

## Children's Hospital of Eastern Ontario (CHEO) Improves Drug Library Compliance, Reduces Infusion Safety Events and Lowers Labor Costs after Introduction of Wireless Medfusion® 4000 System and PharmGuard® Software

### Background

A staggering 1.5 million medication errors occur in the United States each year<sup>1</sup>. While not all of these are fatal, an unacceptable 7000 errors result in fatalities according to the Institute of Medicine (IOM) report *To Err is Human: Building a Safer Health System*<sup>3</sup>. While improvements are being made and much effort has been spent to improve the quality of care, intravenous (IV) drug administration still accounts for nearly 60% of life threatening medication errors<sup>4</sup>. The most common cause of medication delivery fatalities was the administration of the wrong dose (41%)<sup>6</sup>. This is not a phenomenon unique to the United States. The Institute for Safe Medication Practices Canada (ISMP Canada) reports that medication errors pose a serious threat to patient safety in Australia, the United Kingdom, and Canada<sup>5</sup>. Adding in the global unreported incidences of medication error, this is a very significant challenge in healthcare. This translates into nearly 1 error in every 5 doses<sup>2</sup>.

This challenge has a massive potential financial impact. The 400,000+ preventable medication-related injuries that occur each year in the United States cost health-care institutions a shocking \$3.5 billion annually<sup>1</sup>. At approximately \$8750 per occurrence, medication errors can be a significant financial impact to hospitals<sup>1</sup>.

According to MEDMARX®, the Canadian Association of Paediatric Health Centers (CAPHC) in collaboration with ISMP Canada, and the Canadian Patient Safety Institute, IV medication therapy has become extremely complex and children are particularly vulnerable to errors for several reasons. Infants and children have immature organ systems and compensatory mechanisms. They are also vulnerable because they have varying weight and body surface areas. Another contributing factor is the lack of commercially prepared solutions matching the institution's standardized pediatric concentrations. In addition, most infants and young children are unable to communicate in ways that can alert health care providers to a potential error.

### CHEO Background

CHEO is a pediatric health and research center providing outstanding family-centered patient care, pioneering breakthrough research, and training the health care professionals of tomorrow. They have 165-beds and more than 180 doctors, 600 nurses and 1,500 additional staff dedicated to providing the best possible care for the children and youth of their community. CHEO is one of only a few stand-alone pediatric hospitals in Canada, and sees more than 6,000 admissions, 7,000 surgeries and more than 60,000 emergency visits each year.

CHEO was looking for smart pump technology that would meet several goals simultaneously:

- 1) Incorporate standardized drug concentrations
- 2) Provide hard limits to prevent dosing errors
- 3) Automatically have the safety software running on the pumps
- 4) Provide a workable venue across all pediatric ages (neonate through older adolescence)
- 5) Allow collaboration of internal departments on the entire medication delivery process

*At approximately \$8750 per occurrence, medication errors can be a significant financial impact to hospitals<sup>1</sup>*



In 2009, CHEO selected the Medfusion® 3500 syringe pump (non-wireless) with PharmGuard® medication safety software as their solution of choice for their Continuous Quality Improvement (CQI) program. Successful implementation satisfied each of their initial goals.

### Problem statement

After the successful implementation new challenges created additional needs:

- 1) Easily update their current library for more frequent library updates driven by drug shortages and substitutions or new releases
- 2) Reduce the labor cost to locate and update the pumps
- 3) CQI reporting to assist with meeting new efficiency, compliance, and cost savings goals while increasing patient safety

Without a wireless system in place, CHEO determined that it was taking 7 technicians 2 days and over 112 man hours to perform each data collection or to execute a library update on 185 pumps. CHEO found the labor involved in locating devices, collecting them and bringing them to a central biomed facility for update to be very high even with a single building and a cooperative and helpful staff. This high labor overhead prevented the data from being collected and libraries updated more than once in 18 months. This frequency was not sufficient to support effective CQI reporting. In addition the manual nature of the update created concern that if a device were missed, it would contain an outdated library and not be completely up to date.

### Solution: Smiths Medical Medfusion® 4000 pump and wireless connectivity

The new Medfusion® 4000 system provided the solution that CHEO needed:

- 1) PharmGuard® Toolbox 2 medication safety software can quickly and easily update the medication library to add new drugs or change dosing limits
- 2) The wireless updates dramatically reduce the labor associated with locating and manually updating pumps and provide assurance that the pumps are running current libraries
- 3) The PharmGuard® Server receives regular updates for current, accurate, and actionable reports to drive CQI initiatives

### Results

The ease of transition to a wireless networked system was immediately experienced. The drug library was easily migrated, and no software related issues occurred. The syringe pump switch to wireless had no interruption to clinical workflow for nurses at the point of care. Deploying the new drug library to the server took approximately 10 minutes. As a result, full library updates were performed quarterly.

