

Acute Care

ISMP Medication Safety Alert!®

Educating the Healthcare Community About Safe Medication Practices

IV push medications—Bridging the gap between education and clinical practice



As the acuity of patients continues to rise, not only in inpatient settings, but also in ambulatory clinics, surgery centers, and infusion centers, ISMP is once again raising concerns about potential errors with the frequent use of intravenous (IV) push medications (often controlled substances or high-alert medications). These error types, which continue to be observed and received through the **ISMP Medication Errors Reporting Program** (ISMP MERP), are associated with unnecessary dilution, resulting in a potential for wrong concentrations, wrong doses, and/or the wrong rate of administration. Throughout the years, ISMP has conducted numerous surveys, as well as a national summit in 2014, that included interdisciplinary practitioners, academic faculty, regulators, and vendors, to address the risks of IV push medication use and labeling practices. The results of these endeavors painted a compelling picture of IV push workarounds and identified a general lack of knowledge about practices that placed practitioners and patients at risk. As a result, ISMP published the nation's first IV push guidelines: **ISMP Safe Practice Guidelines for Adult IV Push Medications** (www.ismp.org/node/97) as well as a tool to enhance safety: **ISMP Gap Analysis Tool (GAT) for Safe IV Push Medication Practices** (www.ismp.org/node/1188).

These resources caught the attention of many practitioners, as well as two faculty members from Arizona. They recognized that they and their colleagues were not in alignment with these recommended guidelines that had the potential for a generational impact on our newest nurses. As a response, in 2019,¹ they surveyed clinical nurse educators and bedside nurses to determine what clinicians were being taught and what the variations in IV push practices were across Arizona. The results demonstrated a lack of consistency in teaching IV push medication administration to Arizona pre-licensure nursing students. In 2019, these faculty members were awarded a *Cheers Award* in recognition of their work to advance a known medication safety issue.

These researchers subsequently partnered with other interested faculty throughout the United States, the Infusion Nurses Society (INS), ISMP nurses, and a nurse from Fresenius Kabi to form a task force to conduct a repeat survey, expanding to nursing programs on the Commission on Collegiate Nursing Education (CCNE) and the Accreditation Commission for Education in Nursing (ACEN) distribution lists. Similar to prior survey findings by the Arizona faculty, the task force identified a definitive lack of understanding concerning the risks associated with IV push medications, limited practice standardization, and the lack of a standard curriculum for instructing undergraduate students about safe IV push medication preparation and administration. Unsafe practices described included the withdrawal and subsequent administration of medications from prefilled syringes or cartridges, unnecessary dilution of IV push medications, and nurse preparation or manipulation of IV push medications at the bedside. In addition, it appeared to the researchers that some practices were learned either during pre-licensure education or during on-the-job orientation, thus perpetuating these unsafe practices.

A key outcome of the task force's work was the development of an IV push administration standardized practice checklist² that addresses the noted areas of inconsistent education and clinical competency validation. The checklist was developed in accordance with the ISMP **Safe Practice Guidelines for Adult IV Push Medications** and the *Infusion Nurses Society 2021 Infusion Therapy Standards of Practice*.³ The checklist is intended for use in all clinical practice settings with both student nurses during their clinical practicum and licensed nurses during orientation to the facility. Most importantly,

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SAFETY briefs



Moderna COVID-19 vaccine overfill leads to a double dose. Under an emergency use authorization (EUA), the recommended dose of the 2023-2024 Moderna coronavirus disease 2019 (COVID-19) vaccine for patients 6 months to 11 years (**Figure 1**) is 25 mcg/0.25 mL. To ensure practitioners can withdraw the proper dose, the manufacturer provides overfill in the vial. However, healthcare professionals have reported up to 0.5 mL of solution in the vial. In several cases, staff has drawn up the entire contents of the vial and administered 0.5 mL, or double the intended dose. At one pediatric clinic, more than 200 children under the age of 12 were given the full vial of the COVID vaccine before the error was identified. To complicate matters, the dose of Moderna's **SPIKEVAX** (COVID-19 vaccine) for patients 12 years and older is 50 mcg/0.5 mL (www.ismp.org/ext/1272), and the volume (0.5 mL) is similar to several other childhood vaccines.



