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ISMP Institute for Safe Medication Practices
An ECRI Company

Acute Care
ISMP Medication Safety Alert!®
Educating the Healthcare Community About Safe Medication Practices

Warning! Similar-looking anticoagulant citrate solutions that lack barcodes risk patient safety

Problem: A long-standing serious risk to patient safety has surfaced once again with Fenwal's anticoagulant citrate dextrose solution, formula A (ACD-A), and anticoagulant sodium citrate solution.

A hospital reported a close call involving a patient who was receiving continuous renal replacement therapy (CRRT). A prescriber ordered a 1,000 mL bag of ACD-A (contains 22 g of sodium citrate dihydrate per 1,000 mL) to prevent blood clotting in the extracorporeal circuit. The pharmacist inadvertently selected a 500 mL bag of anticoagulant sodium citrate (contains 20 g of sodium citrate dihydrate per 500 mL) that was stocked on a nearby shelf in the pharmacy. The bags (made by Fenwal for Fresenius Kabi) look nearly identical with red font. Each also lacks a barcode (**Figure 1**). The anticoagulant sodium citrate bag, which is almost twice as concentrated as ACD-A, is reserved for apheresis or catheter lock in the reporting organization. The medication safety officer (MSO) happened to be walking by and sensed confusion. After comparing the two bags, the MSO identified that they were not equivalent products, an observation relayed to the pharmacist. The pharmacist located the prescribed ACD-A bag and dispensed it to the patient care unit. Had this error not been identified before leaving the pharmacy, there is a chance it may not be caught prior to administration, since there is not a barcode on either of these products for staff to scan at the bedside.

Previous Reports

This is not the first time we have written about the risk of mix-ups with these products. Our June 5, 2014 article, FDA Bar Code Rule Exemption Contributes to Mix-Up, discussed how a pharmacist inadvertently used bags of ACD-A instead of anticoagulant sodium citrate when preparing a patient-specific bag for use during continuous venovenous hemodiafiltration (CVVHDF). Although the pharmacy had implemented an intravenous workflow management system (IVWMS), the lack of a barcode on the bag meant scanning could not be used to verify the contents. Fortunately, the patient did not suffer any adverse effects. At that time, we contacted Fenwal to let them know that these look-alike products had been mixed up and asked the company to examine the container labels and take action to reduce the likelihood of additional mix-ups.

Figure 1. Bags of ACD-A (1,000 mL) (left) and anticoagulant sodium citrate solution (500 mL) (right) by Fenwal look nearly identical and do not contain barcodes.

We also learned that the company was awarded an exemption from the 2004 US Food and Drug Administration (FDA) Bar Code Rule for these products. The exemption request stated that use of ISBT (International Society of Blood Transfusion) 128 compliant labeling during blood collection, processing, and storage in blood centers and hospital transfusion services provided

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SAFETY brief

HIGH-ALERT

Sodium citrate administered instead of sugammadex. An anesthesiologist removed what they thought was a 100 mg/2 mL sugammadex syringe from an anesthesia tray and administered the medication to a patient for paralytic reversal. The anesthesiologist then looked at the syringe and identified that it was a 4% sodium citrate 3 mL syringe. Both syringes are made by SCA Pharma, a 503B outsourcer, and have similar white, black, and orange labels, with the same blue and white company logo on the white syringe cap (**Figure 1**, page 2). The patient's intravenous (IV) line had not yet been flushed, so the anesthesiologist attached a syringe to the port to remove the sodium citrate from the line before it reached the patient.

After the event, the anesthesia team found four additional sodium citrate syringes in sugammadex syringe pockets in other anesthesia trays. The day before, the pharmacy received a sodium citrate delivery intended for an automated dispensing

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IMPORTANT! Read and utilize the Acute Care Action Agenda

One of the most important ways to prevent medication errors is to learn about problems that have occurred in other organizations and to use that information to prevent similar problems at your practice site. Selected items from the **October – December 2025** issues of the ***ISMP Medication Safety Alert! Acute Care*** newsletters have been prepared for use by an interdisciplinary committee or with frontline staff to stimulate discussion and action to reduce the risk of medication errors. Each item includes a brief description of the medication safety problem, a few recommendations to reduce the risk of errors, and the issue number to locate additional information. The **Action Agenda** is available for download as an Excel file.

