

WHITE PAPER

A Smarter Way to Reduce IV Medication Errors

How Networked Specialty Infusion Pumps Help Reduce Medication Errors and Improve Patient Outcomes

A staggering 1.5 million medication errors occur in the United States each year.¹ While not all of these errors are fatal, an unacceptable 7,000 deaths result from these errors each year, according to the Institute of Medicine (IOM) report, *To Err is Human: Building a Safer Health System*.² Not restricted to the U.S. alone, the Institute for Safe Medication Practices-Canada, reports that medication errors have imposed a serious threat to patient safety in Australia and the United Kingdom, as well as become a major public health issue in Canada.³ Including global unreported medication errors, the medication error challenge becomes even more substantial.

Despite hospitals' efforts to improve quality of care, intravenous (IV) drug administration still accounts for nearly 60% of life threatening medication errors.⁴ With respect to IV drug administration, the U.S. Food and Drug Administration reported that infusion pumps were tied to approximately 56,000 incidents of adverse medication events between 2005 and 2009.⁵ Of fatal errors, the most common (41%) were caused by administering the wrong medication dose.⁶ Unfortunately, with approximately 10,000 drugs available, no individual person can master a working knowledge of them all.⁴

Adding to the burden, according to the Institute of Medicine, more than 400,000 preventable medication-related injuries occur each year in the United States, costing healthcare institutions a shocking \$3.5 billion annually.¹ This translates into nearly one error in every five doses.⁷ At approximately \$8,750 per occurrence, the financial impact to hospitals can be significant.¹

Complicating matters, healthcare spending continues to grow at a rate higher than GDP growth—a losing proposition even during strong economic periods.⁸ Labor and treatment costs continue to rise, while reimbursements from providers, insurers and the government are

stagnant—a problem expected to be made worse by an aging population. This unsustainable growth in costs has hospital executives looking for cost-savings opportunities.

Scope of the Problem at the Institutional Level

With 44% of medication errors occurring during the drug administration process⁹ hospital executives acutely aware of the need to address medication error issues are pressured between two powerful imperatives—reduce operating costs and improve patient safety through evidence-based medicine.

From a clinical perspective, Evidence-Based Practice means applying data gleaned through carefully designed studies to set the policies and procedures that lead to the best care outcomes, according to Alan Garber, head of the Center for Health Policy at Stanford University.¹⁰ On the business side, Evidence-Based Practice is a leading strategy too, applying the same evidence-based approaches to benchmark the quality of care, patient satisfaction, medication error rates and other metrics. It is particularly useful for hospital leadership when seeking to justify investments and competitive actions to their board of directors.

In specific terms of operating costs within the arena of reducing IV medication administration errors using non-wireless smart infusion pumps, the impact in man hours has been significant. Health care teams face three challenges when attempting to reduce medication errors with smart infusion pumps: time/wage costs associated with pump maintenance, infrequent pump data collection and limited aggregate data that can be utilized to develop CQI program initiatives.

Healthcare cost-reduction programs are increasingly focusing on medication errors

How can hospitals eliminate excess costs while simultaneously collecting data from infusion pumps for quality improvement (CQI) programs? Is there a way to economically utilize pump safety data as a quality improvement asset?

To address these questions, many hospitals are turning to networked specialty infusion pumps. These pumps help reduce overall costs by collecting aggregated clinical data and distributing library updates through an intelligent central server. The networked specialty infusion pumps allow hospital medication safety teams to strategically utilize pump safety data in their efforts to help improve quality of care and patient outcomes. The focus of this white paper is to explore challenges health care organizations face in their efforts to help reduce medication errors and achieve safe drug administration, reduce labor time/costs, as well as reveal the benefits of wireless networked specialty infusion pumps.

Challenges

Labor Costs to Keep Pumps Current

To help effectively prevent medication errors, infusion pump software and drug libraries should be updated consistently. Frequent updates ensure clinicians are employing up-to-date best practices for dose limits and standard concentrations in an effort to help reduce medication errors and enhance patient safety.

Unfortunately, manually updating pumps with pump software and drug libraries can be cumbersome, time consuming and labor intensive since pumps are difficult to locate and when found are frequently in use. Technical staff can spend significant time revisiting pumps hoping for an opportunity to deploy the update. This expensive cycle is often unsuccessful, leaving hospitals with a fleet of pumps that have a variety of software and drug libraries.

