2003-7

Medical Errors, Drug-Related Problems, and Medication Errors: A Literature Review on Quality of Care and Cost Issues

Jane H. Lassetter
Brigham Young University - Provo, jane_lassetter@byu.edu

Myrna L. Warnick
Brigham Young University - Provo

Original Publication Citation

Lassetter, J. H., & Warnick, M. L. (2003). Medical errors, drug-related problems, and medication errors: A literature review on quality of care and cost issues. Journal of Nursing Care Quality, 18(3), 175-181.

CONTINUING EDUCATION

J Nurs Care Qual
Vol. 18, No. 3, pp. 175–181

Medical Errors, Drug-Related Problems, and Medication Errors

A Literature Review on Quality of Care and Cost Issues

Jane H. Lassetter, MS, RN; Myrna L. Warnick, MSN, RN

Medical errors have received a great deal of attention in recent years. The phrase *medical errors* is an umbrella term for all errors that occur within the health care system, including mishandled surgeries, diagnostic errors, equipment failures, and medication errors. This article is a review and discussion of the literature on the scope of medical errors, with a focus on drug-related problems and medication errors. Cost and quality ideas for addressing these issues are provided. **Key words:** *drug-related problems*, *medical errors*, *medication errors*

MEDICAL ERRORS have received a great deal of attention in recent years. Inconvenience, pain, suffering, and even death have been connected with medical errors. In addition, there is a huge financial burden associated with these errors. The phrase *medical errors* is an umbrella term for all errors that occur within the health care system, including mishandled surgeries, diagnostic errors, equipment failures, and medication errors.[1] (See Table 1 for a summary of terms and definitions discussed.) This article is a review and discussion of the literature on the scope of medical errors, with a focus on drug-related problems and medication errors.

MEDICAL ERRORS

In November 1999, the National Academy of Sciences' Institute of Medicine (IOM) focused national attention on the issue of errors within the health care system of the United States (US) in a report entitled, "To Err is Human: Building a Safer Health Care System." In terms of health care dollars, medical errors have been estimated to cost $5 million per year in large teaching hospitals.[5] The cost to the U.S. economy is $17 to $29 billion each year, with direct health care costs accounting for half of these expenses.[6] Additionally, it is estimated that medical errors injure 1 out of 25 hospital patients in the United States. The IOM report stated that 44 000 to 98 000 hospitalized patients die from medical errors yearly. Even the lower estimate would mean that more people die each year from medical errors than from motor vehicle accidents (43 458), breast cancer (42 297), or AIDS (16 516). By these estimates, medical errors are the eighth leading cause of mortality in the United States.[1]

DRUG-RELATED PROBLEMS

In 1995 Johnson and Bootman cast a wide net in their landmark decision-analytic model on drug-related problems that result in drug-related morbidity and mortality. Drug-related problems identified in their model included

From the College of Nursing, Brigham Young University, Provo, UT, USA.

Corresponding author: Jane H. Lassetter, MS, RN, College of Nursing, Brigham Young University, 500 SWKT, Provo, UT 64602 (e-mail: jane_lassetter@byu.edu).

Table 1. Definitions of terms

Term	Definition
Medical errors	Errors that occur within the health care system, including mishandled surgeries, diagnostic errors, equipment failures, medication errors[1]
Drug-related problems	Circumstances involving pharmaceutical treatment that interfere with optimal outcomes and result in worsening medical outcomes, including overdosage, subtherapeutic dosage, adverse drug reactions, and failure to receive drugs (noncompliance) for a variety of reasons[2]
Medication error	A preventable mistake in prescribing or delivering medication to a patient, that is, an improper use of medicine or one that causes harm to a patient[1,3]
Adverse drug reaction	An excessive response to a medication that is undesired or unexpected.[1,3] This excludes events associated with error[4]
Adverse drug event	Nonpreventable and preventable injuries due to use of drugs[4]
Noncompliance	Failure to receive drugs for a variety of reasons, including economic, cultural, sociological, psychological, and pharmaceutical

overdosage, subtherapeutic dosage, improper selection of a drug to treat a patient's condition, adverse drug reactions, drug interactions, taking a drug for which there is no legitimate medical indication, not receiving a drug for which there is compelling medical indication of need, and failure to receive drugs (noncompliance) for a variety of reasons, including psychological, sociological, and economic.[7] Left unrecognized and/or unresolved, these drug-related problems can lead to drug-related morbidity and mortality. In some cases, no treatment is needed. When treatment is required, it can range from a physician visit to an emergency department visit to a hospital admission and long-term care. On the basis of expert input, Johnson and Bootman estimated the costs and probabilities associated with drug-related morbidity and mortality.[2,8]