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an acceptable alternative to ensure patient safety, and therefore a barcode was not required. At that time (in 2014), FDA was revising the Bar Code Rule, so we asked them to look at this exemption, because without barcodes on these products, the safety features of this technology are bypassed.

In our October 8, 2020 article, ACD-A Bags Will Have a Barcode, But Not Sure When, we shared concerns that 500 mL and 1,000 mL bags of ACD-A (Fenwal) look similar to many IV infusion bags, and could cause serious harm if ACD-A was administered IV. We shared two incidents that were reported to the FDA Adverse Event Reporting System (FAERS) in which ACD-A was inadvertently administered IV, causing harm to one patient. In one case, the CRRT machine was set up incorrectly and the ACD-A flowed directly into the patient's bloodstream instead of bathing the prefilter of the machine. This led to multiple adverse events, including dangerously low calcium levels. A small-print warning, "NOT FOR DIRECT INTRAVENOUS INFUSION," is buried within the red text midway below the product name and is difficult to see. In the other case, a patient received IV ACD-A instead of the intended **HESPAN** (hetastarch). The patient suffered bleeding, although a direct relationship to IV ACD-A administration could not be determined.

As a result of this most recent report, we reached out to FDA and Fresenius Kabi (Fenwal is now a part of Fresenius Kabi), to notify them and to reemphasize the need for differentiating ACD-A and anticoagulant sodium citrate product labels from each other, and other IV infusion bags. We also recommended they add barcodes to the bags so that end users can scan the bag to confirm it is the intended product. Fresenius Kabi told us they do not plan to implement barcode labeling on these products even though in 2020 Fenwal indicated they were planning to add a linear and two-dimensional (2D) barcode on the ACD-A solution bag. To protect patients, the company and FDA must once again reassess this as an urgent need and make this change.

Safe Practice Recommendations: Since these bags currently lack a manufacturer's barcode, potential risks associated with different strategies that address this at your facility must be evaluated to determine the safest option. Organizations should consider conducting a failure mode and effects analysis (FMEA) to identify potential risks and mitigation strategies. For these products, consider whether a barcode should be created and how to safeguard the workflow when adding the barcode to the product to ensure that anticoagulant citrate solutions are not mixed up and NOT directly infused into patients.

Build order sets in the electronic health record (EHR) that automatically link the appropriate formulation in the pharmacy system, to guide prescribers to select the correct option based on the indication (e.g., in the reporting organization, this was built as ACD-A 1,000 mL bags for CRRT, anticoagulant sodium citrate 500 mL bags for leukapheresis). Since these products are not medications that are supposed to be directly infused into patients, practitioners may not always receive training during professional education about prescribing, verifying, preparing, and using anticoagulant citrate solutions. Organizations should educate practitioners who may handle these products about the various formulations and indications. Separate and clearly label storage locations.

Editors: Shannon Bertagnoli, PharmD; Ann Shastay, MSN, RN, AOCN; Rita K. Jew, PharmD, MBA, BCPPS, FASHP; Editor Emeritus, Michael R. Cohen, RPh, MS, ScD (hon), DPS (hon), FASHP. ISMP, 3959 Welsh Road, #364, Willow Grove, PA 19090. Email: ismpinfo@ismp.org; Tel: 215-947-7797.

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cabinet (ADC) in the dialysis unit that was never loaded because the machine was out of service. A pharmacy technician then placed the sodium citrate syringes on top of a nearby anesthesia cart, rather than returning them to the pharmacy. The sodium citrate syringes were later mistaken as sugammadex syringes and were inadvertently loaded into anesthesia trays. The hospital also found that, although the ADC in the dialysis unit was out of service, it was still sending refill messages to the carousel in the pharmacy. And, barcode scanning was not utilized in the operating room where the event occurred.

