

PEER REVIEWED

Medication Safety in Wisconsin Hospitals

Survey notes progress on implementation of medication safety recommendations

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Since the 1999 release of the influential Institute of Medicine (IOM) report, *To Err is Human: Building a Safer Health-System*, patient safety has emerged as one of the key issues in health care.¹ The report suggested that 44,000 to 98,000 people each year die from medical error, and that medication errors alone are responsible for 7,000 of those deaths. Most of the recommendations for improvement included in the IOM report focused on public policy changes needed to improve patient safety. The report did suggest, "Health care organizations should implement proven medication safety practices." Over the last several years, guidelines, recommendations and numerous, more specific statements have been released. For example, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) has incorporated six patient safety goals for 2003 into the hospital accreditation process,^{2,3} and the National Quality Forum (NQF) set 30 universal health care safety practices.^{4,5}

In 1999 and 2000, however, national guidelines were only beginning to emerge. The organizations which then formed the Wisconsin Patient Safety Institute (WPSI) convened a multi-disciplinary task force to develop consensus around a core set of recommended medication safety practices to focus the efforts of Wisconsin health care providers.

WPSI is an independent, not-for-profit organization committed to improving patient safety in Wisconsin's health care system. WPSI brings together health care consumers, payers, provider organizations, practitioners, educators, researchers, regulators, and policy makers to reduce the risk of patient injury caused by the process of health care.

WPSI's recommendations,⁶ included in

ABSTRACT. The Wisconsin Patient Safety Institute (WPSI), a collaboration of health care providers, professional organizations, payers, consumer groups, state government, and other representatives, published ten medication safety recommendations in 2000. In winter 2002, a survey of all Wisconsin acute-care, non-psychiatric hospitals (n=114) assessed changes in practice in Wisconsin hospitals since publication of WPSI's recommendations. On most questions, respondents were asked to compare their practice in 2000 to current (2002) practice.

Seventy-six hospitals returned usable surveys for a response rate of 67%. Most hospitals were rural (63%) and reported having fewer than 100 beds (67%). Wisconsin hospitals with pharmacy services available 24 hours a day increased from 75.3% in 2000 to 81.6% in 2002. Use of the unit dose system for 80% or more of non-emergency medications increased from 80.3% in 2000 to 93.4% in 2002. In 2002, only 5.4% of respondents had fully implemented computerized prescriber order entry (CPOE), but 2.7% reported partial implementation and 64.9% planned to implement the technology. Only 2.6% of respondents had fully implemented bar coding systems for medication packaging and administration in 2002, but 5.3% reported partial implementation and 52.6% planned to implement the technology. Barriers to implementation of CPOE and bar coding systems were similar and included lack of financial resources, other organizational priorities, and the absence of suitable systems.

Multidisciplinary review and promotion of medication safety standards has had a positive impact on pharmacy practice in Wisconsin hospitals. Although room for improvement exists, progress occurred in nearly all areas in which WPSI made recommendations. In areas where data are available, especially in the use of unit dose and bar coding technology for medication administration, Wisconsin hospitals surpass national benchmarks.

Table 1, were adopted in late 2000 and promoted by member organizations, including the Wisconsin Hospital Association (WHA), Rural Wisconsin Health Cooperative, Wisconsin Medical Society, Pharmacy Society of Wisconsin (PSW), Wisconsin Nurses Association, and others.

We undertook this survey to assess changes in practice in Wisconsin hospitals since publication of WPSI's recommendations.

METHODS

A survey instrument based on WPSI's recommendations was developed by the authors in collaboration with a group of WPSI board members from various disciplines (medicine, nursing, administration). Since baseline data for these medication safety practices were unavailable,

most survey questions asked the respondent to indicate the current status of the activity and to recall the status in 2000 (before publication of the ten recommendations). The survey instrument also included questions regarding hospital demographics and barriers to implementation of computerized prescriber order entry (CPOE) and bar-coding systems. Surveys were mailed to directors of pharmacy (expected to be most knowledgeable regarding survey content) at all Wisconsin acute-care, non-psychiatric hospitals using a mailing list from PSW. Each pharmacy director was contacted three times in December 2002. The initial mailing included the survey and a copy of WPSI's recommendations. Reminder postcards were mailed one week later. Two weeks after the initial mailing, a sec-

ond copy of the survey and recommendations was mailed to the entire cohort. Survey responses were entered into an Excel spreadsheet and analyzed using descriptive statistics.

