

Closing the Loop in Medication Management

**Why an integrated, closed-loop solution
is vital for hospitals**

Table of Contents

- 3** Introduction
- 4** A Recognised Solution for Medication Management
- 5** What is Closed-Loop Medication Management?
- 7** Importance of Closing the Loop for Hospitals
- 8** Microsoft: An International and Holistic Approach
- 9** Improving Care: End-to-End Medication Optimisation
- 10** Notes

Introduction

Achieving patient safety is a foremost goal among healthcare leaders around the world. A key area of scrutiny is the risk associated with medication errors. As hospitals strive to meet their business goals, improve care, and perform to high-quality standards, medication safety must be a primary focus.

This white paper discusses the need for hospitals to strive for a closed-loop medication management solution that eliminates gaps in information and smoothes handovers, minimising opportunities for error. Readers will learn about the medication management solution built in to the Microsoft® Amalga™ Hospital Information System (HIS), a fully integrated, hospital information management system for hospitals which contains comprehensive medication management functions.

Issues involving communication, continuity of care, and care planning are cited as a root cause in more than 80 percent of reported seriously adverse unanticipated events in healthcare.

A Recognised Solution for Medication Management

Medication management is one of the most complex parts of a hospital's care delivery. It is not unusual for many different clinicians, departments, facilities, and processes to be involved in a typical patient's medication therapy. Without full coordination of care among the doctor who orders a drug, the pharmacy that fills the order, the staff that deliver the medication, and the nurse who administers it, the risk of potentially harmful medication errors multiplies¹.

Many hospitals invest in technology to automate medication management at various points throughout the hospital. Individual departments may invest in their own technology. For example a pharmacy may implement its own management system, while the nursing floor separately implements automated dispensing cabinets and bar-code medication administration. Individual implementations may be part of a hospital's long-term plan to automate the processes of the entire organisation. But the complete automation of a hospital may be delayed for years due to cost restrictions or the complications inherent in changing systems and processes².

Meanwhile, department-specific systems may prevent medication errors within an individual area of a hospital, but the handover of tasks between departments is where information is often lost. Issues involving communication, continuity of care, and care planning are cited as a root cause in more than 80 percent of reported seriously adverse unanticipated events in healthcare³.

Quality hospitals look to a closed-loop medication management solution to help them significantly improve quality and prevent errors⁴. By choosing systems that work together and flow information smoothly between clinicians and departments, hospitals can progress toward the most informed care.

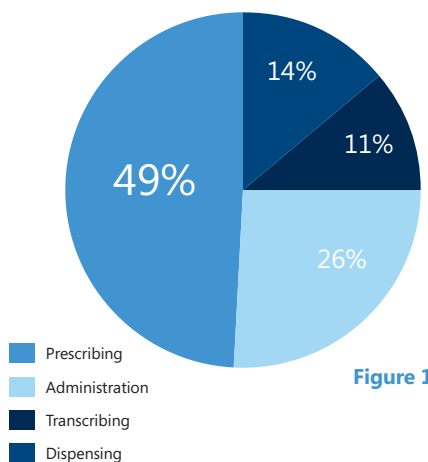


Figure 1

Statistics show dangerous medical errors most often in:

Prescribing: Medications contraindicated because of allergies, age, health conditions or drug interactions can be inadvertently prescribed.

Administration: Mistakes at bedside can result from miscommunication, inaccurate information, or medications delivered to the wrong patients.

Transcribing: Illegible handwriting can result in misunderstood instructions, inaccurate doses and wrong medications.

Dispensing: Overburdened pharmacy staff and manual stock selection and counting processes often lead to dispensing mistakes.

Source: D W Bates, D J Cullen, N Laird, et al., "Incidence of Adverse Drug Events and Potential Adverse Drug Events: Implications for Prevention", JAMA, 247 (1995), pp. 29-34

The electronic handover from physician to pharmacy using CPOE can reduce turnaround time by at least one hour for each drug order.

What is Closed-Loop Medication Management?

