Replacing Old Practices with New Paradigms: Adopting Safe Practices for IV Push Medications

This non-accredited webinar is sponsored by Fresenius Kabi.

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Disclosure

Michelle Mandrack and Susan Paparella declare no conflicts of interest, real or apparent, and no financial interests in any company, product, or service mentioned in this program, including grants, employment, gifts, stock holdings, and honoraria

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Objectives

- Identify the most common unsafe practices and at-risk behaviors associated with the preparation and administration of IV push medications to adults
- Discuss safe practices associated with the use of IV push medications for adults
- Describe the anticipated challenges to the implementation of *ISMP's Safe Practice Guidelines for Adult IV Push Medications*
- Recognize the role of all stakeholders in the attainment of safe IV push practices in adults

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IV Push Medication Use: Understanding Risk and Safety Challenges

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Risk Identification

- Errors reported to the ISMP National Medication Errors Reporting Program (MERP)
- Clinical observations made during ISMP Proactive Medication Safety Risk Assessments
- *Medication Safety Alert!* Surveys:
  - 2010 (N=800) Medication Safety Impact of the Economic Crisis
  - 2012 (N=540) Carpuject practices
  - 2014 (N=1,773) Dilution practices
- Peer-reviewed literature

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Intravenous Medication Use

- Essential component of care
- Clinically advantageous
  - Immediate therapeutic effect
  - High plasma levels
  - Reach target effect quickly
- Errors in use have potential for serious harm[1-2]

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Limited Studies on IV Administration Errors

- American Nurses Association (ANA) Medication Errors and Syringe Safety Are Top Concerns for Nurses[3]
  - 99% believed risk to patients is serious
  - Errors most likely to happen during the preparation and administration of IV medications
- Meta-analysis showed 73% probability of making at least one clinical error with a dose of IV medication/IV infusion[4]
  - At least a quarter of the errors likely to result in permanent harm[5]

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Limited Studies on IV Administration Errors

- 2003 Taxis K, Barber N.[6]
  - IV administration errors occurred in 42% of doses observed
- 2003 Taxis K, Barber N.[7]
  - Errors during IV administration occurred most frequently with IV bolus administration (73%)
  - Most common was administration too quickly (98%)

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Rates of IV Push Administration

- Giving IV push medications too fast is most common type of IV drug errors[6,8,9,10]
  - 43%[8] to 69%[6,11] (majority clinically significant)
  - Wide variability in rates of administration
  - Drug characteristics and fast rates associated with pain, phlebitis, other complications[12]

FAST

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Wrong Rate Event

- Physician prescribed 20 mg labetalol IV bolus for ED patient with hypertensive crisis
- Nurse retrieved medication quickly but patient being moved to radiology
- Enroute, nurse administered the drug in seconds
- Patient immediately arrested

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Rates of IV Push Administration

- Use of term "bolus" to describe small amount of IV medication over short time to elicit response or provide loading dose
  - Misunderstood to mean very quick IV push vs. administration over short interval

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Rates of IV Push Administration

- In PACU, a nurse found patient IV tubing clamped
- Opened the line and flushed it prior to administering a dose of **HYDRO**morphone
- Patient went into respiratory arrest 2 minutes later
- Several mg of rocuronium present in IV tubing and inadvertently flushed into patient quickly

- Typical length of IV tubing 60 inches/10 mL
- Typical length of anesthesia set 100 inches/20 mL

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Rates of IV Push Administration

- Dead volume in IV tubing between port and bloodstream can result in reservoirs of medications
  - Dead volume: common volume shared by 2 infusates
  - Flush or IV push medications can cause too rapid administration of medication in tubing
  - Rate of continuous infusion not considered
    - Move IV push medications too swiftly through tubing once slow IV push completed at distal port used
  - Studies suggest dead volume overlooked by 85-100% nurses[11,13-14]
    - 95% flushed too fast[6]

Rates of IV Push Medication Administration

- 2-5 minutes is a LONG time when administering medication
- Clocks showing elapsed time improve practice[4,15]
- Tubing and ports that connect close to bloodstream

