SYNOPSIS

KEY POINT SUMMARY

OBJECTIVES

The purpose of the study was to investigate whether the implementation of a bar code system reduced pharmacy dispensing errors and potential adverse drug events at a 735-bed tertiary care academic hospital.

DESIGN IMPLICATIONS

Environmental design is an important factor impacting the success of new technology (e.g. bar code system) that improves patient safety. A supportive environment should be provided to facilitate new technology implementation.

Medication Dispensing Errors and Potential Adverse Drug Events Before and After Implementing Bar Code Technology in the Pharmacy in the Pharmacy

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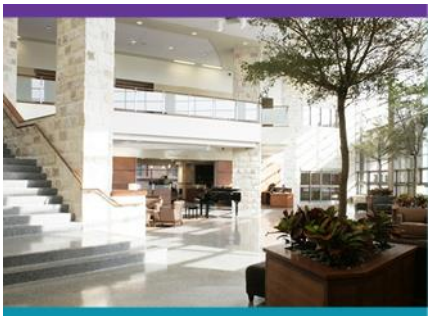
2006 | Annals of Internal Medicine
Volume 145, Issue 6, Pages 426-434

Key Concepts/Context

Medication errors are errors that occur while ordering, transcribing, dispensing, administering, or monitoring medications. Medication dispensing errors refer to discrepancies between a prescription and the medication dispensed by a pharmacist. Examples of dispensing errors include wrong medication, wrong strength or dose, wrong formulation, and expired medication. Because of the high volume of medications dispensed every day, a significant number of dispensing errors may occur in a hospital pharmacy. Only a small proportion of the dispensing errors may be detected and intercepted before medication administration. Many dispensing errors may reach patients and cause harms (i.e. adverse drug events)

Bar code technology, widely used in other industries, is a promising strategy in preventing medication errors. It involves scanning a bar code during pharmacy dispensing to ensure that the correct medication is dispensed in correct dose and formulation. The implementation of bar code technology may need support from environmental design. For example, in this particular study, a dedicated medication repackaging center in pharmacy was built to accommodate the function of affixing a bar code to every dose of medication if a bar code was not applied by the manufacturer.



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Methods

This before-after study was carried out in two phases: pre- and post-implementation of a bar code system. In phase 1, the dispensed medications were only visually verified. In phase 2, the medications without bar codes from manufacturers were repackaged with bar codes at a dedicated repackaging center and all medications were verified visually and by bar code scanning (either 1 does per batch or all doses in three configurations of bar code implementation). During both phases, a research pharmacist inspected medications to identify four types dispensing errors including wrong medications, wrong does or strength, wrong formulation, and expired medications. Two board-certified internists independently reviewed each dispensing error, determined whether the error would result in harm to patient (potential ADE), and classified the potential ADE's in three levels—significant, serious, and life-threatening. The rates of dispensing errors and potential ADE's were calculated as the percentages of dispensed medication doses and were compared between the two study phases and between the three configurations of bar code implementation.

Findings

About 370,000 medications were inspected in the two study phases. Both rates of dispensing errors and potential ADE's reduced significantly after the implementation of the bar code system. The overall dispensing error rate was reduced by 85%. The rate of dispensing-related potential ADE's was reduced by 60%. Comparison between the three bar code configurations showed that system configurations that required scanning of every dose had a bigger reduction in errors than configuration that did not require scanning of every dose.

Limitations

There were several limitations of this study:

- The implementation of the bar code system was a bundle of various components including the technology itself, the physical environment support (e.g. medication repackaging center), and the changes in workflow processes. The individual effects of technology and environmental support was not separated out.
- Because the actual ADE data were not available, a surrogate outcome—the rate of potential ADE's based on judgments by two physicians—was used but might not accurately reflected the rate of actual ADE's.
- Pharmacists' performance might have improved or changed because of the existence of observers.
- Because of the differences in medication dispensing processes at other hospitals, study results may not be generalized to other facilities.