

Multiple IV Infusion Safety



Andrea Cassano-Piché, MASC, P.Eng



Mark Fan, MHSc



Christine Koczmar, RN, BSc

Multiple IV Infusion Safety

This Webinar is Supported by:

Healthcare Technology Safety Institute (HTSI)

Infusion Nurses Society

Institute for Safe Medication Practices (ISMP)

ISMP Canada



Phase 1

- Identify issues that contribute to risk of patient harm when administering multiple IV infusions

Phase 2

- Generate and validate interventions to reduce the risk of errors

Scope

- IV medication delivery (e.g., epidural, enteral, intrathecal excluded)
- Large volume and syringe infusions only
- All IV components included (e.g., poles, tubing connectors)
- Excludes IV to non-IV misconnections and compatibility issues



Phase 1

Phase 2



Literature Review
Incident Database Review
Technology Scan



Field Studies
Education Interviews



Ontario-wide Survey
Simulation Study

- Summary of issues by theme
- Nine recommendations
- Summary of education findings
- Questions

Field Study Methods

Adult		Pediatric	
Unit Type	Number	Unit Type	Number
Medical/Surgical ICU	3	Medical Surgical ICU	1
Cardiac ICU	1	Cardiac ICU	1
Medical/Surgical/Cardiac ICU	1	Neonatal ICU	1
Outpatient oncology	1	Inpatient oncology	1
Emergency department	1		
Surgical ward	1		
Subtotal	8	Subtotal	4

- Secondary (“Piggyback”) Infusions
- Line Identification
- Line Set-up
- Dead Volume
- IV Bolus Administration