Factors that Increase the Risk of Errors with IV Push Medications

- Using part of a vial or ampule, or more than one vial or ampule for a dose
- Manipulations needed to prepare medications (e.g., vial-to-syringe, syringe-to-syringe transfer, dilution)
- Reconstitution of powders with specific diluents
- Dilution of some concentrated injectable drugs

Unnecessary or Improper Dilution

- Dilution may lead to unlabeled/mislabeled syringes, contamination, dosing errors
- ISMP survey on dilution practices (adults) N =1,773[16]
  - 83% further dilute IV push medications
    - Single-dose vials and ampules **77%** (14% always)
    - Multiple-dose vials **49%** (11%)
    - Manufacturer's prefilled syringes **43%** (10%)
    - Pharmacy-dispensed syringes **20%** (5%)

Unnecessary or Improper Dilution

- Medications
  - Opioids **67%** (27% always)
  - Antianxiety/antipsychotic **65%** (24%)
  - Antiemetics **55%** (18%)
  - Anticonvulsants, cardiovascular, reversal agents, insulin, heparin

Unnecessary or Improper Dilution

- Other reasons for diluting medications
  - Mistaken belief that it is safer to dilute all drugs to give slowly and monitor patient
  - Nurses reported diluting medications that manufacturers specifically warn not to dilute (e.g., darbepoetin alfa)
  - Use of a bag of normal saline to administer concurrently with IV push medication to circumvent need to dilute drug

Unnecessary or Improper Dilution

- Other reasons for diluting medications
  - Dilution in larger syringe diameter for patients with PICC to reduce the pressure

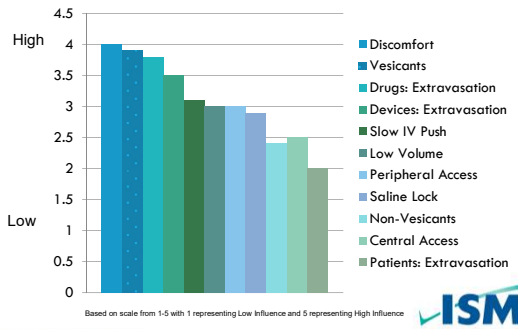
- *"To prevent catheter damage, the size of the syringe used for flushing and locking should be in accordance with the catheter manufacturer's directions for use. Patency is assessed with a minimum 10 mL syringe filled with preservative-free 0.9% sodium chloride. Flush syringes holding a smaller volume and/or designed to generate lower amounts of pressure may also be used to assess patency."* [17]

Infusion Nursing Standards of Practice, Standard 45. Flushing and Locking, Practice Criteria H.

Unnecessary or Improper Dilution

- 49% said volume of diluent and method to determine the volume of diluent was variable
  - Most had personal formulas
    - 1 mL per minute of time needed to slowly administer drug
    - Different if peripheral or central line
  - No respondents described a dilution process that would result in a specific concentration
  - 43% reported policies or guidelines on dilution
- 54% reported drawing medication into manufacturer's prefilled "flush" syringe

Factors that Influence a Decision to Dilute



Based on scale from 1-5 with 1 representing Low Influence and 5 representing High Influence

Improper Reconstitution

- Relatively few medications require reconstitution or dilution immediately before administration
- Reconstitution in patient care units
  - From 11%[8] to 49%[18] of IV medications diluted with wrong diluent
  - Administering just the diluent if labeled with product name
  - Reconstituted medications are often drawn back into the syringe containing diluent

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Causes of IV Push Medication Errors

- Inadequate training/knowledge or skill deficiencies[5,7]
- Lack of dedicated space for preparation[7]
- Wide variability in preparation and administration procedures[6]
- Learned workplace behaviors that persist regardless of knowledge or experience[5]
  - At-risk behaviors

