



I.V. Push Medication Administration



Patient safety • Best practices

A matter of I.V. push drug safety

Experts weigh in on what nurses need to know.

By Catherine Spader, RN

New evidence raises concerns about how nurses are preparing and administering I.V. push medications. A 2018 survey published by the Institute for Safe Medication Practices (ISMP) revealed that practitioners are frequently using unsafe practices.



The 2018 survey is a follow-up to a similar ISMP survey published in 2014. The current survey reveals five major unsafe practices related to I.V. push medications that have persisted or worsened in the past decade. (See *5 common unsafe I.V. push medication practices*.) Survey participants included 977 clinicians; 93% were nurses and 4% were advanced practice nurses.

To shed light on this challenging and multifaceted issue, *American Nurse Today* is presenting this special section, "I.V. Push Medication Administration," which focuses on evidence-based practice. The section begins with an overview of the problem from three clinical experts' perspectives, followed by articles on dilution and the myths of I.V. push administration. It concludes with a checklist of key recommendations that nurses can use to

ensure they're practicing based on the latest evidence.

We asked three clinicians to share their expertise and insight into the issue of I.V. push medication administration:



Elizabeth Campbell, MSN, RN, CRNI, is past-president of the Infusion Nurses Society New

England Chapter and a clinical scholar at Massachusetts General Hospital in Boston.



Steven Jarrett, PharmD, is the medication safety officer in the quality division for Atrium Health

in Charlotte, North Carolina.



Susan Paparella, MSN, RN, is vice president of the Institute for Safe Medication Practices.

Q: What are the concerns about the major findings of the survey?

Paparella: In 2015, ISMP published the *ISMP Safe Practice Guidelines for Adult I.V. Push Medications*. Despite this, the 2018 survey found wide variations in practice and at-risk behaviors. For example, 66% of survey participants reported using prefilled syringes as vials. This involves drawing medication from a manufacturer-prepared, ready-

to-administer syringe into another syringe. This practice increases the risks of contamination and dosage alteration. These products are developed to promote safety, and if you manipulate them, you're negating that.

Campbell: Nurses have been trained about the importance of following the five rights of medication administration: the right medication, patient, dose, route, and time. However, the results of this survey show a rise in unsafe I.V. medication practices that fall outside the five rights. The five rights alone aren't going to keep patients safe. It's just as important to administer medications in the right form prepared in the right way. Otherwise, you put patients at risk for complications, such as infections, reactions, interactions, and medication errors. I.V. therapy can cause many injuries and complications and is heavily litigated.

Jarrett: The elephant in the room is that many nurses aren't following evidence-based practice. Rather than using pharmacy dispensed ready-to-administer, manufacturer-prepared medication syringes, survey participants report that they're frequently preparing or manipulating I.V. push medications on patient care units. This practice increases the risk of contamination from bacteria, particulates, and other impurities. Only 50% of participants say they always label self-prepared I.V. push medications. Another safety issue is the unnecessary dilution of I.V. push medications. Many nurses also are diluting or reconstituting medications using a pre-filled 0.9% sodium chloride (saline) flush syringe, which is an unsafe practice. (For more information about dilution, see page 22.)

Q: Why is there a discrepancy between evidence-based practice and what nurses are doing?

Paparella: Nurses don't always have clear direction and policies about diluting and administering I.V. push medications. They may have conflicting references, learn incorrect information from coworkers, or make up their own methods. They may drift into unsafe behaviors because they don't perceive the risk or believe that the risk is justified.

Campbell: Although nearly every patient admitted to the hospital today has an I.V., insufficient education about I.V.s and infusion therapy is provided in nursing schools. In addition, when hospital budgets get tight, specialized I.V. teams may be cut. This can lead to higher rates of I.V.-related complications because of the gap in skill and knowledge between specialist infusion nurses and other nurses.

Jarrett: Everyone develops their practice based on their experience, what they were taught, preconceived notions, and what they think is the right thing to do. If nurses aren't aware of any complications, they may feel comfortable continuing unsafe practices.

Another issue is the intermittent shortages of 100 mL bags of 0.9% normal saline and D₅W [5% dextrose in water]. Shortages create confusion about administration because nurses must give some medications I.V. push that they were accustomed to administering via I.V. piggyback.

Q: How can organizations change unsafe behaviors?

Campbell: The infusion world changes quickly with new products, standards, discoveries, and drug shortages. The best thing for patients is to have a dedicated I.V. team of experts who are up-to-date on best practices. Education also needs to go beyond a facility's I.V. team. Every unit should have an educated I.V. champion who helps ensure all nurses know best practices.