Secondary Issues



Secondary Case Study



Line Identification Issues



Line Identification Case Study





Line Setup Issues



Line Setup Case Study

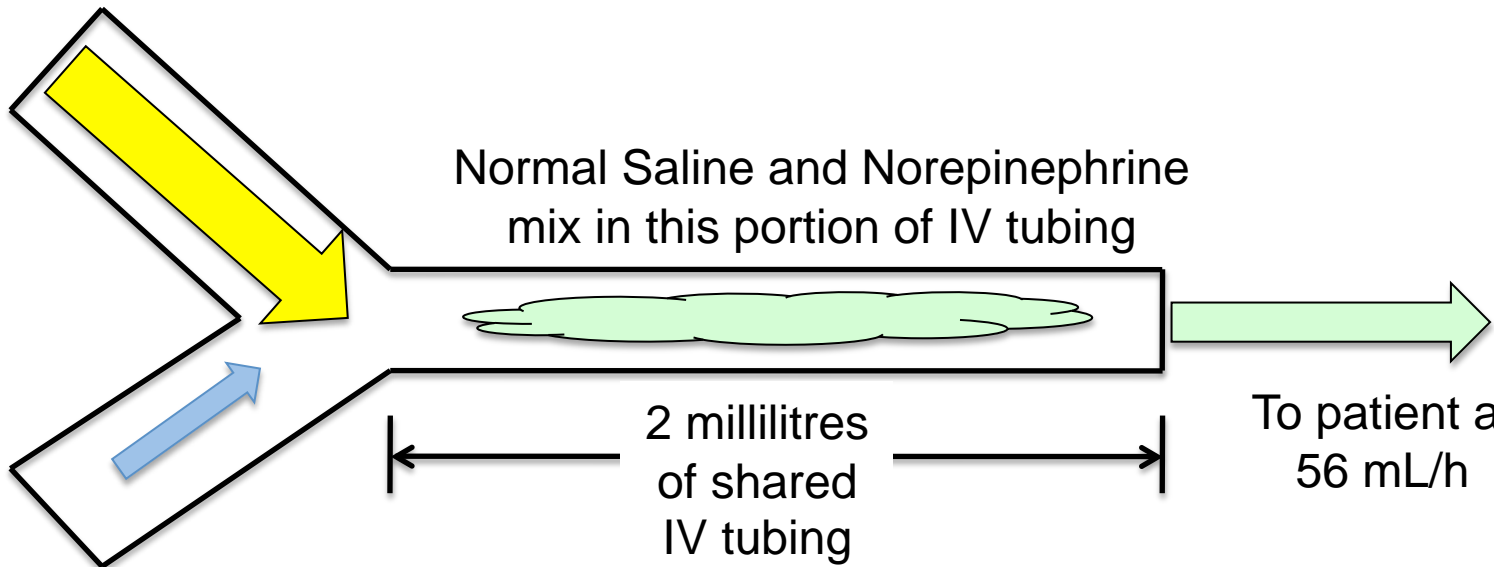


Dead Volume Issues



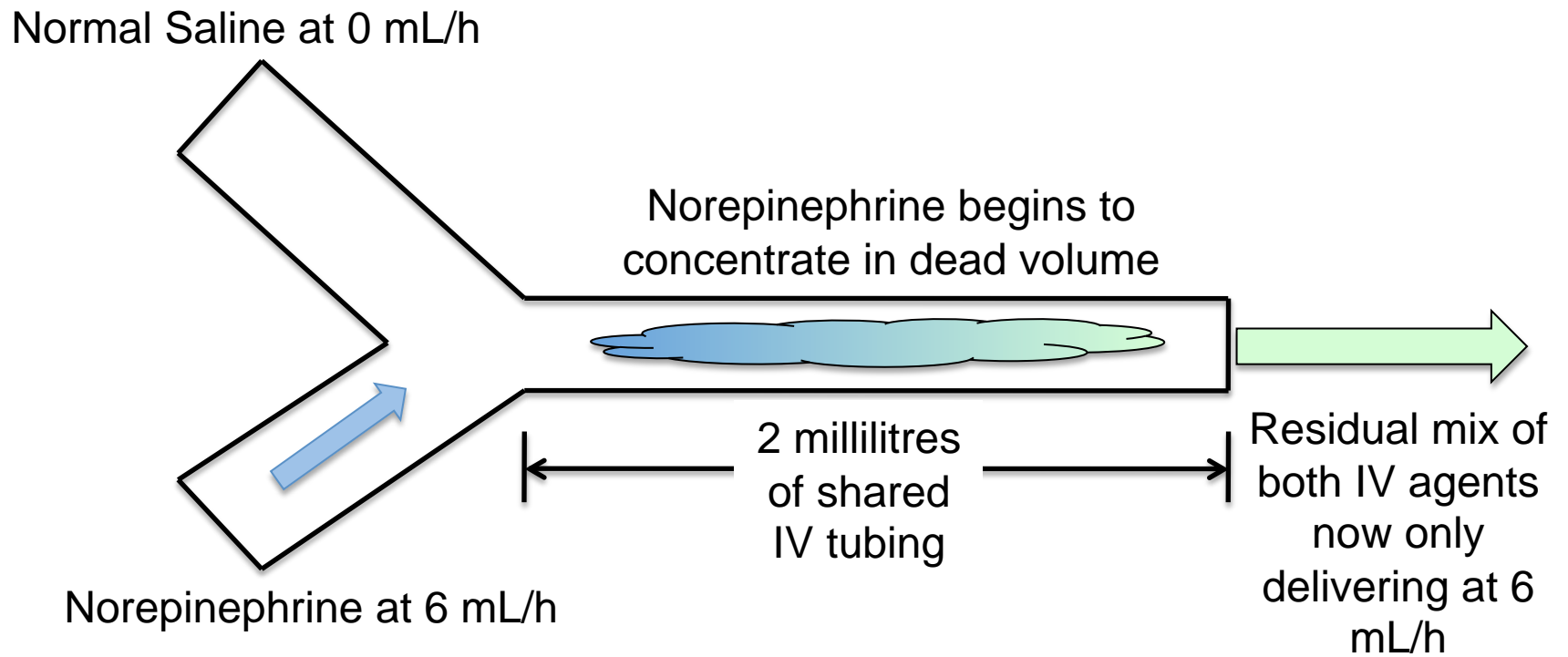
Dead Volume Issues

Normal Saline at 50 mL/h

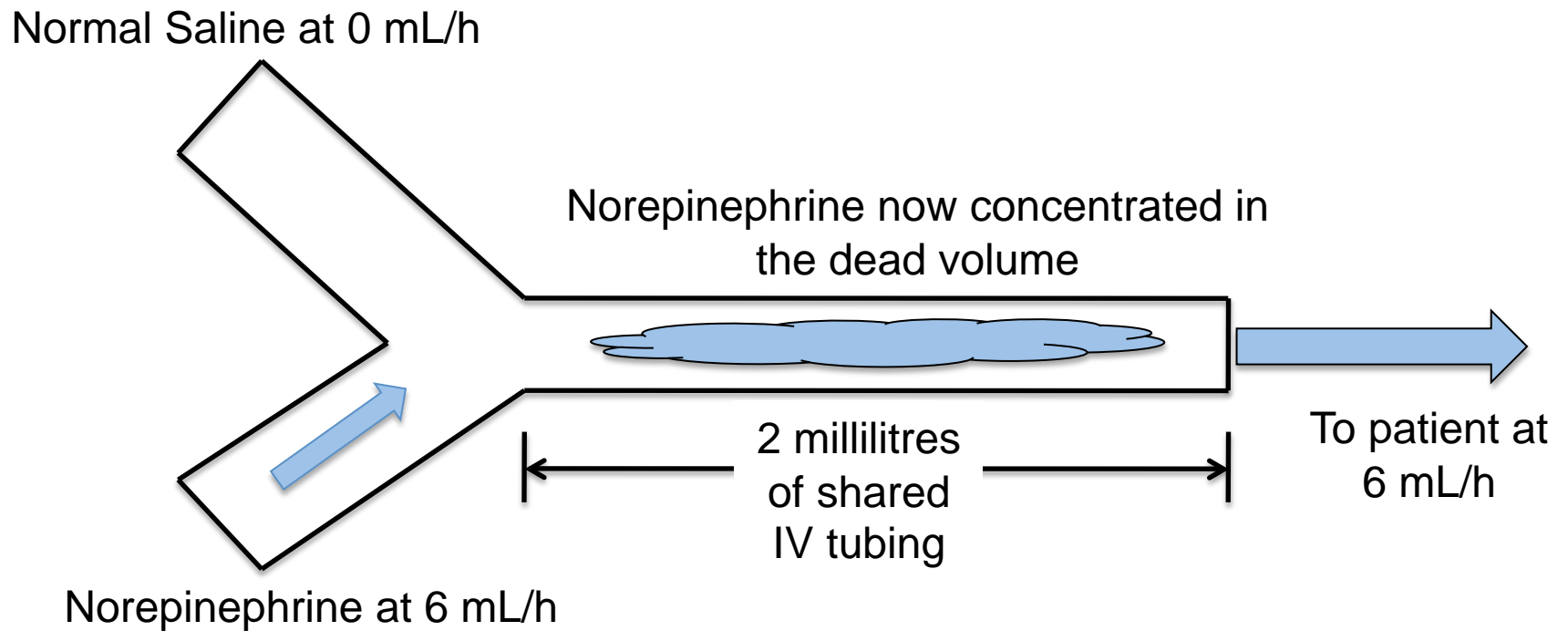


Norepinephrine at 6 mL/h

Dead Volume Issues

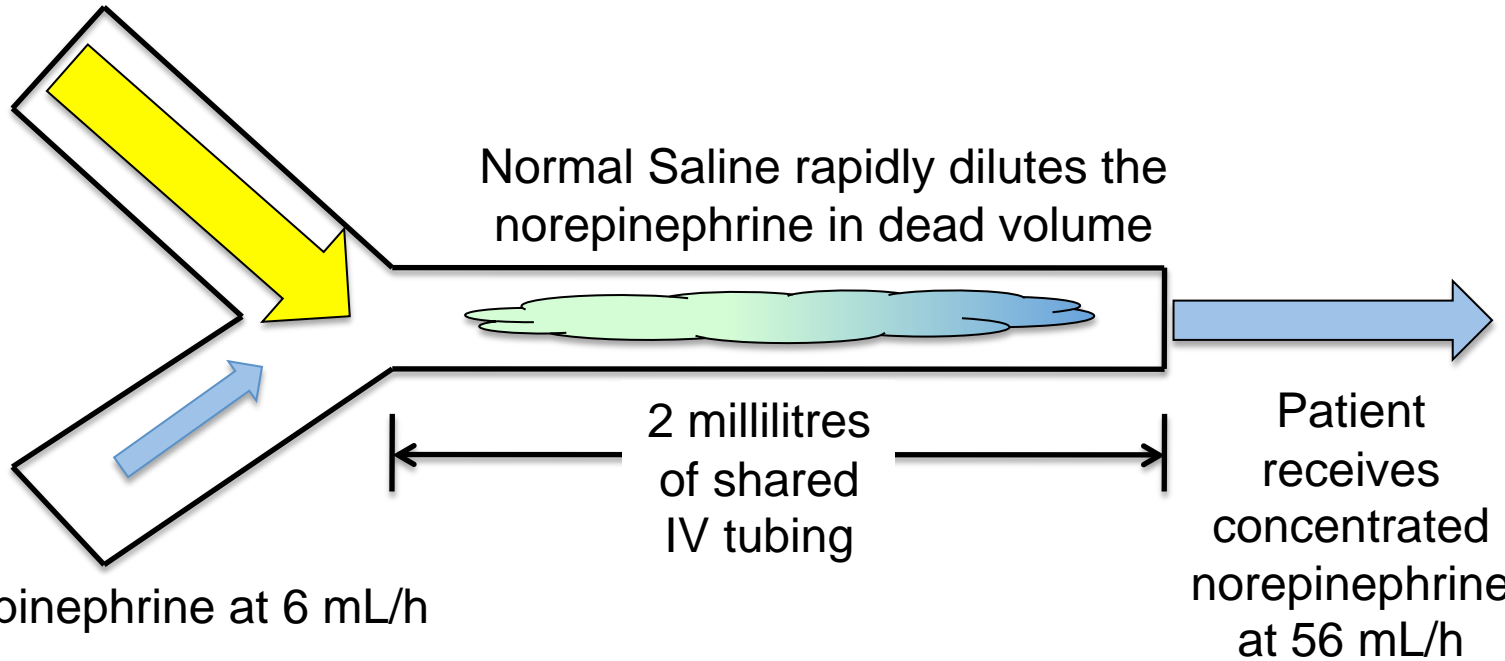


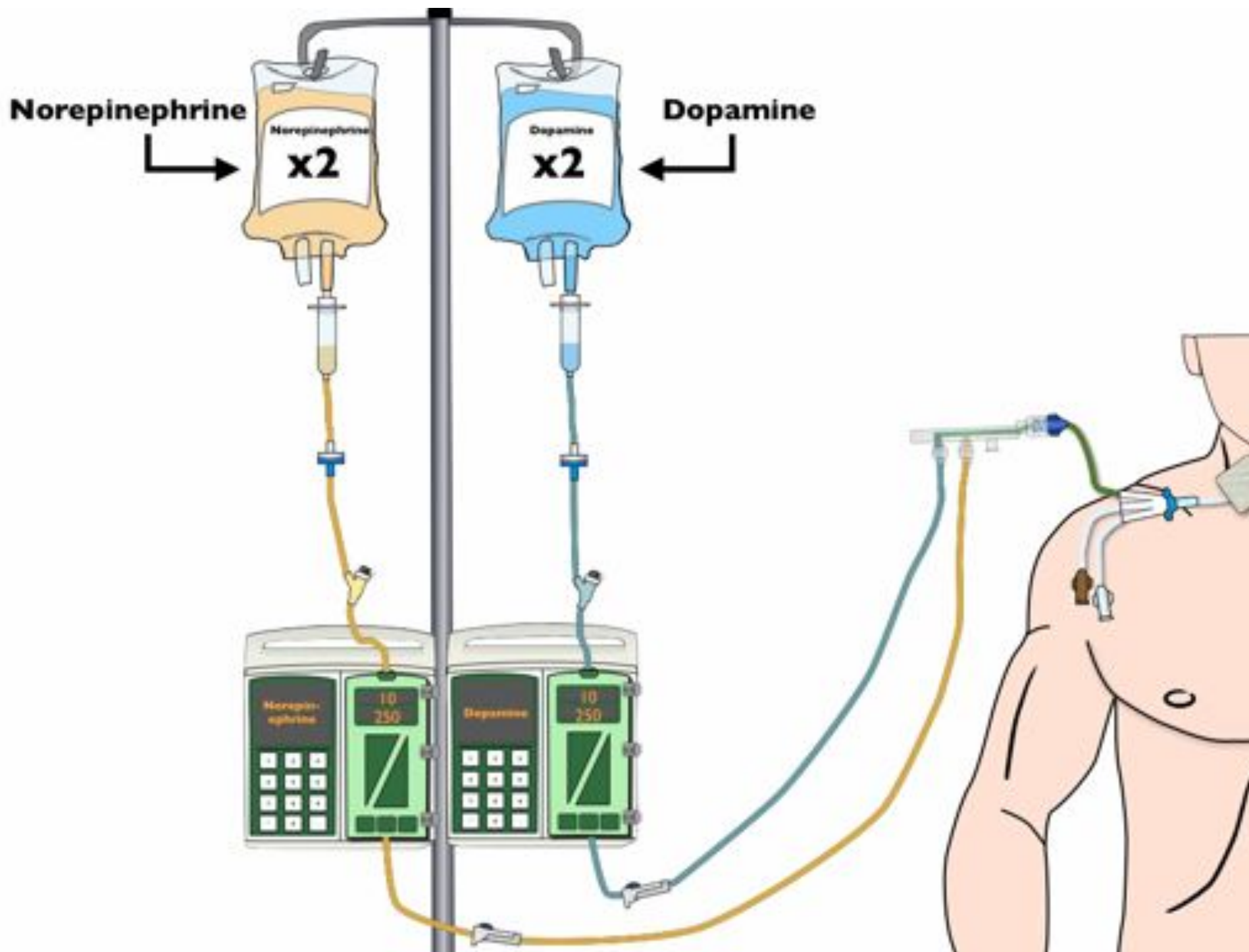
Dead Volume Issues



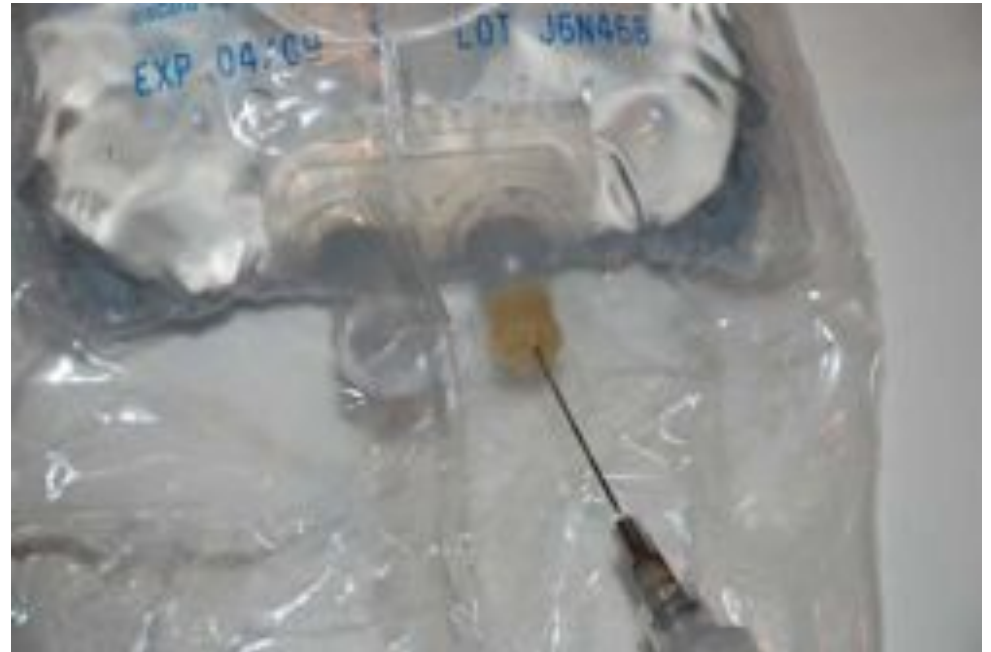
Dead Volume Issues

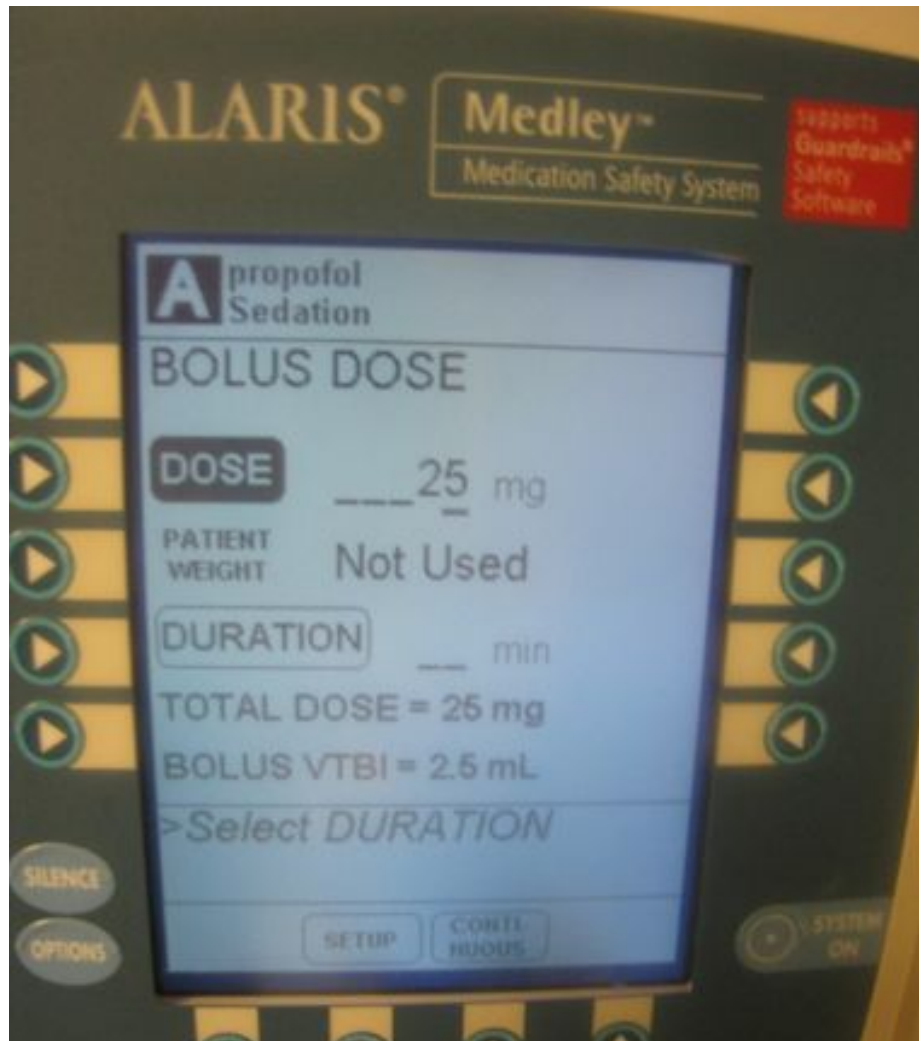
Normal Saline at 50 mL/h





IV Bolus Issues





Unsafe Bolus Methods