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Nurse-Prepared Medications

- In 2010 survey, 25% nurses said they mix (prepare) more drugs than ever before on the clinical unit[19]
  - Joint Commission standard to dispense in most "ready-to-use form" (MM.05.01.11)
  - Impacted by highly decentralized drug distribution in ADCs
- Risk of error heightened
  - Less opportunity for double-checks
  - Often a multi-step process
  - Confusing/look-alike product labeling
  - Many prepared on units are high-alert medications

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Misuse of Vials, Syringes, and Needles

- 2010 online survey nurses (N = 5,446)[20]
  - **1%** admitted to sometimes or always reusing a syringe for multiple patients after only changing the needle
  - **6%** admitted to sometimes or always using single-dose/single-use vials for multiple patients
  - **15%** admitted to sometimes or always using the same syringe to reenter a multiple-dose vial numerous times
    - **7%** reported saving these vials for use with other patients
  - **9%** sometimes or always use a common bag or bottle of IV solution as a source of flushes and drug diluents for multiple patients

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Misuse of Vials, Syringes, and Needles

- Mistaken beliefs
  - Reuse of single-dose vial depends on vial size
  - Reentry into multiple-dose vial not a problem related to bacteriostatic or preservative agents
  - Use of a common IV bag safe if discarded after 24 hours
  - Changing the needle is sufficient (not just nurses)

- Anesthesia reused syringes to access vials of propofol after only changing the needle (2008)[21]
- 63,000 clinic patients exposed - 205 infected

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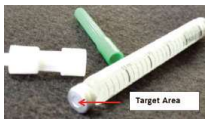
Misuse of Vials, Syringes, and Needles

- Survey on Carpuject™ prefilled syringes (N=540)[22]
  - Looking at issue of overfill & whether nurses were aware
  - Many nurses not concerned about overfill because they withdrew doses from the cartridges using a syringe
  - Using cartridges as single-/multiple-dose vials
    - Removing the needless adapter and puncturing the rubber diaphragm with a needle attached to syringe
    - Withdraw dose and waste or save it for another dose



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Prefilled Syringe Cartridges as Single- and Multiple-Dose Vials[22]

- Risk of contamination
  - Entry into a cartridge not intended for puncture as a vial
  - Using single-use cartridges as multi-dose vials
- Risk of unlabeled syringes or mislabeled syringes
- Risk of dosing or measurement errors when transferring medication from one syringe to another
- Loss of barcode for scanning on prefilled cartridge
- Risk of staff needlestick injuries
- Risk of conditions that may facilitate drug diversion of products documented as "wasted"

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Reasons Prefilled Syringes Not Used as Designed[22]

- Unavailable syringe holders
- Unaware of syringe holders or how to use them
- Can't see volume in cartridge when inside syringe holder
- To prevent waste during shortage
- To prevent infection transmission with reuse of unclean syringe holders for multiple patients
- Desire or need to dilute medication before injection
- Cartridge sometimes slips, making administration difficult
- Rubber plunger pulls out of the cartridge too easily
- Incompatibility of holder with some needleless IV connectors
- Risk of breaking the glass cartridges

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Limited or Absent Labeling

- Clinician-prepared syringes are common
  - ANA survey: 44% of nurses administer IV push medications more than 5 times each shift[3]
- Labels on clinician-prepared syringes more likely to be limited or absent
- Unlabeled syringes observed in every patient care area[23]
  - Despite Joint Commission standard
    - Unlabeled medications among top 5 standards with lowest compliance in office-based surgery settings
    - Unlabeled medications among top root causes in sentinel event data

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Absent Labeling Event

- A syringe containing vecuronium was prepared for a trauma patient
- Medication not used and syringe set down near saline flushes
- Vecuronium later used to flush the IV line of an alert 3-year-old girl
- Child became flaccid and respiratory efforts ceased
- Quickly intubated and ventilated, so permanent harm averted

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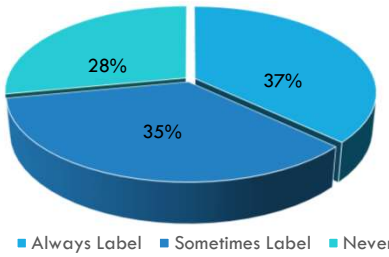
ANA Survey on Challenges with Labeling



