circulating nurse in an operating room (OR) added 50,000 units of heparin to a 1000 mL bag of lactated Ringer’s solution, in anticipation of this solution being needed for intraoperative irrigation. Due to congestion in the workspace, the nurse was not able to access and apply the red “Medication Added” auxiliary labels that were usually used in this situation. The OR scrub nurse confirmed that the right drug, right dose, and right solution were used during preparation. The bag was then stored on an IV pole outside the sterile field, in the operating room. When the patient required fluid replacement during surgery, the unlabeled bag of heparinized lactated Ringer’s on the pole was retrieved and given to the anesthesia provider who infused it IV. Then, when the heparinized irrigation solution was requested by the surgery team, staff discovered it missing and recognized the error. The patient was treated with protamine intraoperatively and recovered without complication.

In the second event, a circulating nurse in the OR used grey tape to label a 1000 mL bag of lactated Ringers to which 50,000 units of heparin had been added (see Figure 1). The heparinized solution

* A heparinized IV solution is one to which the anticoagulant heparin has been added.

Figure 1. Grey tape label on a bag containing heparin intended for irrigation.



intended for irrigation was inadvertently infused by the IV route. When the patient was transferred from the OR, staff in the post-anesthesia care unit (PACU) recognized the error immediately and administered protamine. The patient was monitored carefully and recovered without sequelae.

Background

During surgical procedures, a sterile preparation such as an IV solution may be used for wound irrigation, because ideal irrigation solutions are not always available in packaging designed for irrigation. The risk of a substitution error is increased whenever a solution intended for injection is used for irrigation, because the packaging for many of these solutions, both with and without additives, looks very similar.

Heparin is a widely used anticoagulant and is considered a high-alert medication.¹ Topical irrigation with a heparinized sterile solution achieves 2

important objectives during surgery: cleansing of the wound to remove debris³ and prevention of thrombosis.⁴ Unintended IV administration of heparin can increase a patient's risk of bleeding. The drug protamine reverses the anticoagulant effects of heparin and can be administered to minimize patient harm should an error be detected or adverse effects develop.

Various factors contribute to a risk of inadvertent IV administration of a product intended for another route (e.g., irrigation,⁵ epidural,^{2,6} subcutaneous,⁷ enteral⁸⁻¹⁰). The potential for this type of error is a grave concern; a literature scan and review of patient safety alerts confirmed the prevalence of wrong-route incidents and the need for system improvements to prevent patient harm.¹¹

Recommendations

Several opportunities for reducing the risk of error recurrence and/or mitigating the potential for harm were identified through analysis of the incident described above. The reporting facilities have already incorporated several changes to their procedures.

Acute Care Facilities

- Establish standard protocols to manage the adverse effects of high-alert medications such as heparin. In both cases, the facilities had a protocol to manage heparin overdose/toxicity by the administration of the reversal agent, protamine.
- Incorporate verbal communication tools such as a transition of care report when a patient is transferred from the OR to PACU and/or for staff relief during a case.
- Develop safety and risk prevention strategies for medication management in the OR based on accepted standards of practice such as those developed by the Operating Room Nurses Association of Canada.¹² Provide training to familiarize staff with these guidelines and their rationale.
- Share examples of effective error detection and reduction strategies with practitioners in the affected patient care area and throughout the organization to demonstrate their value. In one of the incidents described here, the procedure for

transfer of care (from the OR to the PACU) included reconciliation and verification of medications and fluids. This process worked as intended, the error was detected upon transfer, and the appropriate intervention was implemented promptly.

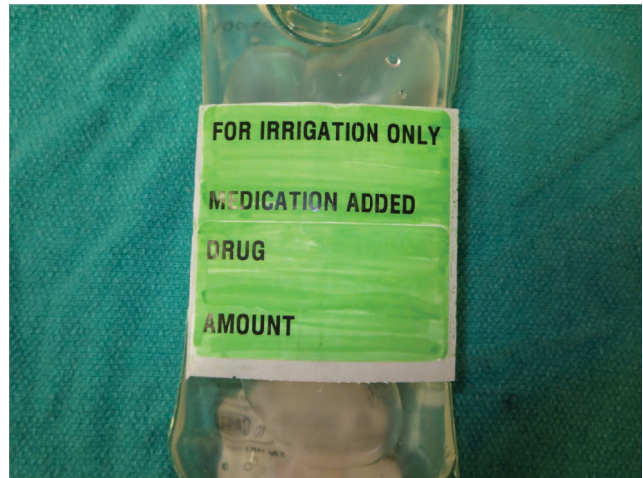
Personnel Responsible for Scheduling and Room Set-Up in the OR

- Schedule time for the OR to be prepared before elective surgery, to support obtaining and setting up necessary supplies and equipment. Adequate time and focused attention are needed if these preparatory tasks are to be carried out safely.
- Designate a space for staff to prepare medications without distractions. Ensure that all required supplies (including labels) are readily available.
- Segregate products intended for fluid replacement from those intended for irrigation by storing them in different areas of the OR or in different sections of the warming cabinet. Label these areas (e.g., “IV Use Only” or “Irrigation Use Only”).
- Use designated equipment for irrigation solutions; clearly label or otherwise identify this equipment.

Personnel Responsible for Medications and Solutions in the OR

- Purchase or prepare sterile solutions intended for irrigation in pour bottles or other route-specific packaging.
- Standardize the strengths of high-alert medication mixtures for irrigation so that commercially available premixed solutions can be used.
- Utilize fluid bags of a different size for solutions intended for irrigation (e.g., 3 L or 250 mL bags). The bag volume can provide a visual cue to differentiate the route of administration. One reporting facility now uses bags containing 5000 units of heparin in 250 mL of 0.9% sodium chloride.
- Assess the feasibility of the hospital pharmacy preparing and supplying commonly used irrigation mixtures to the OR.
- Affix a unique, prominent auxiliary label² (see Figure 2), reading “FOR IRRIGATION ONLY”, to any extemporaneously prepared irrigation solution, whether mixed by pharmacy or by OR

Figure 2. Brightly-coloured auxiliary label indicating “FOR IRRIGATION ONLY”.



personnel. Ensure that the name and amount of medication added are clearly visible on the labelled solution.

- When preparing or dispensing solutions intended to be used for irrigation, attach irrigation-specific connectors and tubing, if available, rather than IV connections and tubing, to prevent inadvertent IV administration. A mixture intended for irrigation is usually decanted into a sterile basin in the sterile field; use only designated “irrigation” poles if irrigation fluid must be hung for decanting. The pole and the basin must be labelled.
- Conduct an independent double check whenever a high-alert medication is added to an irrigation solution. Review independent check processes to ensure that they include verification of the route of administration and application of the appropriate label(s).
- Connect irrigation mixtures to the designated tubing while on the sterile field (i.e., do not hang on the pole without any tubing attached) whenever possible.

Conclusion

This bulletin highlights the potential for inadvertent IV administration of solutions intended for irrigation and proposes strategies to reduce the occurrence of this type of error. Interventions to reduce this risk include visual differentiation and segregated storage of bags to be used for different purposes, use of

irrigation tubing for bags intended for this route of administration, and additional prominent labelling. Whenever possible, connect irrigation mixtures to the designated tubing while on the sterile field (i.e., do not hang on the pole without any tubing attached). Additional measures, such as preparing irrigation solutions in the pharmacy, using commercially available products, dedicating separate space for medication preparation in the OR, designating equipment and supplies for irrigation purposes, robust double-check processes for high-alert medications, and reconciliation of medications at each transfer of care, further support patient safety. Hospital practitioners are encouraged to consider these factors when designing and improving their medication use systems.

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