Subsequently, there are serious implications to the challenge of manually updating pumps. As more drug libraries become out-of-date, the more likely clinicians will be required to override drug parameters. With human error accounting for approximately 40% of medication errors, medication safety officers face significant risk by having outdated drug libraries.¹¹

Fortunately, new wireless infusion pumps help eliminate the labor associated with locating pumps and manually updating pump software and drug libraries.

Infrequent Pump Data Collection

While pumps should be updated to reflect best practices in medication safety, pump safety data should be frequently collected to provide medication safety officers and/or pharmacists the insights they need to make adjustments. The same labor challenges affecting pump library updates also affect data collection—creating a dilemma in the fight for lower medication errors.

Unfortunately, due to these significant barriers in collecting and utilizing essential safety data, pharmacists are forced to operate without drug administration data and consequently, clinicians struggle to improve patient care outcomes. This means a heightened risk of IV medication errors—the source of 60% of life-threatening medication errors.¹¹

Fortunately, new pump solutions enable medication safety officers and teams to consistently collect pump safety data, providing visibility to metrics that were previously cost prohibitive.

Poor Data Sets for Continuous Quality Improvement Programs (CQI)

Pump safety data is helpful for point-in-time policy decisions but the ability to look at usage and safety data over time is required to implement CQI programs.

Unfortunately, because non-networked infusion pump solutions do not easily offer analytics and trending capabilities to set and measure the progress of policy decisions, hospitals often waste valuable resources pursuing medication policy changes that yield little improvement to medication safety.

Fortunately, advanced networked pump solutions now provide medication safety officers and hospital administrators with tools such as data and trend capabilities to truly measure quality improvement.

Required labor time/costs lead to inconsistent collection of pump safety data

Without quality data sets, medication safety officers are challenged to execute CQI programs

The Solution: Networked Specialty Infusion Pumps

To address these challenges, many hospitals are migrating to networked specialty infusion pumps. These small-volumes, precise syringe pumps help medication safety officers prevent medication errors in areas where medication delivery requires the precision and accuracy of a syringe pump with the added benefit of wireless networking. Moreover, these solutions help to significantly reduce costs associated with upgrading pump software and collecting pump safety data required for CQI programs.

In addition to the syringe infusion pump itself, networked specialty infusion pumps are comprised of three primary components, including:

1. Pump medication safety software (a.k.a. dose error reduction software or *DEERS*)
2. Integrated wireless or wired-Ethernet communications
3. Pump management server and evidence-based reporting software

Medication Safety Software

A robust medication safety management application is embedded within the syringe pump to facilitate correct drug dosage and administration

limits based on a selected drug program. Drug programs and profile settings can be customized for individual care areas within a facility or system, enabling significant flexibility. Moreover, this software adds safety features around weight-based dosing and the use of enteral and IV syringes for multiple routes of administration.

Ideally, networked specialty infusion pumps should require users to utilize medication safety software rather than manually opting out and programming in generic mode. This makes it more difficult for clinicians to override safety settings and help minimize safety errors. This approach to drug administration promotes a heightened level of safety for high-risk patients.

The medication safety software application is utilized through an intuitive user interface on the front of the infusion pump that displays the full drug name. This helps the medication safety teams to minimize drug abbreviations and the risk of

misreading. The human factors design enables the user to program the pump with a minimal number of steps. This maximizes the frequency the user remains within the medication safety software instead of manual operation.

To enable CQI, programming keystrokes are logged to allow for potential recreation of events leading up to an error.

When operating the pump, clinicians receive both visual and audible alerts from the pump. This multi-sensory approach combined with a large screen oriented in the direction of the syringe provides an intuitive user interface through which to safely operate the pump.

Additionally, as hypodermic syringe manufacturers change molds in factories, it is important to periodically update the syringe data in the pump. Networked specialty pumps are capable of easily updating syringe types.

Wireless Communications Component

The wireless communications component is responsible for securely transmitting pump data between the pump and the pump management server and reporting system. This component is also responsible for receiving pump software updates (firmware) and drug library updates from the server.

Best-in-class networked specialty pumps are specifically designed to separate the wireless communications component from the clinical portion of the pump. This reduces any communication issues over the wireless network from impacting drug administration.

The wireless communications component is designed to leverage existing hospital networks and utilize industry-standard network security protocols and encryption. This promotes privacy when transmitting pump data and provides a protected health information (PHI)-compliant roadmap in the event patient data should ever need to be transmitted.