Johnson and Bootman estimated the direct cost of managing drug-related morbidity and mortality in the ambulatory setting to be $76.6 billion per year in the United States. The cost of drug-related hospitalizations accounted for 62% of their total cost estimate, with approximately 8.76 million admissions annually at a cost of $47.4 billion.[2] More recently, Ernst and Grizzle have updated cost estimates based on Johnson and Bootman's 1995 model. Their results show that cost of drug-related problems among ambulatory Americans has more than doubled and is now at $177.4 billion annually. Hospital admissions are responsible for $121.5 billion or 69% of this total cost.[8]

The discrepancy between the $29 billion estimated by the IOM for all medical errors and the over $177 billion estimated by Ernst and Grizzle using the Johnson and Bootman model on drug-related problems needs to be carefully analyzed. From the literature, one can extrapolate that Johnson and Bootman used a more comprehensive community model than the IOM did when examining actual event costs.

Johnson and Bootman identified preventable drug-related morbidity and mortality as a critical medical problem in urgent need of expert attention. They maintained that a significant portion of drug-related morbidity and mortality results from inappropriate behaviors and is, therefore, preventable. A modest 10% reduction in inappropriate behaviors (ie, improper prescribing and/or inadequate monitoring of patient conditions

by health care professionals and patient non-compliance) would result in significant savings to the health care system. They supported the practice philosophy of pharmaceutical care, involving implementation and monitoring of patient-oriented therapeutic plans. Goals of such efforts include prevention of drug-related problems where possible and early identification and resolution of problems that could not be prevented. Specifically, they advocated for enhanced pharmaceutical services and pharmaceutical involvement in an interdisciplinary team approach to patient care, feasibly leading to improved detection of problems and overall reduction in drug-related problems.[2]

On the basis of Johnson and Bootman's conclusions[2] and using their estimated cost of $76.6 billion for drug-related morbidity and mortality, Penna[9] extrapolated the potential savings to be found in reducing these costs through more fully integrating pharmaceutical experts into patient care. Penna[9] stated that estimated amount spent on drug-related morbidity and mortality is just slightly more than the cost of the medications themselves. On the basis of data from a panel of pharmaceutical experts, Johnson and Bootman[2] suggested that up to 60% of patients who receive medication experience drug-related problems in a typical ambulatory setting in which pharmacists were not providing the proposed level of care as described above. On the basis of this estimate, Penna deduced that up to 60% of drug-related morbidity and mortality are preventable. If this is correct and assuming an approximate equivalency between medication costs nationally and costs of drug-related morbidity and mortality, Penna calculated the following cost savings: Given an average medication cost of $18 per member per month (PMPM) for a managed care organization (MCO), and that drug-related problems resulting in morbidity and mortality cost an equivalent $18 PMPM, a program aimed at reducing these problems could optimally save $10.80 PMPM (60% of $18 PMPM). Few initiatives have such great potential for cost-control and quality improvement as efforts that can effectively and efficiently address this problem.[9]

MEDICATION ERRORS

A *medication error* is defined as a preventable mistake in prescribing or delivering medication to a patient, that is, an improper use of medicine or one that causes harm to a patient. It differs from an adverse drug reaction, which is defined as an excessive response to a medication that is undesired or unexpected.[1,3] Medication errors are a very common type of medical error. Of all medical errors, medication errors, specifically, are estimated to increase hospital costs in the United States by about $2 billion annually.[10] Deaths from medication errors are estimated to be about 7000 per year.[11] A recent survey of 300 health care professionals conducted by HCPro, a health care management and regulatory information company, examined the nature and frequency of medical errors. Results of this survey implied that 30.5% of deaths from medical errors were attributable to medication errors. Ninety-four percent of the respondents to the HCPro survey further indicated that medication errors had occurred at their health care facilities within the past year. Sixty-four percent identified medication errors as the most common medical error at their facility.[7] Results of a study by the Agency for Healthcare Research and Quality (AHRQ) discovered that medication errors accounted for 20% of medical errors that resulted in injury or death.[12]