Figure 1. A sodium citrate syringe (top) was mistaken for a similar-looking sugammadex syringe (bottom).

ISMP Targeted Medication Safety Best Practices for Hospitals, Best Practice 18, calls for maximizing the use of barcode verification prior to medication administration by expanding use beyond inpatient care areas, including perioperative areas. Provide education for pharmacy technicians to emphasize that, when medications cannot be refilled in an ADC, they should be immediately returned to pharmacy. Never leave medications, even temporarily, on top of ADCs or anesthesia carts, or anywhere other than official storage locations. While color alone should not be relied upon to identify any medication or drug class, this incident speaks to the importance of carefully reading the individual product label at multiple points of the medication-use process; before loading and after removing the medication from the ADC or anesthesia tray, prior to administration, and when discarding it or returning it to storage. When the pharmacy receives a new product, conduct a proactive review of product characteristics that might cause confusion and lead to medication errors. If similar packaging is recognized, consider purchasing the product (or one product from the problematic pair) from a different manufacturer or outsourcer.

Special thanks to our 2025 MSOS Member Briefings Presenters

The Medication Safety Officers Society (MSOS) holds Member Briefings every other month on various medication safety topics. The MSOS Member Briefings are webinars that feature three 10-minute presentations from volunteer MSOS members who highlight a project, initiative, or relevant medication safety topic. The goal is for participants to take the information presented and use it to implement similar medication safety initiatives within their own organization. At each Member Briefing, ISMP President Rita Jew also provides an update on ISMP activities. Please let us know (ismpinfo@ismp.org) if there is a medication safety topic you would like to present (or see presented) during a 2026 MSOS Member Briefing. We hope others can join us as presenters in 2026! To join the MSOS and attend the Member Briefings, visit: www.medsafetyofficer.org/user/register. MSOS membership and the 2026 Member Briefings are **FREE**.

Production of the MSOS Member Briefings would not be possible without the assistance of voluntary MSOS member presenters. ISMP sincerely thanks all of the 2025 presenters sharing their knowledge and expertise in pursuit of our mission to advance and encourage excellence in medication-use safety.

Thank You!

- **Rukhsar Banu**, PharmD; University Health, San Antonio, TX
- **Erica Brock**; AdventHealth, Orlando, FL
- **Stacy Carson**, PharmD, BCPS, FISMP; AdventHealth, Orlando, FL
- **Loriann De Martini**, PharmD, MPH, BCGP; California Society of Health-System Pharmacists, Sacramento, CA
- **Michael Elduff**; AdventHealth, Orlando, FL
- **Stacie Ethington**, MSN, RN; Nebraska Medicine, Omaha, NE
- **Crystal Franco-Martinez**, PharmD, BCPS; University Health, San Antonio, TX
- **Erica Fredette**, PharmD, BCPS, CPPS; South Shore Health, South Weymouth, MA
- **Liz Ford**, PharmD, MS, FISMP, CPPS; UK HealthCare, Lexington, KY
- **Sloane Hoefer**, PharmD, BCPS; Nebraska Medicine, Omaha, NE
- **Nicole Huber**, RN, RRT; AdventHealth, Orlando, FL
- **Viktoriya Ingram**, PharmD, FISMP; Washington Health, Fremont, CA
- **Kevin McQueen**, MHA, RRT, RRT-ACCS, CPPS, FAARC; UC Health Memorial Hospital, Colorado Springs, CO
- **Abhi Mehta**, PharmD, MS, MBA; Salinas Valley Health, Salinas, CA
- **Brad Schwartz**, BSPharm, BCPS; Avita Health System, Bucyrus, OH
- **Kara Thornton**, PharmD, MEd, CPPS; UVA Health, Charlottesville, VA
- **Madison Yates**, PharmD, BCACP, CPP; Cone Health, Greensboro, NC

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