RESULTS

Response rate and survey demographics

All Wisconsin acute-care, non-psychiatric hospitals (n=114) were surveyed; usable responses were received from 76 hospitals for a response rate of 67%. Most hospitals were rural (63%) and reported having fewer than 100 beds (67%). When compared to demographic information for all Wisconsin hospitals obtained from WHA, the survey sample appears similar in bed size, but rural hospitals are slightly over-represented. Table 2 summarizes respondent demographics.

Status of best practices

The survey included several questions to assess activities by Wisconsin hospitals to address high-risk medications and error-prone abbreviations. The percent of hospitals with a written policy and procedure for select high-risk medications increased from 56.2% in 2000 to 87.8% in 2002. Likewise, the percent of institutions with a written policy to eliminate error-prone symbols and abbreviations increased from 16.4% in 2000 to 55.3% in 2002, and in addition, 31.6% of hospitals had such a policy in development in 2002. The survey further asked whether hospitals had undertaken educational efforts or implemented system changes to eliminate error-prone abbreviations, and 37.3% of hospitals reported some activity and 4% substantial activity in 2000. However, an overwhelming majority of pharmacy directors reported these types of efforts in 2002, with 67.1% reporting some activity in 2002 and 23.7% reporting substantial activity. Given these results, it appears that Wisconsin hospitals have made progress in meeting the requirement in JCAHO's 2003 patient safety goals to standardize abbreviations, acronyms, and symbols.^{3,4}

CPOE will not be widely adopted in Wisconsin hospitals for some time. In 2000, 2.9% of hospitals that responded reported CPOE was fully implemented, and for 2002, the full implementation

rate increased slightly to 5.4% of hospitals. Most (64.3%) of respondents do not plan full implementation until 2005 or later. While the rate of CPOE implementation has been slower than recommended, Wisconsin hospitals have undertaken substantial planning and preparation for CPOE. Approximately 46% of respondents indicated CPOE was planned or partially implemented in 2000, and in

2002 nearly 70% of Wisconsin hospitals reported partial (2.7%) or planned (64.9%) CPOE implementation.

While bar coding systems for medication packaging and administration remain less common than CPOE, they are becoming more prevalent in Wisconsin hospitals. In 2000, only 1.4% of hospitals had fully implemented and 4.3% had partially implemented bar coding technology.

TABLE 1. MEDICATION SAFETY RECOMMENDATIONS FOR WISCONSIN HEALTH CARE PROVIDERS

Hospitals, extended care facilities, nursing homes and other health care facilities need to provide 24-hour pharmacy coverage either on-site or on-call (by telephone access to a staff pharmacist or contracted through a community pharmacist).

Hospitals, community pharmacies, ambulatory clinics, and any other health care facilities that dispense medication should utilize available computer software to provide clinical screening to maximize patient safety in the dispensing of all prescription medications.

Hospitals and other appropriate health care facilities should conduct an evaluation of an integrated computerized prescriber order entry (CPOE) system with clinical decision support for medications and other ordered services by January 1, 2002 with implementation by January 1, 2004.

Hospitals, extended care facilities, nursing homes, and other appropriate health care facilities responsible for the administration of medications to patients should implement an oral and inhalant unit dose distribution system for all non-emergency medications administered within the facility by January 1, 2002.

Hospitals and ambulatory health care centers should utilize a pharmacy based and pharmacist managed process for the preparation of intravenous admixture solutions.

Pharmacies and physicians should include the generic name on the label of prescription medications dispensed to patients.

Hospitals and other appropriate health care facilities should investigate and evaluate the use of bar coding systems for the packaging and administration of medications by January 1, 2002.

Hospitals and other appropriate health care facilities should prepare and maintain written policies and procedures for the use of select high-risk medications within the facility.

Prescribers should institute actions to eliminate the use of symbols and phrases that are commonly misinterpreted by pharmacists and other health care providers.

Prescribers and pharmacists should include the intended use on all prescription orders and prescription drug labels and packages for consumers.

These rates increased to 2.6% and 5.3% respectively in 2002. However, bar coding systems will become common in the future; the number of Wisconsin hospitals that plan to implement this technology increased from 37.1% in 2000 to 52.6% in 2002.