Although medication error is just one classification of medical error, these data illustrate the significant impact of this type of error. As medication errors are more controllable and, thus, more easily addressed than drug-related problems, perhaps the major focus should be here. Because medication errors are multidisciplinary in nature, they can occur anywhere along the health care continuum,[13] resulting in a dilemma with a wide scope. Table 2 summarizes the types of medication errors identified in review of the literature.

Table 2. Medication errors referred to in the literature

Type of medication error	Reference
Prescribing 2 or more medications whose interaction is known to cause side effects	AHRQ[1]
Prescribing a drug to which the patient has a known allergy	AHRQ[1]
Misreading a physician's handwriting	American Society of Health-System Pharmacists[3]
Misinterpretation of an abbreviation	American Society of Health-System Pharmacists[3]
Confusion between 2 similarly named medications	American Society of Health-System Pharmacists[3]
Using a concentrated dose of medication instead of a dilute form	American Society of Health-System Pharmacists[3]
Switching of different medications in similar-looking packaging	American Society of Health-System Pharmacists[3]
Unclear dosage directions that result in excessive or insufficient doses or incorrect timing of administration	American Society of Health-System Pharmacists[3]
Omission error	O'Shea[13]

Specific methods of curtailing medication errors need to be identified. In order to accomplish this, medication systems need to be examined. Delivery of medication requires completion of at least 5 interdependent steps: ordering, transcribing, dispensing, delivering, and administering. There are numerous opportunities for errors in any of these steps.[10]

Leape and associates[14] found that 39% of errors occurred in physician orders followed closely by 38% in nurse administration of the drug. Remaining errors were divided almost equally between transcription and dispensing. A study in 2 tertiary care hospitals by Bates and associates found errors that were common in specific steps of the process. Ordering and administering medications accounted for 56% and 34%, respectively, of the preventable medication errors.[15]

Research has demonstrated that targeting the systems that incorporate the steps involved in delivery of medication will yield the best results.[16] One study by Bates and associates attempted to identify patient risk factors for medication errors but discovered few such factors. They found that sicker patients with longer lengths of stay experienced adverse drug events more frequently, but few risk factors surfaced after controlling for level of care and preevent length of stay. These researchers also suggested that a focus on improving medication systems would likely prove more effective than seeking to identify patient risk factors.[4]

Leape and associates[14] concluded that the vast majority of medication errors were due to system failures, with problems in drug knowledge dissemination being the most common system error (29%). Many physician prescription errors appeared to have been caused by lack of knowledge about the medications and their proper usage. Errors associated with dosing were by far the most common. Nurses also made errors related to lack of knowledge, but these were less frequent and less likely to do harm.[14]

System factors specifically surrounding nursing have been identified as contributing to medication errors. In research conducted in Alaska, Roseman and Booker's findings indicated that medication errors were positively associated with the number of shifts worked by temporary staff and negatively associated with the number of overtime shifts by

permanent staff. These authors suggested that despite the accompanying fatigue of overtime shifts, they were more likely to be worked by experienced nursing staff. In contrast, temporary staff may be less experienced, resulting in higher error rates.[17] Additionally, Leape and associates[14] noted that staffing deficiencies and excessive workloads are thought to be causes of a large number of errors.

