The Massachusetts Coalition for the Prevention of Medical Errors

MHA Best Practice Recommendations to Reduce Medication Errors

Executive Summary

In 1997, the Massachusetts Coalition for the Prevention of Medical Errors launched a statewide initiative to improve patient safety and reduce medical errors. The goals of the Coalition are to exchange knowledge and information about the causes of medical errors and develop strategies for prevention. In addition, the Coalition promotes collaboration among organizations to enhance patient safety and increase awareness of error prevention strategies through public and professional education.

The Coalition's first initiative – the prevention of medication errors – is based on the Massachusetts Hospital Association's (MHA) medication error prevention project. A consensus group was convened by MHA and the Coalition to develop a set of principles and best practice recommendations for use by hospitals with different resources, needs, and capabilities. Consensus group participants included nurses, physicians, pharmacists, and administrators representing 20 hospitals of different sizes from around the state.

To build consensus, the project looked at existing approaches to medication administration systems, along with available research on the causes and prevention of medication errors.

Two basic principles make up the foundation of the best practice recommendations in this document:

1) the establishment of a systems-oriented approach to patient safety; and,
2) the creation of a safe environment that supports open dialogue about errors, their causes, and strategies for prevention.

The best practice recommendations proposed here include a variety of measures that hospitals can take to strengthen their medication administration systems**.** There are many other approaches used by hospitals in addition to this set of recommendations. The first series of recommendations are those that hospitals can begin to implement immediately; they are focused on reducing human error and have been implemented in a wide range of hospital settings.

The second series of recommendations rely on computerization in the physician order-entry and pharmacy dispensing processes as a means of reducing the potential for errors. These recommendations will take a substantial period of time to implement and may be possible only after hospital-wide changes have first been made, and when they are technologically and financially feasible. The leadership and commitment of the information and pharmacy system vendor community will also be required.

MHA and the Coalition will host a series of educational programs to help hospitals learn about the different approaches to implementing these best practices.

Principles and Best Practice Recommendations for Preventing Medication Errors

The following principles and best practice recommendations for the prevention of medication errors were developed by members of a consensus group convened by MHA and the Massachusetts Coalition for the Prevention of Medical Errors

Principles for the Prevention of Medication Errors

1. Adopt a systems-oriented approach to medication error reduction

- **Rationale:** Recent studies have indicated that errors, while made by individuals, are often the result of error-prone systems, processes and tasks. Incorporation of principles to reduce human error into the design of work greatly reduces the likelihood of error and increases the chances of intercepting errors before harm to the patient results. These include such strategies as standardization, simplification, and use of computers.

- **Supporting Literature and/or Standards:** Leape LL, et al. Systems Analysis of Adverse Drug Events. JAMA 1995; 274: 35-43; Leape LL. Error in Medicine. JAMA 1994; 272: 1851-1857; Leape LL, Kabcenell A., Berwick D., Roessner J. Institute for Healthcare Improvement's Breakthrough Series Guide Reducing Adverse Drug Events (Boston: Library of Congress) 1998; JCAHO Sentinel Event Policy 1996, 1997, and 1998; JCAHO Sentinel Events: Evaluating Cause and Planning Improvement (Library of Congress) 1998.

2. Promote a non-punitive atmosphere for reporting of errors which values the sharing of information about the causes of errors and strategies for prevention.

- **Rationale:** Much has been written about the lessons that can be learned from other industries that have been successful at reducing errors. These industries, such as aviation, have moved away from an atmosphere of blame and punishment to one of system redesign. The best approach to prevention is one that encourages learning from mistakes. To do this, people must be able to talk about errors in a safe environment. The sharing of information about the causes of errors and strategies for preventing them must be valued and fostered if future quality system improvements are to occur. This is no substitute for professional accountability. Health care leaders must continue to hold care givers accountable for professional judgment while at the same time work to make our processes for delivering care as error-proof as possible.

- **Supporting Literature and/or Standards**: Billings, C. Adverse Event Reporting Systems in Aviation and Elsewhere: Lessons Learned. Newton-Wellesley Hospital Symposium 1998; Leape LL, et al. Systems Analysis of Adverse Drug Events. JAMA 1995; 274: 35-43.