In addition, all incidents of medication infiltration should be documented, and managers should hold month-



5 common UNSAFE I.V. push medication practices

The Institute for Safe Medication Practices (ISMP) published a survey in 2018 that revealed these widespread **unsafe** I.V. push medication practices:

- 1** Using prefilled syringes or cartridges as vials (drawing some or all medication from the prefilled syringe or cartridge into another syringe for administration).
- 2** Diluting adult I.V. push medications unnecessarily despite their availability in a ready-to-administer form (e.g., manufacturer- or pharmacy-prepared syringes, single-dose vials).
- 3** Diluting or reconstituting an I.V. push medication in a prefilled 0.9% sodium chloride (saline) flush syringe that might not be relabeled.
- 4** Failing to properly label syringes of I.V. push medications prepared away from the patient's bedside.
- 5** Preparing or manipulating I.V. push medications on patient care units instead of having the pharmacy dispense ready-to-administer syringes of medications.

ly staff meetings to discuss issues that have occurred and how to prevent them with safe practices.

Paparella: Effecting change is a multilayered process that includes creating awareness, providing the right products, ensuring that managers understand practice guidelines, and educating nurses about best practices.

ISMP guidelines state that facilities should provide I.V. push medications in a ready-to-use form as often as possible. This highest-level strategy practice limits the possibility of error. Another tactic is to create easy-to-reference tables that identify the most commonly given I.V. push medications, how to administer them, and how to dilute them,

if necessary. Organizations also can use the free ISMP Gap Analysis Tool to evaluate their I.V. push medication practices. (See *Resources*.)

Jarrett: Nurses have valid concerns that explain why they do what they do. Listening to their concerns is important to understand why unsafe practices occur in your setting. Then present evidence-based standards and the reasons nurses need to follow them. Once you get the evidence out there, nurses will respond. ■

Catherine Spader is an author and healthcare writer based in Littleton, Colorado.

Note: Campbell and Jarrett are members of the Fresenius-Kabi Advisory Board.

Resources

Access these resources to learn more about safe I.V. medication administration practices.

Infusion Nurses Society infusion therapy standards of practice:
[ins1.org/Default.aspx?TabID=251&productId=113266](https://www.ins1.org/Default.aspx?TabID=251&productId=113266)

Institute for Safe Medication Practices (ISMP) safe practice guidelines for adult I.V. push medications
[ismp.org/guidelines/IV-push](https://www.ismp.org/guidelines/IV-push)

ISMP gap analysis tool for safe I.V. push medication practices:
[ismp.org/resources/gap-analysis-tool-safe-IV-push-medication-practices](https://www.ismp.org/resources/gap-analysis-tool-safe-IV-push-medication-practices)

Tackling the dangers of unnecessary I.V. dilution

System-wide, evidence-based practice is the solution.

By Steven Jarrett, PharmD, and Catherine Spader, RN

The 2018 Institute for Safe Medication Practices (ISMP) survey uncovered many concerns about how nurses are diluting I.V. push medications. A common unsafe practice is unnecessary dilution of adult I.V. push medications. Another issue is dilution or reconstitution of I.V. push medication using a prefilled 0.9% sodium chloride (saline) flush syringe.

Nurses are making more work for themselves by diluting drugs unnecessarily, and the practice doesn't provide value to patients; instead, it creates contamination and medication error risks. In addition, facilities are paying a premium price for prefilled syringes. So why are nurses diluting?

Nurses believe that dilution is good for patients. In the survey, the primary factors that influenced a decision to further dilute adult I.V. push medica-

functional and following the manufacturer's instructions for diluting and administering I.V. push medications.

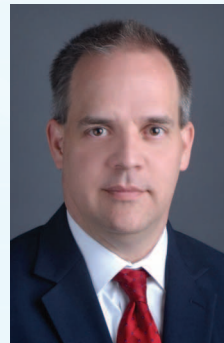
Concerns about flush syringes

The manufacturers of prefilled 0.9% sodium chloride flush syringes state that their products aren't designed for diluting medications. Despite this, 81% of ISMP survey participants (mostly nurses) reported that they've used a flush syringe to reconstitute or dilute an I.V. push medication.

There are many concerns about using flush syringes for dilution, including the possibility of interaction with the medication being diluted. In addition, they may not be guaranteed to be sterile if the plunger is pulled past a certain point. These syringes also are not designed to measure doses accurately. Some of these syringes are labeled "for flush only." Drawing a medication into a syringe labeled for something else creates confusion and a serious safety issue.

Reducing dilution risks

Ideally, all medications should be provided to nursing units as ready-to-administer syringes to reduce confusion about dilution and the associated risks. This goal isn't yet realistic in all settings because ready-to-administer I.V. drugs may not always be available and may cost more than vials that need to be reconstituted. However, all drugs that aren't available in a manufacturer-prepared, ready-to-administer syringe need to be reconstituted and diluted under a flow hood in the pharmacy. These specialty hoods provide a controlled



Steven Jarrett

setting that reduces contamination risk.