Pharmacy was able to quickly deploy an urgent library change request. The networked capability of the Medfusion® 4000 pumps allowed for easy access and evaluation of pump history data, as well as effortless updates to the drug library.

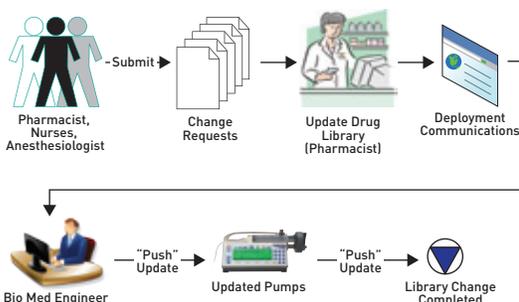
These features proved invaluable due to drug shortages that have recently plagued Canada. Lack of availability of certain medications or concentrations requires drug library modifications to allow for substitutions. The Medfusion® 4000 pump can rapidly replace a drug library with a new version that contains the updated medication or concentration, eliminating the need for pump users to work around the safety software to deliver replacement medications that previously had not existed in the drug library.

The library update progress is monitored from the server to provide documentation and a formal record of completion. Date and time are updated by the network server to keep all system clocks synchronized with the enterprise systems.

*Without a wireless system, it took over 112 man hours to perform each data collection or to execute a library update*

*Deploying the new drug library to the server took approximately 10 minutes*

IV Pump Library Update Workflow<sup>7</sup>



Compliance data was collected to verify that pump users were in fact utilizing the drug library and safety programs. According to analyzed pump data, CHEO's drug library compliance rate was 95.59% and safety events reduced to 6.12% within 6 months of implementation. Wireless access for library investigation, assessment, and recommendations were scheduled on a weekly basis as a routine task by pharmacists. Weekly inquiries included Drug Library Compliance by Care Area, and Pump Safety Event Summary and Safety Event Details. Specifics include looking at hard and soft limits, overrides, compliance, and need for

*Safety events were reduced to 6.12% within 6 months of implementation*

library changes, as well as ongoing review of physician orders to ensure actual use matches expected usage. With repetition, this process now takes only a couple of hours to evaluate.

According to the safety event logs, CHEO's most common programming issues were around drug selection, entering weight into the dose field, or inputting volume instead of milligrams. The reporting features allowed an analysis of the top 20 medications associated with safety events - one of which was methylprednisolone which ranked as 12th and 13th for safety events counts.

The pharmacy prepares methylprednisolone using a 2.5 mg/mL or 10mg/mL concentration. However, the drug programs on the pump were labeled "methylprednisolone low dose" and "methylprednisolone high dose". The pump user was required to enter a concentration on the pump when using either drug program. This was an unusual process compared to other drug programs. A drug utilization review had revealed that methylprednisolone 10mg/mL was used only once for high dose. After consulting with nursing, the methylprednisolone drug programs were renamed in the library to Methylprednisolone 2.5 mg/mL and Methylprednisolone 10mg/mL with standard concentrations, thus eliminating the need for the pump user to enter a concentration. Since the change, methylprednisolone is no longer in the top 20 medications with safety events.

### Conclusions

CHEO's multidisciplinary healthcare team actively engaged in the process to implement Smiths Medical's wireless Medfusion® 4000 syringe infusion pump and the PharmGuard® Server solution. As a result, CHEO eliminated labor costs associated with manual updates from 112 man hours down to 10 minutes with no clinical interruptions, allowing quarterly library updates, acquired data for process improvements and the tools to measure them, and finally, successfully updated their drug libraries resulting in 95.59% compliance, as well as a reduction in safety events to 6.12%. CHEO has continued to maintain 95% compliance throughout their first year.

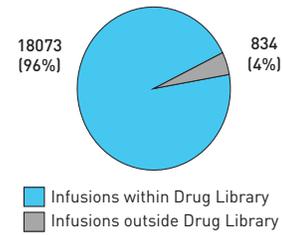
*CHEO eliminated labor costs associated with manual updates, allowing quarterly library updates*

By devoting their time to uncover needed practice changes and incorporating an internal rigorous monitoring system, this team ensured that their use of smart pumps delivers on their promise to contribute to patient safety related to infusion

therapy. As a result, the Go Live went as planned, the previous library was migrated without issues, and their CQI program provides data driven improvement and solutions.