- Nurses cited multiple factors that interfere with labeling
- 68% believe errors can be reduced with more consistent syringe labeling

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Failure to Disinfect Access Ports

- Ports not disinfected
  - Unexpected outcome from using needleless systems
- Proper procedure may not be followed/coached
- Port exposed to potential contamination that can be pushed into IV line once accessed

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Failure to Engage Barcode Medication Administration

- No barcode on nurse-prepared syringes
- Multiple-dose vial not brought to bedside
- Missing or unreadable barcode on package/wristband
- Improper or skipped process steps
- Scan barcode on one package multiple times
- Scanning pre/post administration
- Don't use data from barcode system for process improvements

Other Challenges

- Patient assessment and monitoring of patients who receive IV push medications
- Use of filter needles with ampules
- IV push drugs given by wrong route
- Extravasation
- Possible overfill in vials and prefilled syringes

Other Challenges

- Ambiguous and undefined terminology often used to direct the administration of IV medications such as "IV push," "IV," "IV bolus," "IV over X minutes," and "slow IV push"
- A lack of, confusing, or ambiguous directions found in drug information resources regarding whether a medication can or must be diluted prior to IV push administration
- Lack of administrative policies/protocols/guideline development for IV injections by organizations, so the expectation for safe practice is undefined and left solely to each individual's and/or the department's preference

Taking a Lead in Advancing Medication Safety: ISMP Safe Practice Guidelines for Adult IV Push Medication Use

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Vice President - ISMP

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National Summit

- Educational grant from BD
- 56 expert participants from across the US
- Interdisciplinary mix of frontline providers, as well as individuals representing professional organizations, regulatory bodies, and vendors
- Initial framework of risk and best practices established based on literature review and analysis of the ISMP Medication Errors Reporting Program (MERP) and ISMP surveys
- Consensus methodology utilized
- Public review and comment period followed

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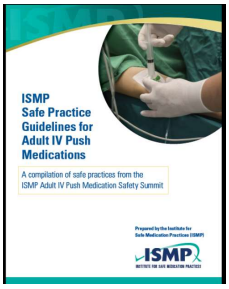
Safe Practice Guidelines for Adult IV Push Medications

- Identify the risks with IV push medication administration
- Relate current evidence related to IV push practices
- Make recommendations for safe management of IV push medications



http://www.ismp.org/Tools/guidelines/IVSummitPush/IVPushMedGuidelines.pdf

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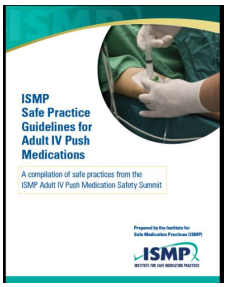
Safe Practice Guidelines for Adult IV Push Medications

- Identify unresolved issues that impact safe IV push practices requiring additional study
- Outline further action by stakeholders to improve the safety of IV push medication use



http://www.ismp.org/Tools/guidelines/IVSummitPush/IVPushMedGuidelines.pdf

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Guidelines Intended to:

- Reduce unacceptable or undesirable variations in practice
- Provide a focus for discussion among health professionals
- Allow different practitioner groups to reach agreement regarding safe management
- Support a quality framework by which organizational practices can be evaluated

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Safe Practice Guideline Categories

1. Acquisition and Distribution of Adult IV Push Medications
2. Aseptic Technique
3. Clinician Preparation
4. Labeling
5. Clinician Administration
6. Drug Information Resources
7. Competency Assessment
8. Error Reporting

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Acquisition and Distribution of Adult IV Push Medications

1.1 To the greatest extent possible, provide adult IV push medications in a ready-to-administer form (to minimize the need for manipulation outside of the pharmacy sterile compounding area)

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Acquisition and Distribution of Adult IV Push Medications