Figure 1. The label of Moderna COVID-19 vaccine (2023-2024) for patients 6 months through 11 years states, "0.25 mL Single Dose Vial," but practitioners have administered the entire contents, which is actually up to 0.5 mL.

We have notified the US Food and Drug Administration (FDA) and the manufacturer of this concern. If your organization purchases this vaccine, affix preprinted labels to the prepared syringe specifying the vaccine name, indicated age range, and dose of 0.25 mL. Build order sentences with dosing guidelines that will help practitioners in selecting the

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it can be used to standardize practice between nursing programs and clinical practice sites. As a potential safety strategy, this checklist, and associated materials and resources, were submitted to the Quality and Safety Education for Nurses (QSEN), a group designed to set six core competencies in order to prepare future nurses with the knowledge, skills, and attitudes needed to improve the quality and safety of the healthcare system. The checklist was approved and adopted by QSEN and is also available on the INS website in the learning center.

As a follow-up, and with interest to see if there had been adoption of these recommended guidelines, this past year the task force resurveyed nursing program faculty across the United States for implementation data on the use of these tools. Nearly 200 respondents, representing 37 states, completed the 2023 IV push education survey. While much emphasis has been placed on the improvement of IV infusion safety, there has been limited national advancement regarding standardized practices associated with IV push safety. Results of the latest survey follow.

IV Push Competency Assessment

Almost all respondents (95%) reported that within their nursing program, adult IV push medication preparation and administration are taught in the nursing skills laboratory (skills lab). A skills lab is a place where nursing students can practice nursing competencies and techniques in a safe environment under the guidance of their instructor. These labs help ensure that students are comfortable with the techniques and protocols for each task before they perform them with actual patients. Almost two-thirds (62%) reported that competency for IV push medications is determined using a combination of a skills lab evaluation checklist and an observational faculty evaluation in the clinical setting. For others, competency is assessed solely via a skills lab checklist (27%), or only by faculty in the clinical setting (5%). Unfortunately, some respondents (6%) reported that IV push competency is not assessed, or that students are not allowed to administer medications via IV push in the clinical setting due to facility restrictions. In programs where IV push competency is measured, students are allowed to push adult IV medications in the clinical setting, but only under faculty supervision (54%), or with a registered nurse (RN) preceptor employed by the facility (not the school) (18%). Other respondents indicated that it is never allowed (6%) at the facility or there were other circumstances (22%) that deterred it, or they did not know.

Learning to Dilute IV Push Medications

Although diluting IV push medications is usually not recommended in product labeling, skills labs are often set up to simulate how to prepare and administer IV push medications, including with dilution. To practice adult IV push techniques, students often have access to vials (98%), glass ampules (72%), ready-to-administer syringes with simulated medications (60%), syringe-to-syringe transfer devices using prefilled syringes of 0.9% sodium chloride (42%), CARPUJECT cartridges (32%), and CARPUJECT holders (30%). While some commented that students are taught not to dilute IV push medications, others teach students to dilute adult IV push medications prior to administration for certain classes of medications and/or under certain circumstances, including the following:

- Opioids (45%)
- Antibiotics (42%)
- Small volume medications less than 1 mL (39%)
- Anxiolytics (27%)
- Antiemetics (26%)
- Cardiac medications (19%)
- Reversal agents (e.g., flumazenil, naloxone) (5%)
- Others (37%) (e.g., nitroglycerin, heparin, atropine, **EPINEPHRINE**)

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correct dose. In clinics and medical offices, develop protocols and/or order sets to guide practitioners to select the correct dose for the patient population. Educate staff that the dose for patients 6 months through 11 years is 0.25 mL, not the entire vial. Once the dose is removed, discard the vial.