Many health care institutions have recognized that patients face a needlessly high risk of injury from medication errors. A report on a collaborative effort to reduce medication errors in Utah and Nevada found that most errors are caused by complex systems that place exceptional demands on human memory, attention, and vigilance; poorly standardized procedures for the use of medications; and poor communication between personnel within the system.[18] These authors concluded that the most significant change brought about by quality improvement activities may have been enhancement of the safety cultures in participating institutions. In other words, how tolerant an institution was toward error or potential error affected how likely people were to report them.[18]

Leape would agree with this conclusion since he stated, "the most important thing that can be done to prevent errors is to create a nonpunitive environment in which people do not get punished for making mistakes."[16(p283)] Leape explains that unless such an environment exists, people will not report the errors that they can hide, making it difficult to identify errors, let alone prevent them from happening. He further stated that one of the reasons for our high rate of medical errors is the "train and blame" culture we have created in health care. In this culture, people are highly trained and held to very rigorous standards and are expected to make no errors. When mistakes occur, people are punished. But errors are made by competent, careful individuals simply because people sometimes make mistakes. He said that motivation to hide mistakes is a particular problem in nursing because most states have regulations that require suspension or loss of a nursing license when certain errors are made.[16] Leape stated, "Such regulations are ill-founded and need to be changed."[16(p285)]

In an effort to improve reporting of errors, Baylor Health Care System implemented a systems approach that increased employee satisfaction, reduced costs, and enhanced error reporting. Baylor leadership's strong belief that gathering data on adverse events would help identify gaps in hospital systems and processes helped them in creating an atmosphere of safety that encouraged error reporting. Other key factors to their success included an easy-to-use Web-based reporting system, feedback to staff on patient safety data, and financial and nonfinancial incentives for staff who reported errors.[19]

Work design also has an impact on errors that are made. Leape explained that experience in other industries, particularly aviation and nuclear power, has taught that a major factor in the mistakes people make is the way in which their work is designed. Leape asserted that rules and checks are rather ineffectual instruments in preventing errors. For example, he points out that all of the double-checking of medications did not do nearly as much to reduce errors as the initiation of unit-dosing, because unit-dosing accomplished a system change that provided the correct dose rather than requiring nurses to constantly calculate and measure doses.[16]

Efforts to improve communication have also been effective in reducing errors. For instance, the involvement of pharmacists in rounds has been shown to reduce medication errors significantly.[20] Computerized prescribing also helps decrease medication errors by eliminating the need for handwriting. Other ways computerized prescribing can help reduce medication errors are helping the physician select an appropriate medication based on prescription regimens from accepted clinical guidelines and screening for allergies and interactions (provided there is a link between pharmacy and clinical data).[21]

Computerized order entry has been shown to be effective in practice. For instance, computerized order entry was implemented at the

Hospital for Sick Children in Toronto in 1993 and improved in 1996 for the pediatric intensive care unit. This process change has contributed significantly to the decrease in medication errors at this institution.[22]

Although the primary motivation for computerized order entry should be to improve the quality of patient care, the financial aspects of implementation and maintenance of such systems must be considered. Pressure for full implementation of computerized order entry in the United States is mounting from consumer consortiums such as the Leapfrog Group, which estimates over 500 000 serious medication errors a year could be prevented and $549 million annual savings nationwide from such efforts.[23] Implementation costs vary according to the size of hospital and the capabilities of the existing clinical information systems at a specific facility. Initial cost estimates range from $496 000 (with $174 000 for annual maintenance of small hospitals with clinical information systems with electronic order entry capabilities) to nearly $15 million (with $1.5 million for annual maintenance of large hospitals that require a new clinical information system).[23]

Communication via the prescription label may also be helpful. The Food and Drug Administration has proposed a new prescription drug-labeling format for newer, less familiar medications that would be more user-friendly and provide health care professionals with bulleted highlights on product information.[24]

Iatrogenic injury and death from medication errors and drug-related problems leading to drug-related morbidity and mortality are significant problems in the health care system today. Errors, by definition, are preventable. Drug-related problems can also be diminished through prevention, identification, and resolution. These issues need to be addressed on an institutional, state, and national levels. Many system errors have been identified, but Leape suggests that there are 1000 more system changes waiting to be found.[16] As faults in the medication system are identified and corrected, thousands of lives and billions of health care dollars will be saved.

