Implementation of a telepharmacy service to provide round-the-clock medication order review by pharmacists

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Effective execution of all aspects of the medication-use process, including prescribing, dispensing, and administration, is necessary to ensure high-quality, safe medication practices. Many regulatory, advisory, and purchasing groups have established numerous requirements and recommendations for improving medication safety.1-3 Chief among these is the need for pharmacist review of medication orders before medications are dispensed and administered to patients.

Approximately half of all medication errors occur in the prescribing stage of the medication-use process and may be attributed to the prescriber’s lack of knowledge of a drug, the prescriber’s failure to adhere to accepted practices and procedures, or general slips and memory lapses during the ordering process.4 Pharmacist review of medication orders reduces the pharmacist’s lack of knowledge of a drug, the prescriber’s failure to adhere to accepted practices and procedures, or general slips and memory lapses during the ordering process. Pharmacist review of medication orders reduces the pharmacist’s lack of knowledge of a drug, the prescriber’s failure to adhere to accepted practices and procedures, or general slips and memory lapses during the ordering process.

Purpose. The implementation of a telepharmacy service to provide round-the-clock medication order review by pharmacists is described.

Summary. Seven critical access hospitals (CAHs) worked collaboratively as part of a network of hospitals implementing the same electronic health record (EHR), computerized prescriber-order-entry (CPOE) system, and pharmacy information system to serve as the health information technology (HIT) backbone supporting round-the-clock medication order review by pharmacists. Collaboration permitted standardization of workflow policies and procedures. Through the HIT backbone, both onsite and remote pharmacists were given access to the medication orders, the pharmacy information system, and other patient-specific clinical data in patients’ EHRs. Orders are typically reviewed within 60 minutes of when they are entered into the system. The reviewing pharmacists have remote access to the EHRs in each CAH. After completing the clinical review, the pharmacist selects the appropriate medication to dispense from the CAH’s formulary. If the medication order is not made using the CPOE system, the order is scanned into a document and sent via e-mail to remote pharmacists. The pharmacist enters the necessary information into the EHR and pharmacy information system. The medication order review process from this point forward is identical to that used for medications ordered via CPOE. The new medication order is then entered into the EHR, and the CAH nurse can proceed with the order.

Conclusion. The implementation of a telepharmacy model in a multihospital health system increased access to pharmacy services, allowing for round-the-clock medication order review by pharmacists.

Index terms: Computers; Hours; Medication orders; Pharmaceutical services; Pharmacists, hospital; Pharmacy, institutional, hospital; Telepharmacy

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prescribing errors, as the pharmacist screens the orders for incorrectly prescribed medications (e.g., wrong drug, wrong dose, wrong frequency), interactions, and contraindications.13-15 The potential advantages of medication order review in acute care facilities have been previously discussed in-depth.2,3,8-12

Problem

Despite the recommendations and evidence of the benefits, very few rural hospitals have sufficient pharmacist coverage to ensure adequate prospective pharmacist review of medication orders. A 2008 study found that almost half (48%) of 410 small rural hospitals had pharmacists onsite fewer than five hours per week, and the lack of pharmacist coverage was magnified on nights and weekends, where approximately 90% of hospitals reported that nurses were responsible for dispensing and administering the medications.13 With such limited pharmacist availability, most rural hospitals do not use prospective medication order review. Only 20% of rural hospitals review orders before the medication is dispensed, and only about half review orders within 24 hours after medication administration.5,13 Other barriers to pharmacist review of medication orders in rural hospitals include cost and lack of patient volume to support a full-time pharmacist.6

Background

Small rural hospitals have developed a number of ways to increase pharmacist availability through loan forgiveness and rural training programs, as well as through contracting with community pharmacists or sharing a pharmacist with another health care institution.13-15 Despite these and other efforts, onsite availability of pharmacists to routinely provide medication order reviews before medication administration to patients is usually limited to a few hours per day. As a result, there has been increasing attention directed toward the use of health information technology (HIT) to review medication orders when no onsite pharmacists are available.