Medication safety software enforces drug library rules to reduce medication errors in pump usage

Networked specialty infusion pumps for high-risk care units such as NICU and pediatrics that can be remotely upgraded and accessed for collecting safety data

The wireless communications component is designed to send and receive pump data and library updates without impacting medication delivery

Pump Management Server and Reporting Tool

Networked specialty infusion pumps provide the capability to manage drug library updates effortlessly. Using a centralized pump management server web interface from any secured browser, hospital personnel can send library updates to all networked pumps with a single deployment.

The ease of these deployments enables medication safety teams to address drug shortages and make adjustments from CQI initiatives as needed, so that the specialty infusion pumps have the most

up-to-date drug programs, helping to minimize risks associated with outdated drug libraries. Included in pump management software is the ability for version tracking of each library update with user security settings. This powerful combination provides confidence that the correct library is securely deployed by users authorized to make changes.

A management server enables drug library updates and robust reporting to assist with CQI programs

The pump management server is continuously receiving messages from the networked specialty infusion pumps conveying status and event information. This data is frequently compiled and made available through an advanced reporting tool that provides hospital staff with robust reporting capabilities based on five critical care roles:

1. ***Nursing management:*** Analyze data at the care unit level to measure safety overrides and usage compliance and spot trends that may add risk
2. ***Pharmacy management:*** Track drug usage and enforces pharmacy dosage guidelines
3. ***Biomedical engineering management:*** Monitor the preventive maintenance schedule and alerts staff to any operations issues
4. ***Medication safety officers and team:*** Identify drugs most prone to dosing errors, prevented medication errors and clinical events most likely to lead to medication errors
5. ***Hospital Executives:*** Provide a snapshot of overall medication safety trends, events and prevented medication safety errors

This robust reporting system allows for simultaneous access of the networked infusion pump safety software data by multiple users via the hospital network. Medication safety officers, pharmacy management, biomedical engineers,

nursing management and executives can utilize the same data in different views to meet their diverse needs.

Benefits of Networked Specialty Infusion Pumps

Networked specialty infusion pumps offer many benefits, including:

- Minimize the time and cost to gather pump safety data by wirelessly transmitting pump data to a central server
- Help reduce medication error rates by enforcing safe dosing parameters and making manual system overrides more difficult
- Enhance medication error rate analytics by providing robust safety reporting by dimensions such as library, drug program, infusion method, care area and additional criteria
- Increase data collection consistency and promote improved clinical data analysis required to build an effective CQI program
- Help eliminate the labor cost and delays associated with manually upgrading drug libraries and pump software
- Increase peace of mind through the ability to regularly and cost-effectively update infusion pumps with current drug and therapy dosage information
- Help reduce financial and reputational risk by identifying problem areas and trends before they become problems
- Minimize the installation burden on IT by utilizing existing server and wireless network environments

Networked specialty infusion pumps help reduce medication errors and labor costs associated with maintaining infusion pumps

What to Look For in a Networked Infusion Pump Solution

When evaluating wireless specialty infusion pumps, consider these important requirements:

Separated pump architecture: Seek a solution that separates the interaction of the clinical portion of the pump from the communications module. This helps eliminate the risk that clinical pump operations will be interrupted by other communication or system issues. It is important to select a device with an integrated communications component to confirm the pump is constantly sending data to the central server and avoid solutions that cannot send or receive data if only docked in a racking system.

Look for a solution provider with extensive experience in syringe pumps and neonatal and pediatric care specialties

Hard-to-override safety controls: Select a solution that optimizes the clinician workflow by starting operation within the medication safety software. This maximizes the number of prevented medication errors by reducing manual programming and human error.¹² Avoid solutions that default to manual operation.

Industry-standard security: Look for a solution that protects sensitive patient data and pump safety data during transmission. The best vendors offer at least WEP and WPA/WPA2 authentication with strong encryption such as AES. Avoid solutions that utilize proprietary or non-standard security schemes.

Robust reporting capabilities: Select a solution that offers powerful reporting and analytics capabilities with a robust criteria selection. This provides the clinical and device usage data required to implement effective CQI programs. Best-in-class solutions often provide more

than 30 reports for various hospital roles to help executives and medication safety teams reduce medication errors and improve quality of care.

