



SMART IV Pumps: Clinical Applications and Implications

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The Hospital for Sick Children

- Specialized paediatric acute care hospital
 - ◆ 13,000 admissions
 - ◆ 50,000 emergency visits
 - ◆ 190,000 clinic visits
 - ◆ 362 physical beds / 274 budgeted beds
 - ◆ ALOS – 7 days
 - ◆ 6000 staff / 1500 nursing staff

- Provincial tertiary/quaternary paediatric resource

- Academic Health Sciences Centre affiliated with the University of Toronto



IV Pump Project

- Develop and implement a strategy for IV therapy and medication administration; and procure technology that best supports and reflects the desired practices.
- Includes investigating SMART pump technology as a means to enhance IV fluid and medication delivery, reducing the patient safety risks associated with medication administration.



Why New IV Pumps?

- Current large volume and syringe pumps are no longer manufactured and will not be supported by the vendors.
- Vendors are no longer investing in upgrading the current technology.
- Insufficient number of pumps to meet current and future clinical needs.



Medication Error Reviews

- 79 medication errors were reported over a 13 month period (likely under-reported)
 - Almost 60% of the reported IV medication/rate incidents may have been preventable if SMART pump technology had been in place.
 - Assuming that half of true incidents are reported, this could be more than 100 prevented adverse IV drug events per year.
- In another medication error review, applying the same formula, 1 incident / day estimated



Sources of Medication Errors

- Error in setting the pump
 - Rate error
 - Reverse of rate and VTBI setting
- IV lines reversed
- Calculation error
- Forgot to switch rate back following medication administration
- Wrong channel set
- Prescriber error
- Misread order



Consequences

- Extra observation/monitoring
- Potential for major harm
- Treatment or intervention required



SMART Pumps – What and Why?

- Primary distinguishing feature is Dose Error Reduction Software (DERS)
 - Provides clinical staff with immediate alerts if drug doses or rates are entered incorrectly, preventing adverse IV/drug events at the time of infusion/administration
 - Logs, stores and allows for the retrieval of data related to singular drug events as well as providing organization-wide data that can be used for CQI
 - Interfaces with the hospital drug library – customized IV pump drug library





Dose Error Reduction Software

- Customizable Drug Library

- Categories of drugs that reflect specialties, geographic areas, patient populations, types of drugs, age-groups

- ◆ Primary infusions

- ◆ Secondary infusions

- ◆ Continuous drug infusions

- ◆ Chemotherapy

- ◆ Intermittent medications

- Soft limits – alert that identifies there is the potential for error; allows for over-ride; provides flexibility

- Hard limits – alert that identifies an error; does not allow for over-ride



CQI Data

- Provides information regarding whether:
 - The Drug Library was programmed to appropriately reflect dosing practices
 - Staff require additional education to work within the limits

- Examples of data:
 - # of times soft limits hit / over-ridden
 - # of times hard limits hit
 - Categories of drugs that are involved
 - Times of the day/night that errors are caught
 - Areas where errors occurred



Larger Context of IV Medication Safety

- Computerized Provider Order Entry (CPOE)
- Integrated CPOE and Pharmacy systems
- Pharmacy prepared IV medications and specialty solution
- Standard concentrations
- Double-check systems
- Clear labels – computer generated
- Tall-man lettering to distinguish look-alike names
- Barcoding systems to verify medications and link to patient





Additional Practice Changes

- Going fully needle-less
- Eliminating Buretrols





IV Pump Project Advisory Group

- * Helen Edwards (co-chair) (Dir, CIT)
- * Mario Ramirez (co-chair) (Dir, Med Eng)
- * Maureen Maloney (RN, CIT)
- * Bev Hales (Dir, Pharm)
- * Navtej Viridi (Med Eng)
- * Jean Ngoie (Med Eng)
- * John Edmonds (MD, IS)
- Darlene Murray (NE, DI)
- Ann Chang (NE, Haem/Onc)
- Michael Rotstein (RN, Vasc. Access)
- Trey Coffey (MD, Paed Med)
- Frank Ceci (Transport)
- Cecilia Hyslop (NE, CCU)
- Laura Alexander (Occ Health)
- Gary Nero (IS)
- Barb Bruinse (Mgr, Vasc. Access)

- Peter Cox (MD, CCU)
- Raymond Bisson (Pharm)
- Anne Longo (Pharm)
- Wayne Coros (Dir, Purchasing)
- Michael Flood (Purchasing)
- Kathy Popovski / Lori Palozzi (APNs)
- Lynn Urmson (QRM)
- Stephanie Laivenieks (CL, 6A)
- Krista Cardamone (RN, Inf. Control)
- Debra Harrison (RN, TPN)
- Tanya Levit (NE, PACU)
- Heather Dunn (Mgr, MDCU)
- Christine Elliott (Mgr, NICU)
- Judy Van Clieaf (Dir, Haem/Onc)
- Stephanie Chu (RN, 8B)

- * **Core Team**





IV Pump Project Sub Groups

- Needle-less/Disposables Working Group
- Pharmacy - Nursing Working Groups
 - Standardized Concentrations
 - IV Medication Administration
- PCA Working Group
- Policy and Procedure Working Group



Process

- Advisory Group/Core Group Established
- Expression of Interest
- Hospital-wide Practice Review
- Literature Review
- Surveys of Comparable Paediatric Centres
- Explore IS issues
- IV Pump Inventory and Usage Audit
- Develop new policies/procedures/guidelines:
 - IV therapy
 - Medication administration
 - Pump distribution



Process continued

- RFP – LVP, syringe pump, PCA pump
- Presentations to the Core Group
- Short-listed
- Presentations / Demos
- Clinical Simulations
- Vendor Head Office/Site Visits
- Final Decision with Advisory Group
- Contract Negotiation
- Implementation