A number of telepharmacy models have been implemented by rural hospitals, the most common of which is a “hub and spoke” system.11-27 The hub is the entity responsible for supplying the rural hospital with round-the-clock pharmacist medication review. A hub is usually a larger hospital that either has contracted with the rural hospital or is a part of the same health system, though the use of outsourcing to a telepharmacy organization has also been documented. The rural hospital, through the use of information technology, sends orders to the hub pharmacy for review when its own pharmacist is unavailable. The level of technology associated with a telepharmacy model may vary, ranging from communication via fax to two-way video conferencing. Evidence of the effectiveness of telepharmacy systems in decreasing the rate of medication errors at rural hospitals is sparse, but initial research suggests that telepharmacy systems have been generally well received by patients and staff.1,11,18,24,25,27

There is also growing interest by rural and critical access hospitals (CAHs) to implement HIT-based solutions that allow the reviewing pharmacist, regardless of location, to have real-time access to the patients’ electronic health records (EHRs) and the hospital’s pharmacy information and ordering systems. However, high purchase and implementation costs, limited local expertise in implementing HIT, a need for significant process redesign to take advantage of potential HIT functionality, and the limited number of pharmacists make this approach particularly challenging. The shortage of pharmacists in rural hospitals and CAHs is particularly problematic because of the reduced opportunity for pharmacist input in HIT system workflow design and implementation. This article describes the creation of a HIT-based process for obtaining round-the-clock pharmacist review of medication orders in seven CAHs and a large rural hospital. These hospitals collaborated in implementing the same EHR, computerized prescriber-order-entry (CPOE) system, and pharmacy information system to serve as the HIT backbone supporting round-the-clock prospective medication order review by pharmacists.

Analysis and resolution

Mercy Health Network—North Iowa serves 14 counties in north central Iowa with a combined population of over 200,000. This network comprises Mercy Medical Center—North Iowa (MMC-NI), eight CAHs contract-managed by MMC-NI, and one CAH owned by MMC-NI. MMC-NI’s contract management activities principally include recruiting and hiring for key leadership positions in the CAHs and providing selected management services. Each CAH is its own legal entity with an independent governing board and separate medical staff bylaws and is organized as an independent hospital with its own clinical services and support departments (e.g., nursing, pharmacy, laboratory, billing). The majority of primary care physicians practicing in the seven CAHs studied are also affiliated with the primary care practice network managed by MMC-NI. The dominant referral pattern is between primary care providers practicing in the network CAHs and medical and surgical specialists working at MMC-NI.

At the time of initiating this project (2007), all CAHs had 25 or fewer acute care beds; one CAH included a 10-bed psychiatric unit, and two CAHs had attached nursing homes. Annual CAH inpatient admissions ranged between 350 and 1,795, and all but two offered obstetric services. Each CAH maintained an active outpatient department, with an-
nual visits averaging 16,000–60,600. The number of visits to the hospitals’ emergency departments (EDs) ranged from 2,200 to 6,600 annually. The total number of surgical procedures performed in these CAHs ranged from 450 to 1,280 annually. The total number of full-time-equivalents ranged from 92 to 180. In contrast, MMC-NI, as a large rural referral hospital, had 241 staffed beds and provided approximately 13,000 inpatient admissions, 450,000 outpatient visits, 29,000 ED visits, and 7,000 surgical operations annually. Combined, the MMC-NI network had over 18,000 inpatient admissions, 53,000 ED visits, and 670,000 outpatient visits. CAH outpatient gross revenues ranged from $11.3 million to $21.6 million, accounting for 60–82% of total gross revenues. CAH total net revenues ranged from $11 million to $21.6 million. The cost of charity care ranged from $57,000 to $153,000. In contrast, MMC-NI’s total net revenue was about $300 million, about 26 times that of the smallest network CAH. Combined total network revenues exceeded $415 million.

Pharmacist coverage. Before the system changes described herein, the CAHs used a variety of approaches to provide pharmacy coverage, including two full-time MMC-NI pharmacists shared among multiple CAHs, one full-time MMC-NI pharmacist, and three community-pharmacy pharmacists providing part-time service to different CAHs. Onsite pharmacist coverage was provided 15–40 hours per week (mean, 24 hours), with only one CAH regularly scheduling onsite pharmacist coverage for any portion of the weekend. Although two CAHs did not have pharmacy technician support, the other five did, and these technicians worked 24–70 hours per week. Pharmacists were responsible for verifying provider orders, dispensing medications, and providing general oversight of pharmacy operations.