In 2000, 2.7% of hospitals included the indication or intended use on all inpatient orders and medication administration records, compared to 7.9% in 2002. Indication or intended use was employed even less often in hospital-based outpatient pharmacies. Only 1.4% of outpatient prescriptions and drug labels included the indication or intended use in 2000 and this practice increased marginally in 2002 to 2.6% of respondents.

Table 3 summarizes the status of WPSI's recommendations in 2000 and 2002. Respondents reported that all of these practices are widely used in Wisconsin hospitals, especially 24-hour pharmacy services and the unit dose system.

Barriers to implementation of CPOE

The survey provided a list of potential barriers to CPOE and bar coding implementation: financial resources not available, not an organizational priority, human resources not available, suitable systems not available, and inability to integrate with existing systems. Space was also provided for respondents to indicate "other" barriers. Responding pharmacy directors were asked to mark any statements they perceived as barriers to implementation of these technologies in their

SURVEY SAMPLE		ALL WISCONSIN HOSPITALS*	
Bed Size		Bed Size	
< 50	41%	< 50	48%
50-100	26%	50-100	19%
100-300	24%	100-300	25%
>300	9%	>300	7%
Hospital Location		Hospital Location	
Rural	63%	Rural	44%
Urban	37%	Urban	55%
*Acute care, non-psychiatric hospitals			

hospital. For CPOE, "lack of financial resources" was the barrier most commonly cited by respondents, followed by "not an organizational priority" followed by "suitable systems unavailable." Several remarks in the 'other' category identified physician resistance and opposition as a barrier to CPOE in their organizations.

Barriers to implementation of CPOE frequently cited in the current survey, such as financial concerns and lack of suitable systems, are similar to barriers recognized by others.^{7,8} Significant financial investment in capital, human, and operating resources is required to successfully implement CPOE. One study estimated implementation would initially cost \$7.35 million in a 500-bed hospital, with annual continuing costs of approximately \$1.35 million.⁹ Much of these costs result from CPOE's attempt to au-

tomate complex systems throughout the institution and from software that remains in its infancy. Further, the costs of CPOE in smaller hospitals (similar to the majority of the hospitals represented in this survey) were not included in this study and deserve evaluation.

To date, CPOE has been used most successfully in institutions that have used internally developed "homegrown" systems.^{7,8} In the current survey, several pharmacy directors described physician resistance as a barrier to CPOE, an observation consistent with other research. In a consensus statement on considerations for successful CPOE implementation and other research, physician leadership and acceptance of CPOE were recognized as crucial factors in successful implementation of CPOE.^{9,10}

Percent of Wisconsin Hospitals Reporting Practice	2000	2002
Pharmacy coverage available on-site or on-call 24 hours a day	75.3%	81.6%
Use of clinical screening through pharmacy computer system	64.4%	74.7%
80% or more of non-emergency medications administered in hospital using unit dose system	80.3%	93.4%
Pharmacy based and managed processes used for preparation of admixture solutions	72.0%	82.9%
Generic name included on labels of all inpatient medications dispensed to patients	84.0%	92.1%
Generic name included on labels of all outpatient medications dispensed to patients	80.9%	83.0%
Written policies and procedures available and implemented for the use of select high-risk medications	56.2%	87.8%
Written policy to eliminate the use of error prone abbreviations from medication orders in the hospital	16.4%	55.3%
Indication or intended use included on all inpatient medication orders and medication administration record	2.7%	7.9%
Indication or intended use included on all outpatient prescriptions and drug labels	1.4%	2.6%

TABLE 4. SELECT MEDICATION SAFETY PRACTICES IN WISCONSIN COMPARED TO NATIONAL BENCHMARKS

	NATIONWIDE^{11,12}	WISCONSIN
Unit Dose	81.4%*	93.4%†
24-hour Pharmacy Services	29.2%	81.6%
CPOE	4.3%	5.4% (2.7% Partial Implementation)
Bar Coding Technology	1.5%^	2.6% (5.3% Partial Implementation)

*Percent of hospitals that dispensed 75% or more of oral doses as unit doses to non-critical beds; use of unit dose lower for injectables and critical care beds

†Percent of hospitals that dispensed 80% or more of non-emergency oral or inhalant doses as unit dose

^Excludes federal, VA, and specialty hospitals, number may be higher if VA hospitals were included

Barriers for bar coding technology

The top three barriers to implementation of bar coding technology were identical to those mentioned for CPOE.

