

### Situation

Safe administration of intravenous (IV) push medications is an issue of growing concern in health care today.<sup>1</sup> The risks from many types of medication errors have been decreasing since the adoption of technological solutions such as computerized physician order entry and bar-coded medication administration, but significant risks remain with IV push medications because of the lack of safety checks at the point of preparation and administration.<sup>2-4</sup> Gradually over time, patients and healthcare providers have come to prefer and use the IV route of administration instead of the traditional approach of intramuscular or subcutaneous injections. Evidence-based practice and expertise in preparation and administration of IV push medications has not kept pace with this trend.

Several at-risk practices have been identified, which potentially lead to adverse drug events such as unlabeled syringes, mislabeled syringes, syringe-to-syringe transfer, unnecessary dilution, and use of saline flush syringes to dilute IV medications.<sup>5-8</sup>

The purpose of this informational poster is to raise awareness about the risks associated with the nursing practice of diluting IV Push medications and to stimulate inquiry into developing the science for best practices.



### Background

A survey conducted by the Institute for Safe Medication Practices (ISMP) in 2014 revealed several surprising things about nursing practices for preparation and administration of IV push medications.<sup>8</sup> 83% of the nurses reported that they further dilute some IV push medications that come in vials or ampules, and 20% or more respondents also dilute prefilled syringes. Most of the medications cited by the nurses do not require dilution at the point of care (per manufacturer).

The nurses gave several reasons why they dilute which include:

- Anticipated discomfort at the injection site
- Irritant nature of the medication
- High risk of extravasation with drug or delivery device
- Viscosity of the medication
- Difficulty in measuring a very small dose

A review of the nursing references for IV push medication administration reveals that there is a paucity of data to support many of the recommendations about dilution and rate of administration. Tertiary references do not cite sources of their recommendations. The reference books make blanket statements about dilution and rate of administration, with qualifiers like "if preferred". Preferred by whom? Preferred why? How is the nurse expected to use a guidance that suggests the rate of administration for morphine should be 2-10 mg over 4-5 minutes? The rationale most frequently cited for dilution and slow rate of administration is to prevent adverse drug reactions. But what is the evidence that adverse drug reactions are occurring due to rapid IV push administration? There is primary research data that supports the safe administration of opiates such as morphine at a rate of 5 mg per minute.<sup>9</sup> Yet another study demonstrated the safe administration of a single dose of Morphine 7.5 mg IV push over 1 minute to post-surgical patients.<sup>10</sup> One other source of evidence to support a faster rate of administration for opiates is the safe administration of Patient Controlled Analgesia (PCA). The default bolus administration rate for a PCA pump is set at 150 mL/hr, and can be as fast as 500 mL/hr. Are we relying on recommendations based rooted in fear when there is data to support a practice change?

Dilution of IV push medications is not recommended by a consensus panel of experts in Pharmacy, Nursing, IV Therapy, and Infection Control.<sup>1</sup> **The contamination risks of compounding sterile products at the bedside, plus the risks of unlabeled or mislabeled syringes far outweighs the fear of causing harm.**

### Consider the following.....

**Dilution is not needed for most injectable drugs**

- Pain at the injection site – consider there will always be a sensation because of the temperature difference when injecting room temperature liquid into the body.
- The pH and osmolality of most injectable drugs does not need to be adjusted by dilution prior to injection.
- Many drugs are approved for both IM and IV route – if you can give it IM it does not cause extravasation injury.

**Unapproved use of prefilled saline syringe**

- Transfer of drug into Prefilled Saline Syringe increases the risk of microbial contamination.
- Prefilled Saline Syringes are NOT approved by the FDA for drug dilution.
- Gradations on Prefilled Saline Syringes are NOT calibrated for dose accuracy.
- Transferring drugs into Prefilled Saline Syringes creates mislabeled syringes.

**Dilution not needed to control rate of administration**

- There is a lack of evidence for rates of administration
- Rapid IV push rate already in use with PCA pump technology
- The rate of administration is controlled by the rate of the saline flush.

### Assessment

**The preparation and administration of IV push medications to adults is a high-risk process.** Harm from IV medications errors has been reported to be 5 times greater than from non-IV doses of medications.<sup>4</sup> **The risks to patients are exacerbated by the high degree of variability in nursing practices for IV push medications.** In the 2014 study by ISMP, it was found that 49% said volume of diluent and method to determine the volume of diluent was variable. Most nurses had "personal formulas" for dilution that was based on a volume per minute not by a specific concentration. Only 43% reported that they had policies or guidelines for dilution, and 54% said they diluted drugs into manufactured prefilled flush syringes. **Dilution of IV push medications into prefilled saline syringes further increases the risks by creating mislabeled syringes.**

Recently the Center for Medicare & Medicaid Services (CMS) updated the hospital Conditions of Participation for both Pharmacy Services and Nursing Services, with the goal of decreasing the risks associated with IV medications. **Hospitals must meet all currently accepted standards for safe preparation and administration for CSPs, no matter who prepares them or where.** Nurses frequently prepare sterile medications at the bedside that are classified as "immediate-use CSPs," which are intended for immediate administration, not to be stored for later use. Unfortunately, medications may not be prepared under safe conditions, are stored for hours and may be used for multiple doses, thus increasing the risk of microbial contamination. If IV push medications must be prepared at the point of care, the organization must be able to provide a clean, uncluttered, and functionally separate location using organization approved, readily-available drug information resources and sterile equipment and supplies

### Recommendations

1. Provide manufacturer prefilled syringes or compounded sterile products from the pharmacy or outside vendor whenever possible.



### Recommendations

2. Limit the IV push medications that must be prepared at the bedside.

**Short list of IV push meds that require dilution at the point of care**

Famotidine	Pantoprazole
Lorazepam	Levothyroxine
Dipyramidole	

3. Provide appropriate diluents for point of care dilution (not prefilled saline syringes).
4. Standardize the procedures used for IV push preparation and administration.
5. Use the Saline - Administer - Saline procedure for all IV push medications.
6. Incorporate IV push medication preparation and administration guidelines into nursing programs, orientation, and competency assessments.
7. Inspect what you expect to happen – observe practices and provide coaching to gain compliance.

### References

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