The pharmacy technicians predominantly assisted the pharmacists with medication dispensing and billing for medications administered to patients. As a large rural referral hospital, MMC-NI already had round-the-clock inhouse pharmacist staffing and medication-order-review capability.

HIT implementation. MMC-NI, a member of Trinity Health (Novi, MI), implemented its EHR and CPOE systems in July 2005. Building on a tradition of collaboration centered around improving patient care and administrative processes, planning began in 2006 for a regional implementation of the same EHR, CPOE system, and pharmacy information system from the same vendor. In addition to the benefit of sharing clinical data for patients seen in more than one network facility, this collaborative network approach yielded major advantages, including (1) sharing clinical, HIT, and administrative expertise of the larger rural referral hospital across the CAHs, (2) use of similar HIT readiness assessment, workflow policies and redesign, planning, implementation and postimplementation maintenance processes to reduce the amount of trial-and-error learning, and (3) increased economies of scale from group purchasing opportunities.

All seven CAHs implemented the EHR, CPOE, and pharmacy information systems during the summer of 2008 using a strategy similar to that used by MMC-NI9 to bring the HIT components online at approximately the same time. Three CAHs implemented the systems in July 2008, and the other four CAHs implemented them in September 2008. During the preimplementation, “go-live,” and postimplementation stages, MMC-NI provided a significant amount of leadership, consultation, and planning and educational support. The resulting HIT-enabled changes in medication order review in the CAHs are discussed below.

Service implementation. Ideally, medication order review occurs before a medication is administered. To optimize both quality and safety, order review should occur soon after medications are ordered. Medication orders needing review include initial medication orders, orders resulting in changes to existing orders, discontinued orders, and orders resulting from changes in patient care status, which are handled in a special way in CAHs and rural hospitals. In particular, CAHs and rural hospitals under the Medicare program can use the same inpatient beds to provide acute inpatient care and skilled nursing care. By using these designated “swing beds,” there can be a smoother transition to skilled nursing care without physically moving the patients. Rural facilities benefit from greater utilization of the facility as well as from an additional payment received for the skilled nursing care. However, Medicare requires that patients be discharged from the acute care bed and admitted to the swing bed. Even though patients remain in the same nursing unit and bed, the discharge and admission processes require discontinuing existing medications associated with the acute care stay and initiating new orders written as part of the admission to the swing bed.

Because of the limited onsite pharmacy coverage, implementing round-the-clock pharmacist review of medication orders was achieved by partnering with remotely located pharmacists. Through the HIT backbone, both onsite and remote pharmacists were given access to medication orders, the pharmacy information system, and other patient-specific clinical data in patients’ EHRs. Pharmacists’ ability to verify orders for various medications was facilitated by the development of a standardized formulary, accessible through the pharmacy information system. Development of the shared formulary by the CAHs
was discussed in-depth elsewhere. After implementation of the EHR and CPOE systems, the pharmacists employed locally by the CAHs continued to provide initial medication order reviews during their usual scheduled work hours. In order to provide this service round-the-clock, the CAHs issued a request for proposal to potential institutions who could offer telepharmacy services. Six bidders responded, and the successful bidder was Mercy Medical Center—Dubuque (MMC-Dubuque).

MMC-Dubuque, like MMC-NI, is a member of Trinity Health and has the same EHR, CPOE system, and pharmacy information system. As of 2008, MMC-Dubuque has been providing remote medication order review for the seven CAHs affiliated with MMC-NI. Currently, all after-hours, weekend, and holiday reviews of first medication orders for acute care CAH inpatients (i.e., inpatients on the medical, surgical, obstetrics, and behavioral health units) are done remotely.