If drugs must be reconstituted or diluted by a nurse on the unit, the pharmacist should send clear instructions with the medication. And the lines of communication must be supported so that nurses are comfortable calling pharmacists with concerns and questions.

Creating an evidence-based practice culture

An organization's practice culture can be at the root of unsafe I.V. push practices. Nurses may believe they have to dilute medications in ready-to-administer syringes because the practice was learned as a part of the culture that spreads from one nurse to another. And different practice cultures in different units can exist in the same organization.

Create a structure that keeps nursing practice safe and on the same page. Nurses need system-wide, evidence-based policies and educational processes to learn which medications shouldn't be diluted and the safest way to dilute those that should be. This includes providing dilution policies and drug-specific information. Educational programs also need to stress that the best way to reduce patient discomfort and risks is by following manufacturer's instructions and evidence-based practice.

Nurses like to set their own practice, so establish practice and policy at the nursing level, while accessing pharmacists' expertise. ■

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tions were associated with the desire to administer the drug slowly (94%), avoid patient discomfort (70%), reduce the risk of extravasation (33%), and measure small-volume doses accurately (25%). Nurses also may believe they can monitor patient response more efficiently if they dilute the medication.

However, all of these concerns can be addressed by using best practices, which include ensuring the I.V. line is

Myths of I.V. push administration

Learn the truth about safe administration.

By Catherine Spader, RN



Many myths abound about I.V. push medications. To dispel these myths and outline evidence-based standards of practice, *American Nurse Today* interviewed Elizabeth Campbell, MSN, RN, CRNI, past-president of the Infusion Nurses Society (INS) New England Chapter and a clinical scholar at Massachusetts General Hospital in Boston.

Myth: Drawing medication from a prefilled syringe and transferring it into another syringe is safe practice.

Truth: The INS standards state that you shouldn't transfer medication from one syringe to another. This practice can lead to a medication error or introduce bacteria into the syringe. In addition, a portion of the drug can be lost during transfer. Even a small loss can reduce the efficacy of a drug, especially with small-volume I.V. medications.

Myth: A 10-mL syringe is required to administer I.V. push medications via a central line or peripherally inserted central catheter (PICC).

Truth: Unfortunately, many nurses erroneously believe this to be true. To ensure proper dosing, use a syringe that's the appropriate size for the administration of I.V. push medications via a venous access device. A 10-mL syringe is needed only to assess the patency of the device, not for administering medications. Educational programs must stress using the right-size syringe for the job.

Myth: It's not necessary to label a syringe with medication that a nurse prepares if it will be administered right away.

Truth: The only time it's acceptable not to label a syringe is if the medication is prepared at the bedside and administered right away. Otherwise, syringes should be labeled. That includes when preparing more than one medication at the bedside and when preparing any medication away from the bedside. The reason for these recommendations is that nurses often are interrupted during medication administration. If distracted even for a few moments, what was in the syringe and the dose may be forgotten. In addition, preparing more than one medication at the same time can lead to confusion about the contents of unlabeled syringes.

Myth: Diluting small-volume doses of medication, such as 0.5 mL, to ensure the patient gets the whole dose is a good idea.

Truth: This is false. Ready-to-administer medications come packaged the way they do for a reason. Diluting them can reduce their efficacy and introduce the risk of medication errors and contamination of sterile I.V. medications.

Myth: Using a 0.9% sodium chloride (saline) flush syringe to dilute I.V. push medications is acceptable.

Truth: Nurses may see using saline flush syringes as an easy way to dilute and administer medications. However, the Food and Drug Administration has approved them only for flushing venous access devices. Nurses should be aware that not all brands of saline flush syringes are labeled "for flush only." However, using *any* saline flush syringe for dilution is unsafe.

Myth: Diluting I.V. push medications

will reduce patient discomfort and vein irritation in peripheral I.V.s.

Truth: The most important strategy nurses can use to avoid pain and complications is to ensure that the I.V. is patent, with a good blood return. You also should see no swelling or signs of vein irritation, such as redness and warmth. Administer the medication in the correct form and push it over the proper amount of time, as advised by the manufacturer. The I.V. catheter should be the appropriate size for the vessel. (See next Myth.)

Myth: Go big or go home: A large-bore catheter is ideal for a peripheral I.V.

Truth: Clinicians should use the smallest-bore catheter possible for the safe administration of medication and fluids. For example, using an 18-gauge catheter in a small hand vein can cause irritation. Pushing medications into veins that are already irritated can result in inflammation and lead to infiltration. Remember that the larger bore and the longer the catheter, the more irritation it may cause.

Here is a bonus myth/truth related to I.V. infusions.