A truly closed-loop medication management system is designed to feed outcomes from medication processes back into the system to allow for future improvements and changes in a patient's course of care⁵. As an example:

1. The medication order originates with the physician.

The physician places an order for a medication using computerised physician order entry (CPOE), sending complete electronic information to the pharmacy. Automated alerts built into the system notify the physician of known drug-drug interactions, medication allergies, and other potential safety issues, helping them avoid errors at the time of order. These types of alerting systems may decrease error rates and improve outcomes, especially when alerts are delivered to caregivers as early as possible in the medication ordering process⁶. Studies have found that CPOE systems with drug decision support can prevent 90 percent of adverse drug events (ADEs) associated with transcription, and 30 to 50 percent of ADEs associated with prescribing⁷.

2. Pharmacy receives, processes, and fulfills the electronic order.

An integrated workflow prioritises fulfilment of orders based on patient needs. The electronic handover from physician to pharmacy using CPOE can reduce turnaround time by at least one hour for each drug order because of more effective communication and the elimination of the need to clarify orders and track clinical information to fulfil them⁸. Auto-screening for drug-drug interaction, drug-allergies, drug-disease contraindications, and drug-dose checking helps enable pharmacists to alleviate medication errors.

3. The medications are delivered to the patient room.

Once the order has been fulfilled, medications are placed in secure carts that use bar-code scanning to verify clinicians' and patients' identities. The carts are used to deliver medications to the correct patients.

4. Nurses administer the medication.

Nurses double-check patient identity and prescribing instructions at the bedside, using bar-code medication administration. They have full access to all information provided by the prescribing physician and the pharmacist, as well as other patient clinical information.

5. Physicians monitor patient response for follow up.

The patient's vital signs, condition, reactions, and other information are recorded in the system, this is "closing the loop" so that physicians can understand how the patient is responding to the medication and alter the course of treatment, if necessary. Then the process begins again, with information about the patient flowing smoothly from department to department.

Through the automation of all medication-related processes, closed-loop medication management eliminates a great many steps in the complex process, thereby significantly reducing the number of opportunities for mistakes⁹. The transition between each step in the process is seamless, so information remains fully intact and is presented in a common view at each handover. At one U.S. medical centre, closing the loop meant reducing the number of steps in medication administration from 17 to five, which decreased the rate of harm from ADEs from 3.5 per 1,000 to 0.52 per 1,000 patients¹⁰ (Figure 2).

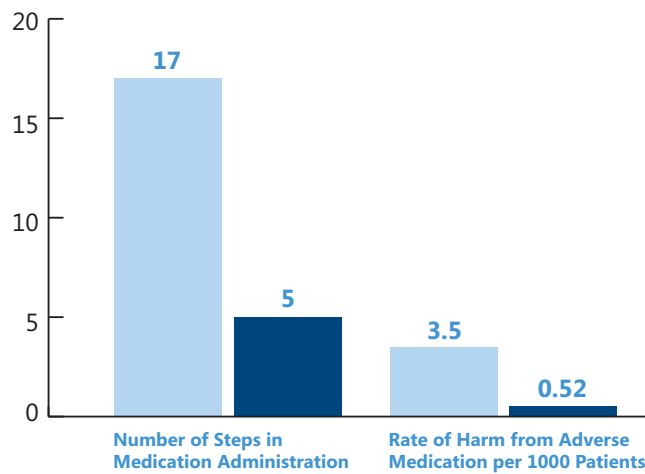


Figure 2

Source: Nicol, Natasha, Pharm.D. "Case study: closing the medication management loop." Pharmacy Purchasing & Products

Importance of Closing the Loop for Hospitals

Patient safety advocates worldwide are calling for a closed-loop approach to ordering, dispensing, delivering, and administering medications in hospital settings as the pinnacle of care¹¹. Hospitals that specialise in international medicine have a special set of concerns and incentives to consider when looking at the investment involved with closing the loop

At one U.S. medical centre, closing the loop decreased the rate of harm from ADEs from 3.5 per 1,000 to 0.52 per 1,000 patients.