Medication order review. Orders entered by the provider are automatically received by the remote pharmacy during its hours of coverage through the integrated pharmacy information system (PharmNet, Cerner Corporation). The process for written medication orders is to have only pharmacists enter those orders into the system. This has been accomplished by an innovative, electronic method that eliminates the need to generate a paper copy for the pharmacist. In the e-mail program used by Trinity Health, a group e-mail account was created and is accessible to all regional pharmacists and pharmacists employed by the contracted pharmacy. Each network site has at least one scanner that can scan either stat or regular orders to the group e-mail account. Nurses scan written and signed orders, select the priority of the order, and send the order as an e-mail message to the remote pharmacy e-mail account. Messages are sent without leaving the internal network to which the CAHs and MMC-Dubuque belong and therefore do not require Privilege Management Infrastructure encryption. Security is managed through role-based access to patient information, which ensures Health Insurance Portability and Accountability Act compliance. This is the same system used for all other health information applications, in which the degree of access is determined by security position as well as authorization by the administrator of the group e-mail account. Users have their own unique usernames and passwords, and sites have methods of monitoring system usage. A dedicated computer screen at MMC-Dubuque is used to separately process all off-site medication order reviews. Pharmacists access their e-mail, noting the sending site’s name and the phone number of the nurses’ station. If the priority of the order is stat, the e-mail subject begins with “stat.” Pharmacists open the e-mail, which contains the order as an attachment in portable digital format and process the order in the pharmacy information system without the need to print the order. Each order is then stored in site-specific folders where network pharmacists may review the orders when they return to work. The scanned orders remain in electronic storage and are deleted after seven days.

Orders are typically reviewed within 60 minutes of their entry into the system. The reviewing pharmacists have remote access to the EHRs in each CAH in order to review the patients’ laboratory test results and other clinical data. If additional information is needed, they can call the prescribing physician or CAH nurses. After completing the clinical review, the pharmacist selects the appropriate medication to dispense from the CAH’s formulary. Each formulary item is represented by a unique stock-keeping unit (i.e., specific drug, dose route, dose) and has an associated National Drug Code (NDC). These NDCs, embedded in bar codes, are used for the subsequent dispensing and bar-code-assisted medication administration (BCMA) processes. An advantage for the reviewing pharmacists is the use of the same EHR, CPOE system, and pharmacy information system platforms and the same formulary across all facilities.

Order volume and costs. Initially, the CAHs estimated the expected annual volume of remote medication order reviews to range from 2,834 (about 9% of all medication orders) to 10,076 (33% of all medication orders). Experience to date suggests that these estimates were too low. For example, the CAH that estimated a total of 10,076 annual order reviews had 15,634 orders reviewed remotely through the first eight months of the year. The average number of orders reviewed monthly was 1,954, almost half of all medication orders being reviewed in that CAH.

Currently, the CAHs pay $4 per medication order reviewed via this HIT-based system. For example, in the case of a patient for whom there is just 1 order for 1 new medication, the charge is $4. Alternatively, for a patient with 10 different medication orders who is discharged from acute care status and admitted to skilled nursing care status, every order to discontinue and every order to start a medication is reviewed, generating a total charge of $80 (10 discontinuation orders × $4 and 10 admission orders as a swing bed patient × $4). While it is in the CAHs’ financial interest to have changes in care level occur during weekdays when their local pharmacists are available to review the orders, such transfers frequently happen outside these hours, on weekends, and holidays. As expected, the volume of and costs for medication orders reviewed remotely varies widely among the seven CAHs, from approximately 700 orders ($2,800) to over 2300 orders ($9,200) per month.
Because the CAHs are reimbursed by Medicare on a cost-plus basis, the additional costs for the pharmacists’ reviews for Medicare patients are directly reimbursable. The CAHs’ cost-plus reimbursement model allowed them to receive significant funding to cover portions of the costs associated with purchasing computer hardware and software. This financial advantage available to CAHs is not available to larger hospitals receiving diagnosis-related group case-based reimbursements.

To gain a better idea of the value added by the pharmacists’ reviews, the types of actions taken as a result of these reviews were evaluated between February–April, 2009. These included a total of 9163 orders that were approved, 2226 new orders, 1294 modified orders, 972 discontinued orders, and 179 orders voided by the reviewing pharmacists. Overall, about 58% of the total reviews were conducted by the remote pharmacists.