Myth: Administering two antibiotics at the same time in different I.V. lines is okay. (See *note on final page*.)

Truth: Antibiotics should be given one at a time. Giving two or more at the same time can overload the kidneys and cause renal failure, especially with high doses of strong antibiotics, such as metronidazole and vancomycin. ■

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For more information, see resources on page 21.

I.V. push safety checklist

The Institute for Safe Medication Practices (ISMP) made several recommendations related to the safe administration of I.V. medications based on the results of its survey and has published a compilation of best practices. The Infusion Nurses Society (INS) standards also address I.V. push administration.

Here is checklist of recommendations from ISMP and INS to help ensure safe practice.

For pharmacists

- Dispense I.V. push medications in ready-to-administer prefilled syringes.
 - If a prefilled syringe isn't commercially available, prepare a syringe in the dose specific to the patient. Label the syringe with the patient's name, drug name, strength, dose, directions for administration (e.g., slow I.V. push over 3 to 5 minutes), and the beyond-use date/time.
 - If stability is a problem, dispense a single-use vial with instructions.
- Be sure manufacturers' prefilled syringe cartridge holders are readily available to clinicians administering I.V. push medications.
- Avoid dilution of I.V. push medications, but if required, do so in the pharmacy (instead of having clinicians dilute them).
- Provide the rate of administering I.V. push medications on the medication administration record.

For nurses

Before administration

- Do not dilute I.V. push medications unless required to (for example, because stability issues prevent the pharmacist from doing so).
 - If you have to dilute, follow the specific directions provided by the pharmacy and prepare the medication in an uncluttered location with the needed supplies.
 - Do not use saline flush syringes for diluting medications.



- Do not draw medication from a commercially prepared syringe into another syringe for administration.
- Ask the pharmacy to prepare I.V. push medications whenever possible if a manufacturer-prepared prefilled syringe is not available.
- If more than one syringe of medication for a single patient needs to be prepared at the bedside, prepare each one separately and immediately administer it before preparing the next one.
- Label all medication syringes that you prepare when not at the patient's bedside, even if you think you'll be administering them right away.

Administration

- Use an appropriately sized syringe (for example, 3 mL) for administering I.V. push medications via a central vascular access device. (A 10 mL syringe is required only for confirming patency of the line, not for administering the medication.)
- Use the needleless connector that's closest to the patient whenever possible for administering medication.
- Disinfect I.V. access ports before administration by scrubbing with the disinfectant used in your organization; allow to dry for 10 seconds.
- Follow the recommended rate for administration and use a watch or clock with a second hand for timing to ensure accuracy.

Remember to contact a pharmacist if you have a drug information question and a nurse educator or advanced practice nurse if you have a drug administration question.

For organizations

- Conduct a gap analysis of I.V. push medication practices using the ISMP Gap Analysis Tool (GAT) for Safe IV Push Medication Practices, available at ismp.org/resources/gap-analysis-tool-safe-iv-push-medication-practices. Another resource is the Ready-to-administer (RTA) MedSafety Form from The Joint Commission, available at rtamedsafety.com.
- Provide I.V. push education for clinicians during orientation and annually.
- Ensure policies and procedures follow national standards and guidelines.
- Encourage clinicians to report errors and near-misses, which can help identify areas for improvement. ■

Sources: Infusion Nurses Society. Infusion therapy standards of practice. 2016;39(15):1-169.

Institute for Safe Medication Practices (ISMP). Part II: Survey results suggest action is needed to improve safety with adult IV push medications. 2018. ismp.org/resources/part-ii-survey-results-suggest-action-needed-improve-safety-adult-iv-push-medications

ISMP safe practice guidelines for adult IV push medications. 2015. ismp.org/sites/default/files/attachments/2017-11/ISMP97-Guidelines-071415-3.%20FINAL.pdf

Note: Since the publication of this article, pharmacy experts have noted that there is not evidence to support needing to administer I.V. antibiotics one at a time. One pharmacist notes: “I do not want to discourage the practice of giving two antibiotics at the same time because in several instances it may be ideal (sepsis, extended infusion). Separating antibiotics also does not help differentiate which antibiotic caused the reaction. For instance, if cefepime is I.V. pushed at 09:00 and vancomycin started at 09:30 but patient develops a rash at 10:00, you would not be able to definitively conclude which antibiotic caused the reaction.

“There is a lot of I.V. compatibility data supporting concomitant administration of antibiotics.

“Additionally, there are several other non-antibiotics (such as furosemide both oral or I.V/) that are eliminated through the kidney that we administer at the same time without worrying about ‘overloading the kidney’. When we get concerned about increased risk for nephrotoxicity with concomitant agents, it is not because they are administered at the exact same time but because patient is receiving both therapies.”

<https://www.myamericannurse.com/myths-of-i-v-push-administration/>