- **Accreditation.** A closed-loop medication management system is an important key to achieving the quality outcomes required by Joint Commission International (JCI) accreditation. JCI places extreme emphasis on medication safety and supports the implementation of standards and systems that reduce risks for adverse effects¹².
- **Liability.** Medication errors in hospitals lead to millions of injuries, illnesses, and deaths worldwide each year. These errors are responsible for a large percentage of legal claims made against practitioners and hospitals. According to the U.K. Medical Defence Union, 25 percent of claims settled by healthcare providers during a six-year period were due to errors in the prescribing and administering of medications¹³. Rigorous, airtight medication management practice minimises risks to prevent hospitals from becoming entangled in costly, time-consuming litigation or investigations that can harm their reputation.
- **Resource and cost management.** Medication errors open the doors to worsened conditions or new illnesses or injuries. When patients develop additional conditions or become sicker, a hospital's caseload grows exponentially, which puts a strain on resources. Reports indicate that ADEs can increase patients' hospital stays by an average of 2.2 days¹⁴, adding about U.S.\$8,750 to the cost of the stay¹⁵. Getting it right the first time improves operational efficiencies.
- **Reporting.** A closed-loop medication management system more exhaustively tracks medication usage across a health system, enabling accurate reporting for compliance purposes and providing management insight into clinical trends¹⁶.
- **Supply costs.** More accurate tracking of medication usage, optimised inventory management, and more informed forecasting of supplies usage provide hospital management with the ability to negotiate drug costs with suppliers for meaningful cost savings¹⁷.

The Amalga HIS medication management system helps capture, protect, and communicate medication information and features built-in safeguards for a high level of accuracy.

Microsoft: An International and Holistic Approach

Achieving a true closed-loop medication management system requires the involvement and investment of every area of the hospital or health system that delivers patient care. Many hospitals approach medication management in a piecemeal fashion because they face extraordinary challenges in obtaining the budgetary approvals, assigning resources, and overcoming disruption in hospital processes.

However, taking a holistic approach to closing the loop is essential. Hospitals should consider end-to-end software integration, where each piece of the puzzle fits seamlessly with the rest. As one healthcare industry consultant points out, many hospitals have made strides in adopting individual products, but interfaces between those products are only first steps: "They enable systems to mix together by sharing messages, but they do not fundamentally transform the nature of either system they bind together."¹⁸

International hospitals also require a solution that addresses the rapid pace and always-changing needs of their highly diverse patient base, anticipating and eliminating any opportunity for miscommunication or error.

Microsoft Corporation offers a single solution built expressly to smooth the flow of information and automate processes for international hospitals, eliminating gaps as each step of medication management is completed and responsibility handed over to the next clinical stakeholder. The Microsoft Amalga Hospital Information System (HIS) includes an end-to-end medication management system designed specifically for international organisations that helps ensure the integrity of information at every point in the medication process.

With a shared record that provides identical views of patient and medication information to everyone involved in a patient's care, the Amalga HIS medication management system helps capture, protect, and communicate medication information and features built-in safeguards for a high level of accuracy.

Designed to meet the varied needs of all hospital departments and functions while providing a low cost of ownership and small hardware footprint, Amalga HIS is built on a single architecture and code base. Amalga HIS runs on commodity hardware with an architecture that is designed to be simple to manage and deploy, powerful, and reliable.

Improving Care: End-to-End Medication Optimisation

With Amalga HIS, hospitals can improve medication management at each stage of the process, ensuring a process that is greater than the sum of its parts.

Procurement and inventory management. Hospital pharmacies use Amalga HIS Medication Management to optimise their medication supplies, with automatic adjustments to inventories and robust and automated usage reporting, which avoids dangerous out-of-stock situations and helps reduce costs.

Ordering. Doctors use built-in ordering capabilities to place electronic orders. Based on information stored in the centralised patient medical record, doctors benefit from order pre-screening, which allows them to directly select from a list of potential medications. The system shows alerts relating to potential interactions and adverse effects before the physician makes a selection, reducing “alert fatigue” and promoting physician adoption of electronic ordering.

Pharmacy. When pharmacies receive electronic orders, Amalga HIS automatically screens them for potential interactions and duplicates, based on the patient’s electronic health record, and provides instant built-in access to drug monographs.

Dispensing. Amalga HIS supports dispensing in unit-dose, multi-dose, or traditional supply methods to accommodate standards across countries and continents. Seamless integration with pharmacy automated systems supports dispensing accuracy.