1.2 Use only commercially-available or pharmacy-prepared prefilled syringes of appropriate IV solution to flush and lock vascular access devices

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Aseptic Technique

2.1 Use aseptic technique when preparing and administering IV push medications, flush/locking solutions, and other parenteral solutions administered by direct IV injection

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Aseptic Technique

Aseptic technique includes:

- 2.1a Hand hygiene prior to and after preparation and administration of the medication or solution
- 2.1b Disinfection of the medication access diaphragm on a vial or the neck of an ampule prior to accessing the medication or solution

Aseptic Technique

Aseptic technique includes:

- 2.1c Disinfection of the IV access port, needleless connector, or other vascular access device (VAD) prior to administration of the medication or solution
- 2.1d The use of personal protective equipment (PPE) if contact and exposure to blood or bodily fluids are possible when administering the medication or solution

Clinician Preparation

3.1 Withdraw IV push medications from glass ampules using a filter needle or straw, unless specific drugs preclude their use

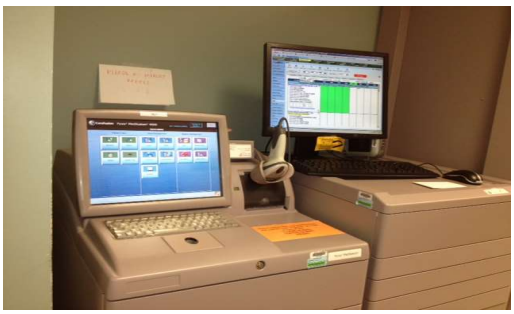
3.2 Only dilute IV push medications when recommended by the manufacturer, supported by evidence in peer-reviewed biomedical literature, or in accordance with approved institutional guidelines

Clinician Preparation

3.3 If dilution or reconstitution of an IV push medication becomes necessary outside of the pharmacy sterile compounding area, perform these tasks immediately prior to administration in a *clean, uncluttered, and functionally separate location* using *organization-approved, readily-available drug information resources* and sterile equipment and supplies

Safe Location For IV Push Drug Preparation?

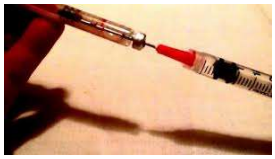
Safe Location for Drug Preparation?



Clinician Preparation

3.4 Provide instructions and access to the proper diluent when reconstitution or dilution is necessary outside of the pharmacy sterile compounding area

3.5 Do NOT withdraw IV push medications from commercially-available, cartridge-type syringes into another syringe for administration



Clinician Preparation

3.6 Do NOT dilute or reconstitute IV push medications by drawing up the contents into a commercially-available, prefilled flush syringe of 0.9% sodium chloride

Clinician Preparation

3.7 When necessary to prepare more than one medication in a single syringe for IV push administration, limit preparation to the pharmacy

Clinician Preparation

3.8 NEVER use IV solutions in containers intended for infusion, including mini bags, as common-source containers (multiple-dose product) to prepare IV flush syringes or to dilute or reconstitute medications for one or more patients in clinical care areas

Labeling

4.1 Appropriately label all clinician-prepared syringes of IV push medications or solutions, unless the medication or solution is prepared at the patient's bedside and is immediately administered to the patient without any break in the process

Labeling

4.1a If the clinician needs to prepare and administer more than one syringe of medication or solution to a single patient at the bedside:

- Prepare each medication or solution separately, and immediately administer it before preparing the next syringe

OR

- If preparing several IV push medications at a time for sequential IV push administration, label each syringe as it is being prepared, prior to the preparation of any subsequent syringes

Labeling

4.1b Alternatively, if a practitioner prepares one or more medications or solutions away from the patient's bedside, immediately label each syringe, one at a time, before preparing the next medication or solution

4.1c Bring only one patient's labeled syringe(s) to the bedside for administration

Labeling

4.2 Provide clinical units with blank or printed, ready-to-apply labels, including sterilized labels where needed, to support safe labeling practices