Look-alike vial labeling from a 503B outsourcing facility.

A hospital discovered that a pharmacy technician accidentally mixed up two different local anesthetic vials when restocking an automated dispensing cabinet (ADC). Both products are packaged by Mediviant Healthcare, a 503B outsourcing facility. The products, **BUPI**vacaine 0.5% with **EPINEPH**rine 1:200,000 injection and lidocaine 1% with **EPINEPH**rine 1:100,000 injection come in similar-looking vials (**Figure 1**). The 10 mL vials have the same red caps, and the labels have similar bright yellow and red colors and graphics. When the vials are partially turned and the label is obscured to only show “caine,” the vials look identical.



Figure 1. **BUPI**vacaine 0.5% with **EPINEPH**rine 1:200,000 injection (left) and lidocaine 1% with **EPINEPH**rine 1:100,000 injection (right) have similar-looking labels and cap colors.

Another hospital reported concerns about similar-looking ketamine 500 mg/5 mL and 50 mg/5 mL vials (**Figure 2**, page 3), also packaged by Mediviant Healthcare. The products come in 5 mL vials, with the same red caps and similar label color schemes and graphic designs. As with the lidocaine and **BUPI**vacaine products above, unless the vials are fully turned while reading the label, it is difficult to see the full label title or expression of the drug strength. With the

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Some respondents said they instruct students to only dilute if the medication requires a slow IV push, or to send it back to the pharmacy for preparation if further dilution is required. Students are taught to use a vial of 0.9% sodium chloride (38%), a prefilled syringe of 0.9% sodium chloride (28%), a vial of sterile water (11%), or other (23%) (e.g., solution indicated by drug reference, a combination of those previously listed). Fortunately, all respondents indicated that they do not teach students to withdraw fluid from an actively infusing IV bag of 0.9% sodium chloride.

Teaching Challenges

When asked about challenges that impede teaching nursing students about safe practices for IV push medications, respondents frequently gave the following examples:

- Lack of simulation capabilities
- Inability to practice IV push techniques at clinical sites due to facility restrictions
- Variation in safe practice techniques taught in the school compared to IV push techniques used by staff nurses at the clinical setting
- Variation in technique to dilute IV push medications (e.g., use of vials during simulated learning but taught to use prefilled syringes of 0.9% sodium chloride in the clinical setting)

Use of Resources and Guidelines

A survey question asked which resources students were expected to use when preparing and administering adult IV push medications. The following resources were identified:

- Davis's *Drug Guide for Nurses* (43%)
- Lippincott's *Nursing Drug Guide* (10%)
- Mosby's *Nursing Drug Reference* (8%)
- *Micromedex* (7%)
- *Lexicomp* (4%)
- *Nursing 2023 Drug Handbook* (3%)
- Other (25%) (e.g., a combination of those above, hospital-specific formulary, Elsevier's *2023 Intravenous Medications Handbook for Nurses and Health Professionals*)

In a subsequent question, nearly two-thirds (63%) of respondents confirmed that they were familiar with the ISMP **Safe Practice Guidelines for Adult IV Push Medications** but did not mention if they used it as a resource. In addition, a question was asked if respondents had read the IV push administration standardized practice checklist² found in QSEN and if they had incorporated it into the curriculum, or if barriers exist. Many respondents indicated that they would be adding the QSEN-approved checklist to their curriculum. However, other respondents shared several barriers such as inconsistency (turnover) among faculty and staff, lack of faculty who know and understand QSEN's mission, and faculty who are hesitant to institute best practices into educational programs. Respondents also noted that some faculty are resistant to change and want to continue with the "this is how we have always done it" approach. Others responded that they were not aware that this checklist existed but would work on incorporating it or a curriculum revision was already underway.