- Manually increasing the rate of the primary continuous infusion to a high value, waiting for a period of time, then manually adjusting the rate back to the primary rate
- Manually increasing the rate of the primary continuous infusion to a high value and changing the volume to be infused to reflect the bolus dose, then manually adjusting the rate and volume back to the primary values when the bolus is complete.

Safer Bolus Methods

- Use a pump's bolus feature to specify and deliver the bolus dose of a primary continuous infusion (preferred)
- **If no bolus feature is available** on the pump, program the bolus dose as a secondary infusion on a primary continuous infusion, but do not hang a secondary IV bag.
- **DO NOT** program the primary infusion outside of the drug library to support this task

IV Bolus Case Study



1. When initiating a secondary medication infusion (often referred to as a “piggyback” infusion), nurses should verify that the secondary infusion is active, and that the primary infusion is not active, by viewing the activity in both drip chambers. Full drip chambers should be partially emptied to restore the visibility of drips.

2. Continuous high-alert medications should not be administered as secondary infusions. No secondary medications should be connected to high-alert primary continuous infusions*

*The Institute for Safe Medication Practices defines high-alert medications as “drugs that bear a heightened risk of causing significant patient harm when they are used in error.” For more information, visit: <http://www.ismp.org/tools/highalertmedications.pdf>

3. Secondary infusions should be attached to primary infusion sets that have a back check valve. If infusion sets without back check valves are also available on the unit, multiple strategies should be employed to ensure that the types of tubing available are easily differentiated, and that the likelihood of a mix-up is minimized.

4. Hospitals should work towards the use of gowns that have snaps, ties, or Velcro on the shoulders and sleeves to facilitate line tracing and gown changing. Metal fasteners (e.g., metal snaps) should be avoided to prevent a patient burn should a gown with metal fasteners go into the magnet room of an MRI suite.*

*Healthcare Human Factors Group. Magnetic Resonance Imaging Environment Safety in Ontario. Toronto: University Health Network; 2006;
Available from: http://www.ehealthinnovation.org/files/MRI_Environment_Safety_in_Ontario.pdf.

5. If an “emergency medication line” that is controlled by an infusion pump is set up on a patient, it is strongly suggested that the associated primary IV tubing be labelled as the emergency medication line at the injection port closest to the patient. The label should be prominent, and visually distinct from all other labels in the environment.