Administration. The medication is physically transported to the nursing floor, where nurses scan bar codes to positively identify the right patients and drugs before administration. Integrated clinical decision support and bedside drug screening as well as alerts based on real-time patient information from the shared electronic medical record provide an additional layer of security and safety precautions. Stock levels are automatically adjusted as a medication is administered.

Patient Education. Amalga HIS supports the printing of instructions, labels, and literature from the electronic medical record in virtually any language, permitting active patient participation in securing successful outcomes. Medication safety leaders emphasise that the more active and educated a patient is throughout the course of care, the safer the medication process becomes¹⁹.

Monitoring. The patient’s responses after medication administration are checked and recorded directly into the patient’s electronic medical record in Amalga HIS by the administering provider, allowing doctors to make more informed adjustments to dosages and the course of treatment. Doctors can place new orders based on this information - thus fully closing the loop and beginning the cycle again.

Because the system is fully integrated, with embedded alerts and automated screening that support caregivers along the way, processes share information seamlessly. This fosters a true closed loop that helps doctors to continue adjusting their treatments and help prevent dangerous misidentification or miscommunications, and contribute overall to quality and efficiency.

Hospitals are under pressure to perform financially and meet rigorous quality standards - and the risk of avoidable medication errors can be detrimental to their success. A solution such as the Microsoft Amalga HIS helps healthcare organisations close the loop, smoothe complex medication management processes, dramatically improve operational efficiencies, increase clinician productivity, and work toward improved patient safety and organisational quality.

Notes

¹ Kelly, William N. and Donald T. Rucker. "Compelling features of a safe medication-use system." *American Journal of Health-System Pharmacy*, August 2006.

² Davis, Mike. *Stage 6 Hospitals: The Journey and the Accomplishments*. HIMMS Analytics, 2007.

³ Streitenberger, Kim; Karen Breen-Reid; Cheryl Harris. "Handoffs in care: Can we make them safer?" *Pediatric Clinics of North America*. Volume 53, No. 6. 2006.

⁴ Enrado, Patty. "Key is closing the loop." *Healthcare IT News*, May 1, 2007.

⁵ Wisz, Mike. "Next steps in patient safety involve compounded products, monitoring systems." *H&HN's Most Wired*, May 19, 2007.

⁶ Bates, David W., MD, MSc; Michael Cohen, MS, RPh; Lucian L. Leape, MD; J. Marc Overhage, MD, PhD; M. Michael Shabot, MD; and Thomas Sheridan, ScD. "Reducing the frequency of errors in medicine using information technology." *Journal of the American Medical Informatics Association*. Volume 8, No. 4, July-August 2001.

⁷ Thompson, Douglas Ivan, MBA; David C. Classen, MD, MS; and Peter J. Haug, MD. "EMRs in the fourth stage." *The Journal of Healthcare Information Management (JHIM)*. Volume 21, No.3, Summer 2007.

⁸ Thompson, et. al.

⁹ Nicol, Natasha, Pharm.D. "Case study: closing the medication management loop." *Pharmacy Purchasing & Products*.

¹⁰ Nicol, et. al.

¹¹ Williams, Cynthia T., MSN, MBA, RN, FACHE. "Inside a closed-loop medication strategy." *CIN: Computers, Informatics, Nursing*, January/February 2005.

¹² "JCI accreditation: an interview with Karen Timmons." *Medical Tourism Insight*, April 2007.

¹³ Bhatt, Dr. Arun D. "Medication errors: malpractice implications and prevention." *Express Healthcare Management*, June 30, 2002.

¹⁴ Goldberg, Laurence A., FRPharmS. "Closed-loop medicines management system." *Hospital Pharmacy Europe*, November/December 2003.

¹⁵ *Preventing Medication Errors*. Institute of Medicine, 2006.

¹⁶ Goth, Greg. "Raising the bar." *Healthcare Informatics*, April 2006.

¹⁷ Goth, et. al.

¹⁸ Wisz, Mike. "Evolving IT products will help medication connectivity." *H&HN's Most Wired*, May 9, 2007.

¹⁹ Wisz, Mike. "Next steps in patient safety involve compounded products, monitoring systems." *H&HN's Most Wired*, May 19, 2007.