Clarity PSO, a Division of Clarity Group, Inc.
8725 West Higgins Road • Suite 810 • Chicago, IL 60631
T: 773.864.8280 • F: 773.864.8281
www.claritypso.com

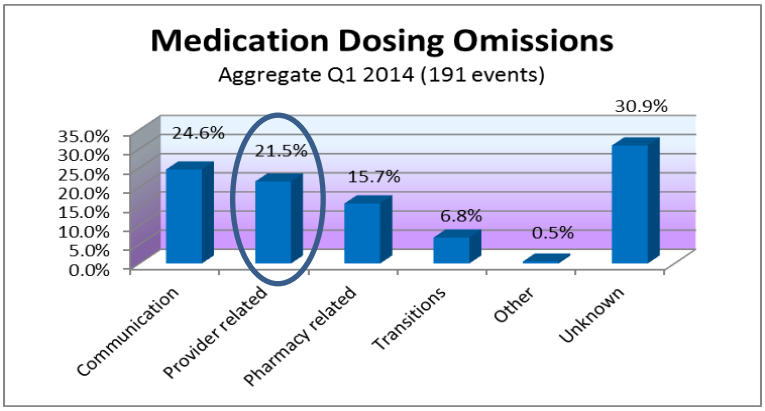
Clarity PSO Learning Series

Topic: Medications and Secondary IV Piggybacks

What We Learned

In a previous PSO Learning Series Report, we discussed medication events related to dosing omissions and the factors contributing to these errors. The analysis showed that right after "communication" the second most frequently reported contributing factor is "provider related" with several reports involving:

- Failure to unclamp the secondary line so that the medication can be infused
- Failure to activate (or mix) medication vials with IV fluids in the IV piggyback



We dug deeper into the data and found that secondary infusion errors continue to persist; this trend crosses many different settings, from large inpatient hospitals to small and rural health, making this a far reaching PSO Learning. Recent data in the PSO shows 17% of medication dosing events involved issues with the use of secondary medications or tubing.

Secondary infusions, also known as piggyback infusions, are used to intermittently deliver medications or fluids to a patient in lieu of the primary IV infusion. This is a common method of delivering medications to patients and therefore poses opportunities for more risks and/or errors. These risks include failure to unclamp the tubing, the medication not being activated, and the medication hanging but not connected to the main IV tubing line.

Through our research, we know that the failure to unclamp secondary tubing alone is a major issue and can cause errors such as:

- Secondary medication omitted or given too late, thereby disrupting therapy
- Inadvertent bolus (infusion of a set amount of fluid over a set amount of time) of primary infusion line, which may or may not be harmful
- Potential for fluid overload due to correction of clamped tubing (Example: because the secondary line was clamped, the medication was never infused and a bolus of primary fluid was administered instead. Then as a correction, the secondary line was unclamped and the medication dose along with the additional fluid was administered).

Clarity PSO, a Division of Clarity Group, Inc.
8725 West Higgins Road • Suite 810 • Chicago, IL 60631
T: 773.864.8280 • F: 773.864.8281
www.claritypso.com

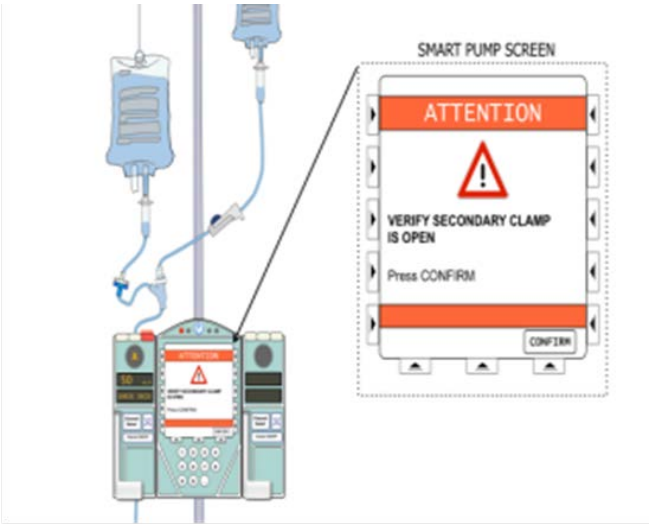
- Potential for fluid deficit related to secondary IV medication administration - rates significantly less than the primary rate (Example: primary rate NS 150 ml/hr; KCl IV secondary medication rate at 25 mg/hr for 2-4 hrs depending on dose, amount, and type of access peripheral vs central)
- Residual volumes due to secondary IV bag overfill causing underdose or IV medication still in secondary tubing
- Residual volumes that are infused with the next dose (drug degradation in tubing may have occurred from previous infusion)