6. When setting up multiple IV infusions at the same time (e.g., a new patient requires many ordered infusions immediately, routine line changes), infusions should be set up one at a time, as completely as possible, before setting up the next infusion. Set-up tasks required for each infusion vary and may include:
- labelling (e.g., IV tubing, pump);
 - spiking and hanging the IV bag;
 - connecting the IV tubing to the pump;
 - programming the IV pump;
 - connecting the IV tubing to the appropriate location (e.g., patient access, manifold); and
 - starting the pump (unless a secondary infusion must be set up prior to starting the pump, or other infusions need to be connected to a multi-port connector before flushing).

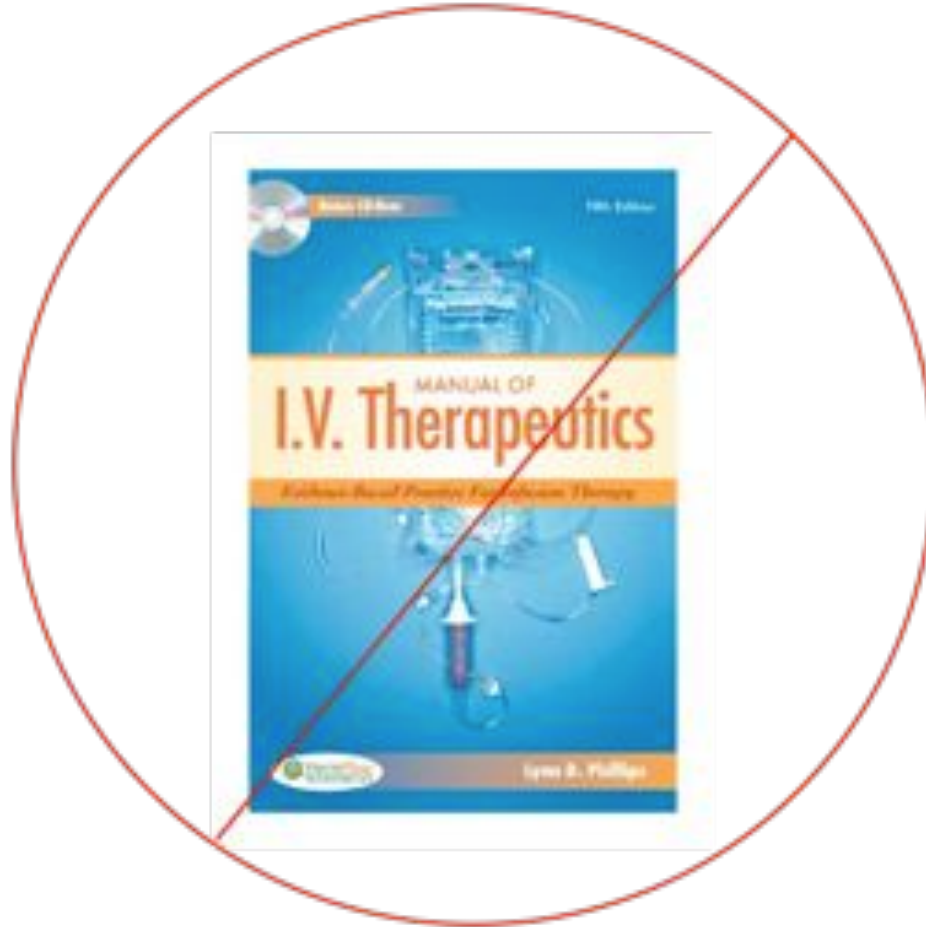
Minor modifications to this recommendation are required for routine line changes.