Barriers for indication or intended use on prescription orders

Greater progress was anticipated toward inclusion of intended use on prescriptions and medication orders. Assessment of the barriers to implementation of this patient safety strategy warrants further study.

DISCUSSION

Comparison with national benchmarks

Most of the results described herein and in Table 3 indicate substantial progress in accomplishing the goals set forth in WPSI's recommendations. Results of the current study were compared with available data from national surveys of pharmacy practice in hospitals from the American Society of Health-System Pharmacists (ASHP) (Table 4).^{11,12} These indicate that Wisconsin exceeds national benchmarks in all areas where comparison information is available. It is especially encouraging to observe widespread use of the unit dose system, which is the foundation of any safe medication use system.

Use of survey results

WPSI commissioned the current study to assess the level of adoption of its original medication safety recommendations. A multidisciplinary team charged with updating Wisconsin's patient safety priori-

ties used the results in its work. The group, which included individuals with expertise in medicine, nursing, pharmacy, risk management, and other disciplines, has focused on identifying practices where there is broad agreement regarding adoption, room for improvement, and a unique role for WPSI in accelerating change. The updated priorities have been expanded to include patient safety concerns beyond medication use. They are broken into the following four general categories: medication safety, facilitation of patient/family involvement, broadly applicable safety practices, and practices specific to a particular clinical condition. These priority areas encourage continued focus on several of the medication safety practices outlined in the 2000 recommendations, including elimination of error prone abbreviations, policies for high-risk medications, CPOE, and bar coding technology. Other practices in the 2000 recommendations, such as unit dose and pharmacist managed intravenous admixture services are not included, since this survey indicated that most Wisconsin hospitals have adopted these practices. Examples of patient safety practices beyond medication use from the updated set of priorities are prevention of wrong-site/wrong-patient procedures, falls, and post-operative infections. WPSI will use this expanded set of patient safety priorities to encourage and support individual, organizational, and collaborative improvement projects throughout Wisconsin.

Limitations

Several limitations of this survey should

be noted. First, differential responses from non-responders cannot be ruled out. While it appears that the survey sample was representative of Wisconsin hospitals (Table 2), results may have been different if all hospitals surveyed had responded. Because baseline data were not available regarding adoption of these practices before WPSI's recommendations were released, hospital pharmacy directors were asked to recall their hospital's practice in 2000. While the practices under consideration are core hospital pharmacy functions with which directors of pharmacy should be well acquainted, respondents may have had difficulty recalling the status of certain practices in 2000 or the exact timing of changes instituted in the intervening years. Finally, while the objective of the survey was to determine changes in practice since publication of WPSI's recommendations, the survey cannot determine a cause-and-effect relationship. The current study cannot determine if changes in practice were prompted by WPSI's recommendations or would have occurred without WPSI's efforts. However, when pharmacy directors were asked to rank WPSI among organizations they look to for guidance and leadership in patient safety, WPSI was ranked third, behind the Institute for Safe Medication Practices (ISMP) and JCAHO. It is thus likely that WPSI's leadership in the state played a role in the advancement of patient safety practices between 2000 and 2002.

CONCLUSION

Multidisciplinary review and promotion of medication safety standards has had a positive impact on pharmacy practice in Wisconsin hospitals. Although room for improvement exists, progress occurred in nearly all areas in which WPSI made recommendations. While the current study cannot establish a clear cause-and-effect relationship between the publication of WPSI's recommendations and progress made in the intervening period, it is clear that WPSI's early leadership focused the efforts of provider organizations and associations at a time when national consensus was only beginning to emerge.

This survey indicates that CPOE will not be in widespread use in Wisconsin until 2005 or later, and that the barriers

to CPOE implementation identified by Wisconsin pharmacy directors are consistent with other research. In areas where data are available, including the use of unit dose, 24-hour pharmacy services, CPOE, and bar coding technology for medication administration, Wisconsin hospitals surpass national benchmarks. WPSI will continue to support Wisconsin hospitals in their pursuit of the ultimate goal, safe patient care. ●

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