

Medication Safety Alerts

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This column draws on US and Canadian experience and may include, with permission, material from the *ISMP Medication Safety Alert!*, a biweekly bulletin published by the Institute for Safe Medication Practices (ISMP), Huntingdon Valley, Pennsylvania.

TECHNOLOGY AND MEDICATION SAFETY

New health care technologies — including electronic medication administration records, automated medication dispensing machines, robots, computerized physician order entry, computerized decision support, bar coding for dispensing and medication administration, and personal digital assistants — have been advocated by many to further the cause of medication safety. Anecdotal reports indicate that it is reasonable to expect these technologies to reduce medication errors. However, critical evaluation of their beneficial impact on errors and other adverse outcomes is lacking.¹ We do know that technology assists us “in organizing and making available information, in identifying links between pieces of information, and in doing boring repetitive tasks, including checks for problems.”² Furthermore, technology helps the user to rely less on memory, standardizes information, can decrease duplication of information, and can be programmed with “forcing functions”. All of these aspects can assist in preventing errors.

Nonetheless, even as we await more data on the impact of new technologies on medication errors, we are introducing these technologies into practice. This being the case, their potential applications and the consequences of their implementation need to be critically considered. First of all, how does a health care institution choose among available technologies? The Healthcare Information and Management Systems Society has reported that in 2003 the top technology priority of 287 chief information officers at hospitals and other health systems in the United States was to “reduce the medical errors and improve medication safety”.³ It has been reported that close to 50% of errors occur at

the ordering and interpretation stage of the drug use process, whereas only 29% occur at the drug administration stage.⁴ Some suggest that most ordering and interpretation errors are intercepted and corrected by either pharmacists or nurses. However, other than the patient, who might be the ultimate safety mechanism, there are limited safeguards at the final stage of the drug use process, i.e., administration of the drug, and there may be little to prevent a caregiver from administering the wrong drug or the wrong dose or even giving a drug to the wrong patient. With these issues in mind, and with a wish to manage medication safety by implementing technologies closer to the “receiving end” of the drug use process, policy makers and health care executives are struggling to choose between computerized physician order entry (CPOE) and bar coding, since in most facilities, financial constraints prevent implementation of more than one technology at a time.

Ideally, every facility should have all possible technologies in place, but the reality is that health care providers and executives need to make difficult choices among available technologies; in addition, different disciplines have their own preferences and interests to consider. For example, the choice of CPOE over other technologies might take into account not only the cost of the technology and its implementation, but also hospital-specific factors, the most significant of which is the medical staff’s culture and acceptance of CPOE (which entails certain changes to the prescribing process). In contrast, the addition of bar coding technology to drug administration involves being able to scan the patient’s identification, the drug profile, and



the specific drug to be given, to ensure that the five “rights” are verified: right medication, right dose, right client, right time, right route. More players, including technology vendors, pharmaceutical vendors, and health care organizations themselves, need to be involved in the application of bar coding than in the implementation of CPOE. Other barriers to bar coding include lack of standardization, problems with coding related to product and label size, and lack of bar coding for single-dose units.

The application of a technology on its own cannot guarantee medication safety, but it can help us to standardize processes and consolidate information, and it can identify errors and prevent them from harming patients. However, these benefits will be realized only if the technology is implemented and used properly.

The following sections describe some of the critical factors for success in planning for and implementing new technologies.

Culture of Safety

Achieving medication safety goals, including implementation of new technologies, requires an expenditure of effort and resources that should be considered worthwhile. This depends on a progressive culture of patient safety and error reduction requiring leadership at all levels and from within all disciplines. Unfortunately, many organizations view technology as “a commodity, like plumbing, rather than as a strategic resource that is vitally important to the delivery of care.”⁵ The necessary culture shift should be coordinated along with implementation of both the new technology and the programs that change the business processes of health care delivery.⁶

Staff Buy-In

Staff members are the end users of any new technologies and as such should have some influence in their selection and application. Both management and front-line staff should be involved from the project’s beginning, at the planning stages, first exploring the relevant practice issues and searching for potential solutions, then identifying system requirements and selecting the appropriate product. During implementation, staff need to be involved in configuring or customizing the product, performing usability and on-site pilot testing, and training users.

System Integration

New technologies require full integration with other related systems to produce their optimal effects. For example, CPOE should have an appropriate interface with the pharmacy system that verifies orders before

they are processed. In this regard, benefits can be achieved through online access or an interface with patient clinical data, where the disease state, laboratory results, and vital signs can be used to guide the clinician to the most appropriate therapy. CPOE can standardize the medication ordering process by forcing legibility and order completeness and by requiring the identification of specific parameters, such as the generic drug name, the dose, and the route of administration.⁶ An interface with a clinical decision support program can then identify maximum doses and inappropriate routes of administration for specific drugs and provide up-to-date clinical information on the medications to be ordered.

In the case of automated medication dispensing machines and bar coding for medication administration, the technologies should have an appropriate interface with the pharmacy application’s patient profile. Automated dispensing machines should only allow medications listed in the pharmacy profile to be removed, except under strictly controlled circumstances. For medication administration, bar code scanning of patient identification and the unit-dose package would automatically be compared with the pharmacy patient profile and help to ensure that the right drug is being administered to the right patient at the right time.

Critical Evaluation

A failure mode and effects analysis (FMEA) of technologies under review for purchase and implementation will pinpoint and explore potential problems with the technologies as they are intended to be used in the facility. This is a good way to identify and avoid or correct deficiencies.

FMEA provides guidance as to which technology platform and which vendor’s product is the best selection for the intended use. The same technology can be applied in different settings, yet the ultimate success and benefits of a particular technology will depend on a variety of implementation factors, including customization; available staff and training; application to the facility’s patient types, organizational culture, practices, and environment; and overall level of support within the organization.

System Robustness

It is important to recognize that health care workers can readily find ways to bypass systems when they break down or are cumbersome to use. Yet “work-arounds” that are not standard downtime procedures can be hazardous and may introduce errors. Therefore, technology should be reliable and easy to use.



Conversely, a technology should be flexible enough that it can be customized for standard clinical practice in a given facility, without requiring the end user to make adjustments to "fit" the system.

Training and Support

End users must be given adequate training when new technologies are introduced into daily practice. The training should include actual operations training to reinforce training-room learning. Provision of adequate support by both the vendor and in-house technical staff, during implementation and thereafter, is critical.

Conclusions

What do all these considerations mean to pharmacists? First, many health care technologies have a direct impact on pharmacy. Second, they are commonly related to the drug use process, in which pharmacists play an important role. Therefore, pharmacists need to merge the issues of clinical practice, patient safety, and technology within their work. To maintain safe medication practices, pharmacists should ensure that they, and the pharmacy department as a whole, are fully involved in the decision-making and deployment processes for health care technologies within their facility.

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