REFERENCES

1. Agency for Healthcare Research and Quality. Translating research into practice: reducing errors in health care. 2000. Available at: http://www.ahrq.gov/research/errors.htm. Accessed January 31, 2001.
2. Johnson JA, Bootman JL. Drug-related morbidity and mortality: a cost of illness model. *Arch Intern Med*. 1995;155:1949–1956.
3. American Society of Health-System Pharmacists. Just the facts . . . medication errors. 2000. Available at: http://www.safemedication.com/meds/mederrors.html. Accessed February 8, 2001.
4. Bates DW, Miller EB, Cullen DJ, et al. Patient risk factors for adverse drug events in hospitalized patients. ADE Prevention Study Group. *Arch Intern Med*. 1999;159:2553–2560.
5. Bates DW, Spell N, Cullen DJ, et al. The costs of adverse drug events in hospitalized patients. *JAMA*. 1997;277(4):307–311.
6. Institute of Medicine. *To Err is Human: Building a Safer Health System*. Washington, DC: National Academy Press; 1999.
7. American Hospital Association. Survey shows medication errors still lead medical mistakes. *American Hospital Association News*. 2000. Available at: http://www.ahanews.com/asp/NewsNowDisplay. . . D=2&ArticleID=86&keyword=medication+error. Accessed February 8, 2001.
8. Ernst FR, Grizzle AJ. Drug-related morbidity and mortality: updating the cost-of-illness model. *J Am Pharm Assoc*. 2001;41(2):192–199.
9. Penna P. Drug misadventures: unrecognized opportunities for cost savings and quality improvement. *Managed Care Interface*. 1999;12(9):61–62.
10. Quality Interagency Coordination Task Force. Report of the Quality Interagency Coordination Task Force (QuIC) to the President. February 2000. Available at: www.quic.gov/report/mederr2.htm#nation. Accessed February 26, 2001.
11. Agency for Healthcare Research and Quality. Medical errors: the scope of the problem. 2000. Available at: http://www.ahrq.gov/qual/errback/htm. Accessed February 26, 2001.
12. Leape LL, Brennan TA, Laird NM, et al. The nature of adverse events in hospitalized patients. Results of the Harvard Medical Practice Study-II. *N Engl J Med*. 1991;324:377–384.
13. O'Shea E. Factors contributing to medication errors: a literature review. *J Clin Nurs*. 1999;8:496–504.

14. Leape LL, Bates DW, Cullen DJ, et al. Systems analysis of adverse drug events. *JAMA*. 1995;272:35–43.
15. Bates DW, Cullen DJ, Laird N, et al. Incidence of adverse drugs events and potential adverse drug events: implications for prevention. ADE Prevention Study Group. *JAMA*. 1995;274(1):29–34.
16. Buerhaus PI. Lucian Leape on the causes and prevention of errors and adverse events in health care. *J Nurs Scholarsh*. 1999;31(3):281–286.
17. Roseman C, Booker JM. Workload and environmental factors in hospital medication errors. *Nurs Res*. 1995;57(3):251–257.
18. Silver MP, Antonow JA. Reducing medication errors in hospitals: a peer review organization collaboration. *Joint Commission J Qual Improvement*. 2000;26(6):332–340.
19. Joshi MS, Anderson JF, Marwaha S. A systems approach to improving error reporting. *J Healthcare Inform Manage*. 2002;16(1):40–45.
20. American Society of Health-System Pharmacists. Written testimony of the American Society of Health-System Pharmacists Bethesda, Maryland: submitted to the Committee on Health, Education, Labor, and Pensions United States Senate hearings on patient safety and medical errors. January 26 and February 1, 2000. Available at: http://www.ashp.org/public/proad/legislative/IOMRep.html; Accessed February 8, 2001.
21. Schiff GD, Rucker D. Computerized prescribing: building the electronic infrastructure for usage. *JAMA*. 1998;279:1024–1029.
22. Koren G. Trends in medication errors in hospitalized children. *J Clin Pharmacol.* 2002;42:707–710.
23. Birkmeyer C, Lee J, Bates D, Birkmeyer J. Will electronic order entry reduce health care costs? *Eff Clin Pract*. 2002;5(2):67–74.
24. American Hospital Association. FDA proposes new RX labeling format to reduce medication errors. *American Hospital Association News*. 2002. Available at: http://www.ahanews.com/asp/NewsNowDisplay. . .=2&ArticleID=136&keyword=medication+error. Accessed February 8, 2001.