### Drug Program Compliance, January – May 2011<sup>7</sup>

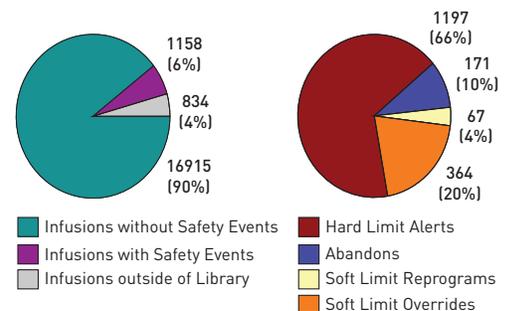
Total infusions within selected criteria: 18,907



### PharmGuard® Software Report for Medfusion® 4000 Pump Safety Event Summary, January – May 2011<sup>7</sup>

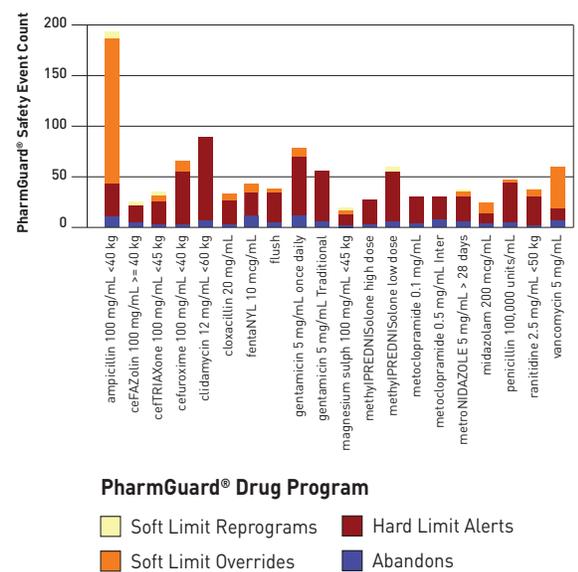
Total PharmGuard® infusions within selected criteria: 18,073

Total safety event count within selected criteria: 1,799



### PharmGuard® Software Report: Top 20 Medications with Safety Events, January – May 2011<sup>7</sup>

Total PharmGuard® infusions within selected criteria: 10,329



## REFERENCES

1. Aspden, P. E. (2007). Preventing medication errors. Institute of Medicine.
2. Campbell, A. C. (November 2008). Working smarter with intelligent pumps. *Pharmacy Solutions*.
3. Corrigan, J. D. (2000). *To err is human: Building a safer health system*. Institute of Medicine.
4. Dennison, R. (November 2006). High-alert drugs: Strategies for safe IV infusions. *American Nurse Today*.
5. ISMP. (2011). Benchmarking medication error rates.
6. Phillips, J. E. (2001). Retrospective analysis of mortalities associated with medication errors. *American Journal of Health-System Pharmacy*.
7. Vaillancourt, R. et al. *Bringing Wisdom to Smart Pump Technology*. Canadian Association of Paediatric Health Centres (CAPHC) 2011 Annual Conference, October 16-19, 2011, Ottawa, Canada.



Contact Smiths Medical  
to learn how the  
Medfusion® 4000 system  
can benefit your facility

medfusion™

**Smiths Medical ASD, Inc.**  
St. Paul, MN 55112, USA  
Phone: 1-214-618-0218  
Toll-Free USA: 1-800-258-5361



**EC Authorized Representative**  
Smiths Medical International Ltd.  
TN25 4BF, UK  
Phone: +44 (0) 1233 722100

**Australian Representative**  
Smiths Medical Australasia Pty. Ltd.  
Brisbane, QLD 4113, Australia  
Phone: +61 (0) 7 3340 1300

**www.smiths-medical.com** Find your local contact information at [www.smiths-medical.com/customer-support](http://www.smiths-medical.com/customer-support)

Smiths Medical is part of the global technology business Smiths Group plc. Product(s) described may not be licensed or available for sale in all countries. Please see the Instructions for Use/Operator's Manual for a complete listing of the indications, contraindications, warnings and precautions. Medfusion, PharmGuard and the Smiths Medical and Medfusion design marks are trademarks of Smiths Medical. The symbol ® indicates the trademark is registered in the U.S. Patent and Trademark Office and certain other countries. ©2013 Smiths Medical. All rights reserved. IN193826EN-032013

smiths medical