4.3 Immediately discard any unattended, unlabeled syringes containing any type of solution

Labeling

4.4 Never pre-label empty syringes in anticipation of use

Clinician Administration

5.1 Perform an appropriate clinical and vascular access site assessment of the patient prior to and following the administration of IV push medications

5.2 Unless its use would result in a clinically significant delay and potential patient harm, use barcode scanning or similar technology immediately prior to the administration of IV push medications to confirm patient identification and the correct medication

Clinician Administration

5.3 Administer IV push medications and any subsequent IV flush at the rate recommended by the manufacturer, supported by evidence in peer-reviewed biomedical literature, or in accordance with approved institutional guidelines. Use an appropriate volume of the subsequent IV flush to ensure that the entire drug dose has been administered

Clinician Administration

5.4 Assess central line patency using at a minimum, a 10 mL diameter-sized syringe filled with preservative-free 0.9% sodium chloride. Once patency has been confirmed, IV push administration of the medication can be given in a syringe appropriately sized to measure and administer the required dose

Clinician Administration

5.5 When administering IV push medications through an existing IV infusion line, use a needleless connector that is proximal (closest) to the patient, unless contraindicated in current evidence-based literature, or if the proximal site is inaccessible for use, such as during a sterile procedure

Drug Information Resources

6.1 Standardized, facility-approved IV push medication resources are readily available at the point of care to guide the safe practice of IV push medication administration

Resources should include any special considerations for the preparation and administration of IV push medications and for unique practice locations where medications may be administered IV push to ensure effective patient monitoring

Competency Assessment

7.1 Competency assessments for IV push medication preparation and administration are standardized across disciplines within healthcare organizations and validated through an initial assessment and on an ongoing basis

Error Reporting

8.1 Report adverse events, close calls, and hazardous conditions associated with IV push medications internally within the healthcare organization as well as in confidence to external safety organizations such as ISMP for shared learning

8.2 Use internal and external information about adverse events, close calls, and hazardous conditions associated with IV push medications for continuous quality improvement

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Future Inquiry

- Standardize the terminology associated with the safe use of IV push medications among professional organizations, accrediting bodies, and regulatory agencies to promote safe practice

Bolus? Slow IV Push ?

- Determine under what circumstances it is safe to draw up more than one dose or use a single syringe that contains more than one dose of IV push medication for a single patient?

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Future Inquiry

- When can we use smart syringe pump technology for IV push administration?
- Are there other bedside devices/technologies to support safe IV push practices?
- What is the best inter-professional education and competency evaluation for IV push medication administration? Who should it involve?

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Anticipated Implementation Challenges

- Assessment of practice
- Changing attitudes and beliefs:
  - Recognition of the need to alter current practices
  - Convincing professional staff that the efficiencies gained in the work-arounds are not without risk
- Changing behaviors:
  - Moving away from using prefilled syringes of flush solution for drug dilution and administration
  - Providing more medications in a ready-to-administer form

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Next Steps

- Organizations are asked to enhance current orientation and clinical educational models to include the safety of IV push medication therapy
- Manufacturers are asked to provide IV products in the most ready-to-administer form as possible, and to design devices and technology that will promote the safe administration of IV push medications

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Next Steps

- Educators and healthcare leaders are asked to observe and monitor practice, and coach at-risk behaviors
- Academicians are asked to look for novel ways to introduce IV push medication safety into the curriculum, and to ensure student understanding of all safety principles for IV push medication therapy before graduation

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Next Steps

- Researchers are asked to take on the unanswered questions regarding IV push medication safety, leading the healthcare community to a better understanding of what places patients at risk and the corresponding evidence-based strategies that have proven to be the most successful
- Frontline practitioners are asked to adopt and promote safe practices, to avoid risky behavioral choices that bypass basic safety and infection control practices, and to report any system barriers making it difficult to maintain best practices

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Next Steps

ISMP:

- Continue to work with all stakeholders to accomplish IV push medication safety goals
- Develop a risk assessment tool to assist organizations to determine gaps in practice

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Questions?

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