Recommendations

Failure to unclamp secondary IV clamps is very common and is primarily related to a slip or lapse of a skill-based error (Chan, 2014). The best interventions, then, are to increase your checking systems/procedures to detect these errors (slip) and to make changes in your work design to decrease the likelihood of them occurring (lapse).

The following are suggested recommendations to address secondary IV clamping issues and ensure the safety of your patients:

- Use forced functions such as smart pump warnings and alarms for the secondary line
    - A technology based, forced function intervention that would likely produce the best outcomes for failure to unclamp secondary tubing is the use of a smart infusion pump with alerts. The system should:
        - Remind the provider who is programming the secondary setting to unclamp with an attention screen on the pump display and require a confirmation and/or
        - Provide sensing technology to sound the alarm when the secondary line has a high resistance to flow



This image shows a smart pump screen with a forced function reminder requiring the provider to press a button confirming the alert.

Clarity PSO, a Division of Clarity Group, Inc.
8725 West Higgins Road • Suite 810 • Chicago, IL 60631
T: 773.864.8280 • F: 773.864.8281
www.claritypso.com

- Avoid secondary connections to primary IV infusions containing high-alert drugs or other drugs/IV solutions that could be detrimental to the patient's health if an accidental bolus is given at an inappropriate secondary rate
- If required, infuse secondary medication in its own separate, primary line (must consider residual volume management/flushing procedures of medication left in primary tubing; consider cost) or separate normal saline primary line to infuse as a secondary (consider cost)
- Increase provider awareness of clamping issues – encourage providers to conduct visual checks that secondary drip chambers are dripping as part of the secondary IV medication administration process (repetitive nature of task)
- Increase education related to clamping issues starting with staff orientation. Continue the education and awareness through annual competencies, unit refreshers, posting of colored laminated reminder signs on IV pumps, colored sticker reminders on IV piggyback containers, etc.
- Have leadership engage with vendors and manufacturers to explore product and human factors engineering options to enhance safety features for secondary medication administration

Additional Resources and Literature

The Institute for Safe Medication Practices (2009) offers the resource *Safe Implementation and Use of Smart Infusion Pumps*. One guideline that particularly relates to error prone practices and secondary IV infusions is the use of simulation exercises in staff training.

The Institute for Safe Medication Practices (ISMP) Canada has posted several bulletins and alerts regarding this issue. The article (2006) *Secondary lines require "primary" attention* discusses the magnitude of the problem and calls for manufacturers to take action and address the engineering aspects of infusion pumps. The article presents a case study involving the inadvertent bolus of an insulin drip bag (secondary tubing not unclamped) into a critically ill patient.

Katherine Yin-Yee Chan (2014) wrote a doctoral dissertation at the Institute of Biomaterials and Biomedical Engineering, University of Toronto, specifically addressing the mitigation of risks associated with secondary IV infusions. In the dissertation, she discusses concerns surrounding secondary IV administration, including the failure to unclamp secondary tubing, three interventions that were tested in a simulated environment, and the outcomes. She also acknowledges the lack of literature addressing this area of medication error etiology. The PowerPoint of her dissertation is accessible HERE.

Chan, K. Y. (2014). *Mitigating risks associated with secondary intravenous infusions: An empirical evaluation of a technology-based, training-based, and practice-based intervention*. Retrieved from http://accenet.org/publications/Downloads/Reference%20Materials/2014_Student_Paper_Competition_Katherine_Chan.pdf

ISMP. (2009). *Proceedings from the ISMP Summit on the use of smart infusion pumps: Guidelines for safe implementation and use*. Retrieved from http://www.ismp.org/tools/guidelines/smartpumps/printerversion.pdf

Koczmara, C. & Jelincic, V. (2006). *Secondary lines require "primary" attention*. Retrieved from http://www.ismp-canada.org/download/caccn/CACCN-Winter06.pdf