Neonatal and pediatric expertise: Look for a solution provider with extensive experience in syringe pumps and neonatal and pediatric care specialties. This enables you to leverage the combined knowledge gained over decades of treatment and multiple generations of pump technology.

Customizable drug library: Seek a solution that enables facilities to customize a drug library for its unique care areas. This tailors drug programs to the unique needs of the care area's patients. The best solutions support at least 16 unique profiles.

Visible syringe labeling: Look for a solution that provides nurses with a clear line of sight to the entire syringe and medication label. This allows nurses to double-check the screen, syringe and medication to verify the correct drug and dosage.

Proven error prevention: Seek a solution that provides quantifiable data demonstrating the number of medication errors prevented. This translates into a higher likelihood of financial savings and protection of the hospital's brand.

Intuitive library editor software: Choose a solution that offers drug library software that is easy to use and enables immediate library updates. This makes it more likely medication safety teams will keep the drug library current. The best solutions can wirelessly deploy a new library to all connected pumps within minutes.

Leadership in syringe pump technology: Seek a solution provider with a strong legacy in developing and commercializing syringe pump technology. This allows medication safety officers to benefit from the latest developments in high-risk IV drug administration.

Microsoft-compatible: Look for a solution that supports Microsoft® Windows® client and server software. This helps minimize the time and investment required to integrate the solution into existing environments.

User-friendly interface: Seek a solution with an easy-to-learn interface. This helps clinical staff capitalize on the pump benefits with little training. Best-in-class solutions offer a large screen and fewer steps to begin administering medications.

Integrated training curriculum: Seek a solution provider that offers a robust training program integrated with pump deployment. This helps hospitals quickly realize the ROI from new pump deployment. Best-in-class companies offer training regarding library development, analytics and nurse training as a minimum.

Dedicated professional services: Look for a solution provider that dedicates a senior project team to each implementation. The best providers offer customized installation based on best practices. Avoid providers that offer a single cookie-cutter approach to deployment.

The Smiths Medical Advantage

Designed to address all the requirements outlined in this paper, the Smiths Medical Medfusion® 4000 syringe infusion pump with PharmGuard® medication safety software and PharmGuard® server infusion management software helps hospitals minimize medication errors and reduce the cost to maintain infusion pumps. Now hospitals have the data they need to execute successful CQI programs and help improve patient outcomes.

By enforcing adherence to drug dosing limits at the care unit level, the Smiths Medical

solution helps hospitals to reduce medication errors caused by human error. Supporting over 16 drug profiles and up to 288 drug programs per profile, the Medfusion® 4000 syringe infusion pump with PharmGuard® software gives medication safety officers the power to deliver thousands of drug programs. The Medfusion® 4000 syringe infusion pump is the first syringe pump to obtain market clearance by the FDA following the April 23, 2010 infusion

pump premarket guidance document; Smiths Medical has invested heavily in human factors and usability testing to refine the Medfusion® 4000 syringe infusion pump user interface over several years.¹³ This results in faster program ROI.

Smiths Medical syringe infusion pumps are trusted by the entire 2011-2012 U.S. News & World Report Children's Hospital Honor Roll¹⁴

Leveraging a 25-year legacy in NICU and pediatric medicine, Smiths Medical PharmGuard® server infusion management software enables hospitals to manage thousands of syringe infusion pumps. This web-based application collects safety data from all syringe pumps, providing a customizable reporting solution that provides 34 customizable reports for multiple hospital management roles. This gives management the insights needed to help increase quality, manage compliance and respond to drug shortages. In addition, PharmGuard® server infusion management software enables the distribution of drug library and software updates with the simplicity of only a few mouse clicks, reducing the cost to manually locate and update individual pumps.

The Medfusion® syringe pump is in use by all of the hospitals included in the *2011-12 U.S. News & World Report Children's Hospital Honor Roll report*.¹⁴ By analyzing the success of syringe infusion pump installations across the most well-known health organizations, Smiths Medical consulting professionals act as a results-focused extension of your medication safety team. With offices on six continents, Smiths Medical is well-equipped to meet the infusion safety needs of hospitals around the globe. Start reducing medication errors before they become a liability by turning pump safety data into your most strategic asset.

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For a live demonstration and free ROI analysis using the Smiths Medical Medfusion® 4000 syringe infusion pump with PharmGuard® server infusion management software, call 800-258-5361 or visit www.smiths-medical.com.

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

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

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