Discussion

The CAHs affiliated with MMC-N1 have gone from very limited to round-the-clock pharmacist order review coverage in all but one hospital, with that one lacking coverage for only one hour per week. This has been accomplished by the direct use of HIT to connect remotely located pharmacists in near real time, generally within 60 minutes, to when a medication order is entered. Critical to the success in establishing round-the-clock pharmacist review of medication orders were several key decisions made by each hospital’s executive leadership toward standardizing medication-related policies and practices. The results of these decisions included standardization of the formulary system across all hospitals involved, creation of a regional pharmacy and therapeutics committee to oversee future formulary changes, use of the same clinical software systems across all hospitals, development of policies and procedures requiring pharmacist review of first medication orders (except in emergencies), and use of the same equipment and software to support automated dispensing and BCMA devices. Further, before implementation of round-the-clock order review, most pharmacists working in the local hospitals had not previously met or worked with each other. In order to have a seamless review process, it was essential that these pharmacists work together not only to standardize the formulary but to help develop the review process to ensure consistency between local and remote pharmacists’ reviews.

With few exceptions, remote pharmacist review of medication orders has been well received and is perceived to improve the quality and safety of patient care. Interviews with all of the CAHs’ chief nurses and pharmacy directors revealed that physician response to the process has been positive. The potential to talk with a pharmacist, regardless of the time of day or day of the week, was also viewed as very positive.

One concern raised in one CAH was the occasional delay in obtaining the remote pharmacists’ reviews. Such delays may be a result of how a medication order is sent from a particular CAH or a specific problem with receiving orders from that CAH. If there is a delay or an immediate need to dispense medication, the CAH staff still has the ability to dispense and administer the medications without the pharmacist’s review. Another concern was that some nurses who previously acted immediately on a physician’s medication order were frustrated that they now had to wait for the pharmacist’s review before giving the patient the prescribed medication.

Although CAHs can pass the incremental costs of remote pharmacist review on to third-party payers, concern was raised by the CAHs about having the same charge applied to all orders, particularly for transitions in level of care, for which there may be no changes made to the actual orders. However, even when orders are rewritten without any changes, pharmacist review plays a key role in supporting medication reconciliation requirements, as well as providing an important check for potential transcribing errors.

One final concern is that because different remotely located pharmacists review the orders, the opportunity for these pharmacists to develop close working relationships with the physicians located in the CAHs is reduced. This potential negative effect is easily outweighed by the advantages associated with having round-the-clock pharmacist order review. One option to address this concern is to have the remote pharmacists visit the CAHs and meet the medical staff and nurses with whom they will be communicating.

The successful implementation of a HIT-enabled process that supports round-the-clock pharmacist medication order review is a major step forward in the CAHs’ efforts to create safer and more-reliable medication processes. Combined with the introduction of automatic dispensing units and BCMA, the CAHs successfully implemented a closed-loop medication process. Critical to this success was the shared vision for improving patient care quality and safety, combined with the collaborative approach used to incorporate knowledge and skills from the larger rural referral hospital into their own facilities and patient care processes. This partnership approach allowed for the sharing of expertise and development costs, making this important transition less expensive, both in direct dollar costs and staff time. The shared bid process covering several CAHs and using the same information technology infrastructure to link remote pharmacists to the hospitals resulted in multiple bidders. While it
is not possible to estimate a specific economy-of-scale effect, this may have had a positive effect on both the number of bidders and bid prices. The study hospitals clearly demonstrated the potential for HIT solutions to address both work force and distance challenges faced by rural hospitals.

In the case of the CAHs affiliated with MMC-NI, local and remote pharmacist order review resulted in pharmacists taking actions beyond order review and approval (e.g., order modification or discontinuation) for approximately one third of the medication orders. However, this information does not allow for the exact measurement of the number of prescribing errors prevented or near misses identified as a result of the pharmacist order reviews. In addition, we could not document how the pharmacists’ reviews may have improved the quality of the prescribing physicians’ decisions related to medication type, dosage, frequency, or route of administration. However, the number of medication orders being reviewed and the frequency with which pharmacists took actions beyond just reviewing the orders in this case study suggest that pharmacist review of medication orders is an important value-added service.

Conclusion

The implementation of a telepharmacy model in a multihospital health system increased access to pharmacy services, allowing for round-the-clock medication order review by pharmacists.

References