Response to Survey Results

The results of the 2023 IV push survey showed variations and gaps in the use of IV push evidence-based standards. In fact, results clearly demonstrate that the steps between understanding the evidence and actually implementing the best practices do not always take place. In response, the task force published *IV push medications: An evidence-based practice guide*⁶ in 2023 in the official

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ketamine vials, a practitioner could believe they have a 50 mg/5 mL vial when they have a 500 mg/5 mL vial.



Figure 2. Ketamine 500 mg/5 mL (left) and 50 mg/5 mL (right) have similar-looking labels and cap colors.

We reached out to Mediviant Healthcare to notify them of this concern and recommend employing color differentiation for the labels and caps as well as centralizing the strengths on the principal display panel. The company notified us that label changes are forthcoming. We also let the US Food and Drug Administration (FDA) know about these issues because of similarities in the way other 503B outsourcing facilities label some of their products. For now, if you use these products, consider using auxiliary labels on medication containers and storage bins to help differentiate them. If possible, consider purchasing one of these products from a different company to reduce the potential for mix-ups. Ensure barcode scanning is used when restocking, preparing, dispensing, and administering these medications. Segregate their storage locations and use locked-lidded drawers in ADCs. Report actual errors and/or close calls with these products to the associated 503B outsourcing facility and ISMP.

Special Announcements

Virtual MSI workshop

Don't miss the opportunity to register for our last **ISMP Medication Safety Intensive (MSI)** workshop in 2023. The unique 2-day virtual program will be held **November 30** and **December 1, 2023**. For more information and to register, please visit: www.ismp.org/node/127.

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journal of the American Nurses Association to foster greater awareness of this practice gap. The task force continues to disseminate the checklist among nursing programs and all healthcare organizations to promote adoption.

Conclusion

While this survey queried nursing program educators about their IV push practices curriculum, healthcare organization educators and managers need to understand the background of what new licensees may or may not be learning and experiencing in regard to promoting safe IV push practices. If your organization provides clinical rotation sites for nursing programs, educators from each practice site should meet with the clinical instructors who will supervise the students to review the organization's approach to IV push medication administration and the role of students. Clinical faculty should also review the organization's medication administration policies and procedures, including IV push guidelines. In addition, instructors should be strongly encouraged to attend an orientation program (the same program that new hires attend) that covers the organization's safety goals so they can reinforce safe practices during clinical rotations.

Staff educators within your organization should also:

- Ensure that evidence-based guidelines and IV push practices are incorporated into policies and procedures.
- Recognize that while new licensees may have had simulation experience with IV push medication use, the content may have been a far less significant portion of a new licensee's experience in their undergraduate program.
- Complete competency assessment and validation for IV push medications when hiring new staff.
- Work with pharmacy and nursing leadership to purchase or have pharmacy prepare and dispense IV push medications in a ready-to-administer form as much as possible.
- Instruct staff to:
 - Only dilute IV push medications when recommended by the manufacturer or in accordance with approved institutional guidelines.
 - Never dilute or reconstitute an IV push medication by drawing the contents into a commercially available prefilled flush syringe of 0.9% sodium chloride or any other prefilled, labeled syringe of diluent.
 - Never withdraw IV push medications from commercially available, cartridge-type (CARPUJECT) syringes or any other prefilled syringe into another syringe for administration.
 - Scan the barcode on the IV flush syringe prior to its use. While it may seem unnecessary to scan a saline flush syringe, given that it contains no active medication, there may be look-alike prefilled medication syringes that could be inadvertently administered as a flush solution and cause patient harm.
 - Administer all IV push medications and any subsequent flush solutions at the rate recommended by the manufacturer, supported by evidence in peer-reviewed literature, or in accordance with internal guidelines.
- Provide practitioners who prepare, dispense, or administer IV push medications with ongoing information about associated risks and errors that have occurred in the facility and have been reported by external organizations, and strategies to minimize these risks.
- Instruct staff to report errors, close calls, and hazardous conditions associated with IV push medications to external safety organizations such as ISMP for shared learning.

