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Intravenous Smart Pumps at the Point of Care: A Descriptive, Observational Studay

Karen Giuliano RN

University of Massachusetts Amherst

Jeannine Blake RN

University of Massachusetts Amherst

Nancy Bittner RN

University of Massachusetts Amherst

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Background

- Linear peristaltic IV smart pumps (IVSP) are prone to use-error because the setup process must be managed manually at the point of care.
- Failure to adhere to setup specifications during clinical use may lead dangerous medication errors due to decreases in flow rate between what is actually delivered to the patient and what is programmed into the IVSP by the clinician.

Purpose

- Advance understanding of IVSP primary and secondary fluid and medication administration practices.
 - Observed adherence with manufacturer IVSP system setup requirements at the point of care during actual clinical use.

IV Pump Setup (Figure 1)

- The IVSP should be placed on the IV pole level with the patient's heart, with the top of the fluid in the primary container 20-24 inches above the middle of the pump.
- At least 9.5 inches between the primary fluid level and secondary fluid level are required for adequate infusion (#2).
- The hydrostatic pressure differential closes a back-check valve in the primary tubing to prevent unintended primary flow from the secondary container into primary container, instead of into the patient (#1).
- The roller clamp on the secondary tubing should be open during secondary infusion and closed during the primary infusion (#3).
 - If the roller clamp is inadvertently closed during secondary infusion, no pump alarm will sound, and the fluid will be pulled from the primary bag at the programmed secondary flow rate.

Methods

- The study was conducted in a 285-bed community hospital.
- The study design was observational and non-interventional, and all data were collected by a single observer.
- Observations included measurement and documentation of adherence with the Baxter Spectrum IQ system setup requirements with both primary and secondary infusion during actual clinical use.
- We also collected: type of secondary medication; system components (secondary hanger; tubing connections); concurrent flow; incomplete delivery.

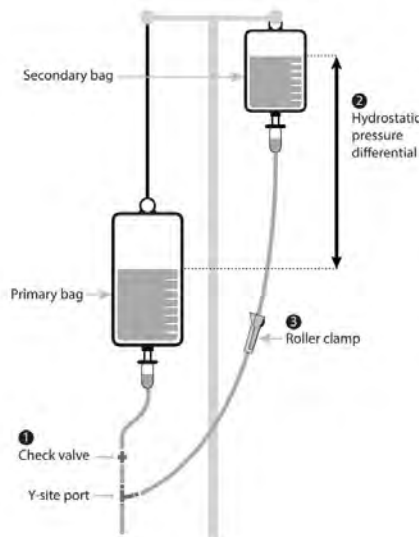


Figure 1. Required components for secondary medication infusion for head-height differential systems.

Results

- A total of 200 primary and secondary IV medication administration observations were included: 101 in critical care and 99 in medical-surgical.
- Overall adherence was found to be: 6.5% with IV smart pump position relative to the patient; 6.5% with required position of the primary infusion bag; and 69.5% adherence with required position of the secondary medication infusion bag, with no single system completely correct.
- Additionally, 83% of secondaries were antibiotics, and we found incorrect use of hanger (30%), concurrent flow (24%), incomplete delivery (61%).

Conclusion

- These results add to the body of knowledge that adherence to required system setup for head-height dependent IV smart pumps is low and difficult to achieve during actual clinical use, resulting in notable reductions in flow rates and secondary medication delivery.
- Consideration of alternative human factors designed technology to replace the current manual setup requirements is needed to improve the process of acute care IV medication administration in this very important area of patient safety.

References

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