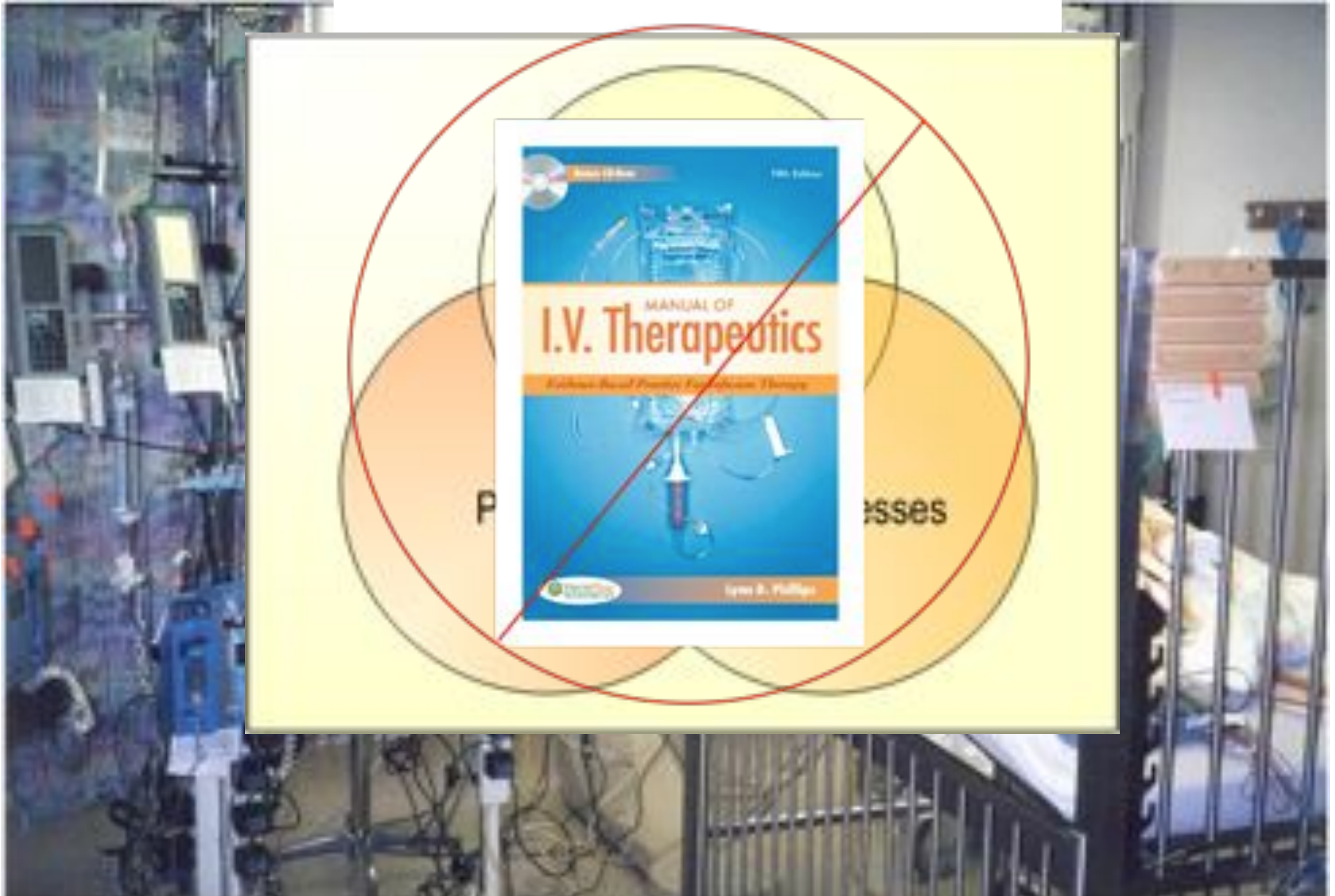
7. Multiple 3-way stopcocks joined together in series to connect multiple IV infusions into a single line are prone to leaks, which may often be undetectable. Hospitals should provide multi-port or multi-lead connectors, and nurses should use these connectors to join multiple IV infusions into a single line, as required.



8. Hospitals should develop a policy to limit the practice of manually increasing the infusion rate to administer a medication bolus of a primary continuous infusion. If a separate medication bolus cannot be prepared, and the bolus is administered using the primary continuous infusion pump/pump channel, then the nurse should program the bolus dose parameters (i.e., total amount of medication to be given over a defined duration) into the pump without changing any of the primary infusion parameters. Some examples of how to specify the bolus dose parameters include:
- programming a bolus using a dedicated bolus feature in the pump (preferred, if available)
 - programming a bolus using the pump's secondary feature but without connecting a secondary IV bag (pump will draw the bolus from the primary IV bag).

9. Hospitals should ensure that their smart pump drug libraries include hard upper limits for as many high-alert medications as are appropriate for each clinical area, in order to prevent the administration of a bolus by manually increasing the primary flow rate.







Information and Contacts

- Full Report Web Link:

www.hqontario.ca/en/eds/tech/pdfs/2012/multipleinfusions1b_May.pdf

- Multiple IV Infusions Project web page

<http://www.ehealthinnovation.org/?q=node/595>

- Contact information:

Mark Fan: mark.fan@uhn.ca