We thank Marlene M. Steinheiser, PhD, RN, CRNI, Infusion Nurses Society; Candy Cross, MSN-Ed, RN, Chandler Gilbert Community College; and Denise Dion, MSN, RN, CNE, PCCN, Scottsdale Community College, for providing the survey results and for assisting with this article.

References appear in the right column >

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Foundations in Medication Safety

ISMP's new online, interactive course offers healthcare organizations a standardized, cost-effective way to ensure staff involved in the medication-use process have the basic knowledge they need. For more information, please visit: www.ismp.org/node/74900.

Tubing misconnection survey

Are you a clinician who has experience with an actual event or close call related to a tubing misconnection? Please take about 5 minutes to complete the anonymous survey (www.ismp.org/ext/1273) conducted by a group of Global Enteral Device Supplier Association's (GEDSA) clinical advisors. Your insights are invaluable in making healthcare safer for all.

References

- 1) Cross C, Dion D, Hulse M, Marks R. Evidenced based guidelines for intravenous push medications. *Arizona Nurse*. 2019;72(3):16.
- 2) Dorn LK, Campbell E, Dion D, et al. IV push evidence-based practice checklist. Quality and Safety Education for Nurses (QSEN). January 7, 2022. Accessed October 16, 2023. www.ismp.org/ext/1275
- 3) Gorski LA, Hadaway L, Hagle ME, et al. Infusion Therapy Standards of Practice, 8th Edition. *J Infus Nurs*. 2021;44(1S Suppl 1):S1-S224.
- 4) Dorn LK, Steinheiser MM, Cross C, et al. IV push medications: An evidenced-based practice guide. *Am Nurse J*. 2023;18(4):27-30.

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HITTING THE SAFETY HIGH NOTES



ISMP 26TH ANNUAL CHEERS AWARDS

Tuesday, December 5, 2023

House of Blues – Anaheim

Join us on Tuesday evening, **December 5, 2023**, at 6:00 pm for the ISMP 26th Annual **Cheers Awards** at the **House of Blues** in Anaheim. The awards will showcase medication safety stars who have set the tempo when it comes to developing innovative strategies that ensure progress.

You can help honor this year's **Cheers Award** winners by attending the awards dinner and/or supporting the event. Your participation helps bring attention to safety advances and enables ISMP to continue the core of its lifesaving work – preventing medication errors. For support opportunities and/or to register for the dinner, please visit: www.ismp.org/node/83407



Guest Speaker:

RaDonna Vaught, a former nurse who is a passionate advocate for system-based medication safety and second victims of errors



Lifetime Achievement Award Winner:

Susan D. Scott, PhD, RN, CPPS, FAAN
Nurse Scientist/Adjunct Associate Professor, University of Missouri Health Care/Sinclair School of Nursing

ISMP Activities at the 2023 ASHP Midyear Meeting

Workshop *(registration required)*

Thursday, November 30 & Friday, December 1

Medication Safety Intensive

7:30 am – 4:30 pm ET

Virtual format

To register, visit: www.ismp.org/node/76170

Symposium *(at Anaheim Convention Center North)*

Wednesday, December 6

Leveraging IV Robotics to Optimize Sterile Compounding Practices to Improve Safety

11:30 am – 1:00 pm PT, Doors open at 10:45 am

Room: 161, 100 Level

To register, visit: www.ismp.org/node/101371

Educational Sessions with ISMP Speakers

(at Anaheim Convention Center)

Sunday, December 3

2023 Health Technology and Patient Safety Hazards: Are You Playing at the TOP of Your Game?

4:00 pm – 5:00 pm PT

Room: 204b, Level 2

Tuesday, December 5

ISMP Medication Safety Update 2023

2:00 pm – 3:00 pm PT

Room: 207b, Level 2

Wednesday, December 6

Look Outside! Safety Risks Outside the Pharmacy Walls

8:00 am – 9:15 am PT

Room: 204b, Level 2

Visit us at booth #621



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