CE Test

CE

Medical Errors, Drug-Related Problems, and Medication Errors: A Literature Review on Quality of Care and Cost Issues

Instructions:

- Read the article on page 175.
- Take the test, recording your answers in the test answers section (Section B) of the CE enrollment form. Each question has only one correct answer.
- Complete registration information (Section A) and course evaluation (Section C).
- Mail completed test with registration fee to: Lippincott Williams & Wilkins, CE Depart., 16th Floor, 345 Hudson Street, New York, NY 10014.
- Within 3–4 weeks after your CE enrollment form is received, you will be notified of your test results.
- If you pass, you will receive a certificate of earned contact hours and answer key. If you fail, you have the option of taking the test again at no additional cost.
- A passing score for this test is 11 correct answers.
- Need CE STAT? Visit www.nursingcenter.com for immediate results, other CE activities and your personalized CE planner tool.
- No Internet access? Call 800-933-6525 x331 or x332 for other rush service options.
- Questions? Contact Lippincott Williams & Wilkins: (212) 886-1331 or (212) 886-1332.

Registration Deadline: September 30, 2005

Provider Accreditation:

This Continuing Nursing Education (CNE) activity for 1.5 contact hours is provided by Lippincott Williams & Wilkins, which is accredited as a provider of continuing education in nursing by the American Nurses Credentialing Center's Commission on Accreditation and by the American Association of Critical-Care Nurses (ANCC 9722, CERP Category O). This activity is also provider approved by the California Board of Registered Nursing, Provider Number CEP 11749 for 1.5 contact hours. LWW is also an approved provider of CNE in Alabama, Florida, and Iowa and holds the following provider numbers: AI, #ABNP0114, FL, #FBN2454, IA #75. All of its home study activities are classified for Texas nursing continuing education requirements as Type 1.

Your certificate is valid in all states. This means that your certificate of earned contact hours is valid no matter where you live.

Payment and Discounts:

- The registration fee for this test is $12.95.
- If you take two or more tests in any nursing journal published by LWW and send in your CE enrollment forms together, you may deduct $0.75 from the price of each test.
- We offer special discounts for as few as six tests and institutional bulk discounts for multiple tests. Call 800-933-6525 x331 or x332 for more information.

CE TEST QUESTIONS

General Purpose: To present a literature review on the scope of medical errors, focusing on drug-related problems and medication mishaps and to suggest strategies for addressing these issues.

Learning Objectives: After reading this article and taking this test, you'll be able to:

1. Outline the demographics of medical errors, including etiology, cost, and overall impact.
2. Describe the pertinent findings from previous research related to medical errors.
3. List at least four initiatives aimed at reducing medication errors.

1. In the U.S., medical errors represent the
a. third leading cause of death.
b. fifth leading cause of death.
c. eighth leading cause of death.
d. tenth leading cause of death.

2. A 2001 estimate by Ernst and Grizzle indicated that medical errors now cost about
a. $29 billion each year.
b. $71 billion each year.
c. $122 billion each year.
d. $177 billion each year.

3. Johnson and Bootman attribute a significant portion of drug-related morbidity and mortality to
a. inappropriate prescribing and monitoring behavior.
b. the vast spectrum of adverse effects of drug therapy.
c. the use of less expensive generic formulations.
d. the lack of patient education about the risks of drug therapy.

4. Penna believes that the key to reducing medication-induced morbidity and mortality is
a. drug research focused on reducing adverse complications.
b. initiatives that promote patient education about the possible adverse effects of drug therapy.
c. increased involvement of pharmaceutical experts in patient care.
d. increased nursing hours dedicated to medication monitoring.

5. By definition, an adverse drug reaction is
a. preventable.
b. either undesired or unexpected.
c. an erroneous delivery of a drug to a patient.
d. an improper use of a medication.

6. According to the Agency for Healthcare Research and Quality (AHRQ), how many deaths from medical errors result from medication errors?
a. 10% c. 30%
b. 20% d. 40%

7. Of the following independent steps in delivering drug therapy to a patient, which has been identified in two recent studies as accounting for the greatest percentage of errors?
a. prescribing c. dispensing
b. transcribing d. administering

8. In a study by Bates and colleagues of patient risk factors for medication errors, the researchers found the highest frequency of medication errors among patients
a. with limited understanding of drug therapy.
b. in long-term care facilities.
c. receiving multiple medications.
d. with longer lengths of stay.

9. Of the following, which system error did Leape and colleagues find to be the most common?
a. excessive workloads
b. lack of standardization
c. problematic drug knowledge dissemination
d. inadequate monitoring

10. According to Roseman and Booker, which of the following nursing-related problems correlated with the greatest number of medication errors?
a. poor staffing ratios
b. overtime shifts worked by permanent staff
c. inadequate drug inservice education
d. higher numbers of shifts worked by temporary staff

11. According to a study of medication errors in Utah and Nevada, medication errors are a result of medication-use procedures that are
a. poorly standardized.
b. overly complex.
c. outdated.
d. not easily accessed.

12. Leape has stated that the most important thing that can be done to prevent errors is to
a. simplify existing medication systems.
b. stop punishing people for making mistakes.
c. increase the amount of continuing education required.
d. raise the standards of entry-level medication knowledge for nurses.

13. The environment of safety created at Baylor Health Care System primarily encouraged staff to
a. reduce costs.
b. simplify medication administration.
c. report errors.
d. enhance patient monitoring systems.

14. Which system change does Leape believe has been most effective in reducing medication errors?
a. double-checking orders
b. initiating unit dosing
c. co-signing for medication administration
d. initiating computerized documentation of medication administration

15. Which initiative has had the most impact on reducing medication errors at Hospital for Sick Children in Toronto?
a. involvement of pharmacists in rounds
b. computerized screening for allergies and interactions
c. initiation of unit dosing
d. computerized order entry

CE Enrollment Form

Journal of Nursing Care Quality **July–September 2003**

Medical Errors, Drug-Related Problems, and Medication Errors: A Literature Review on Quality of Care and Cost Issues

A **Registration information:**

Last name_____ First name_____ MI____

Address_____

City_____ State_____ Zip_____

Telephone_____ Fax_____ email_____

Registration Deadline: September 30, 2005

Contact Hours: 1.5

Fee: $12.95

ANCC category: 0

❑ LPN ❑ RN ❑ CNS ❑ NP ❑ CRNA ❑ CNM ❑ Other_____

Job Title_____ Specialty_____

Type of facility_____

Are you certified? ❑ Yes ❑ No

Certified by_____

State of License (1)_____ License#_____

State of License (2)_____ License#_____

Social Security_____

❑ From time to time we make our mailing list available to outside organizations to announce special offers. Please check here if you do not wish us to release your name and address.

B **Test Answers:** Darken one for your answer to each question.

	A	B	C	D		A	B	C	D		A	B	C	D
1.	❍	❍	❍	❍	6.	❍	❍	❍	❍	11.	❍	❍	❍	❍
2.	❍	❍	❍	❍	7.	❍	❍	❍	❍	12.	❍	❍	❍	❍
3.	❍	❍	❍	❍	8.	❍	❍	❍	❍	13.	❍	❍	❍	❍
4.	❍	❍	❍	❍	9.	❍	❍	❍	❍	14.	❍	❍	❍	❍
5.	❍	❍	❍	❍	10.	❍	❍	❍	❍	15.	❍	❍	❍	❍

C **Course Evaluation***

	A	B
1. Did this CE activity's learning objectives relate to its general purpose?	❑ Yes	❑ No
2. Was the journal home study format an effective way to present the material?	❑ Yes	❑ No
3. Was the content relevant to your nursing practice?	❑ Yes	❑ No

4. How long did it take you to complete this CE activity? ____hours____minutes

5. Suggestion for future topics_____

D **Two Easy Ways to Pay:**

❑ Check or money order enclosed
(Payable to Lippincott Williams & Wilkins)

❑ Charge my ❑ Mastercard ❑ Visa ❑ American Express

Card #_____ Exp. Date_____

Signature_____

*In accordance with the Iowa Board of Nursing Administrative rules governing grievances, a copy of your evaluation of the CE offering may be submitted directly to the Iowa Board of Nursing.

Need CE STAT? Visit www.NursingCenter.com for immediate results, other CE activities, and your personalized CE planner tool!