Best Practice Recommendations for Medication Administration Processes and Procedures:

Short-Term:

1. ***Maintain unit-dose distribution systems (either manufacturer prepared or repackaged by pharmacy) for all non-emergency medications.***

   - **Rationale:** Unit-dose distribution systems provide individually packaged medications in the exact dose needed and delivers them to the point of administration. Research over the years continues to support the effectiveness of unit- dosing systems on reducing medication errors. Some of the ways it reduces medication errors include: eliminating the need for calculation, measurement, preparation and handling on the nursing unit; making drugs available in ready-to-administer fashion; and providing a fully labeled package that stays with the medication up to its point of use.

   - **Supporting Literature and/or Standards**: Statement on Unit-Dose Drug Distribution. American Society of Health-System Pharmacists 1988; Joint Commission on Accreditation of Healthcare Organizations Standards 1998.

2. ***Institute pharmacy-based IV admixture systems.***

   - **Rationale:** Having the pharmacy place additives in IV solutions or purchasing them already-mixed simplifies the medication administration process on the patient care floors and dramatically reduces the chance of calculation and mixing errors. One of the ways it accomplishes this is by reducing the need for nurses to prepare IV solutions from available floor stock on patient care units.

   - **Supporting Literature and/or Standards:** Top Priority Actions for Preventing Adverse Drug Events in Hospitals. Recommendations of an Expert Panel. American Society of Health-System Pharmacists 1996; Institute for Safe Medication Practices 1994; Bates D, et al. Incidence of Adverse Drug Events and Potential Adverse Drug Events. JAMA 1995; 274: 29-34.

3. ***Remove concentrated potassium chloride (KCl) vials from nursing units and patient care areas. Stock only diluted premixed IV solutions on units***

   - **Rationale:** The most frequent type of serious medication error reported to the JCAHO since the enactment of its sentinel event policy has involved KCl. As of February 1998, eight of 10 incidents of patient death resulting from misadministration of KCl were the direct result of the infusion of concentrated KCl.

     In all cases, concentrated KCl was available as a floor stock item. Similar incidents have been reported to the USP Medication Errors Reporting Program.

- **Supporting Literature and/or Standards**: Sentinel Event Alert. Joint Commission on Accreditation of Healthcare Organizations 1998; Institute for Safe Medication Practices 1997; and Cohen M. Important Error Prevention Advisory. Hospital Pharmacy 1997; 32: 489-491.

4. ***Develop special procedures for high-risk drugs using a multi-disciplinary approach. These include written guidelines, checklists, pre-printed orders, double-checks, special packaging, special labeling, and education.***

    - **Rationale:** High-risk drugs are those that when administered improperly have a substantial likelihood of adverse patient outcome. Examples include: insulin; lidocaine; heparin; potassium chloride; chemotherapeutic agents; dextrose injection; narcotics; adrenergic agents; theophyline; immunoglobulin, and neuromuscular blockers. Techniques that simplify and standardize the processes for ordering, preparing, and administering these drugs reduce the likelihood of errors.

    - **Supporting Literature and/or Standards:** Leape LL, Kabcenell A, Berwick D, Roessner J; Institute for Healthcare Improvement's Breakthrough Series Guide Reducing Adverse Drug Events (Boston: Library of Congress) 1998; Cohen M, et al. Preventing Medication Errors in Cancer Chemotherapy. Am J Health-Syst. Pharm. 1996; 53: 737-746.

5. ***Information on new drugs, infrequently used drugs, and non-formulary drugs should be made easily accessible to clinicians prior to ordering, dispensing, and administering medications (e.g., have pharmacist round with doctors and nurses; distribute newsletters and drug summary sheets; use computer aids, and access to the physician desk reference, formularies, and other resources).***

    - **Rationale:** Studies have found that one of the factors contributing to medication errors is lack of access to drug information by physicians, nurses, and pharmacists at all points during the ordering, administration, and dispensing process. Drug information should be made available to clinicians at the time it is needed.

    - **Supporting Literature and/or Standards**: Leape LL, et al. Systems Analysis of Adverse Drug Events. JAMA 1995; 274: 35-43; ASHP Guidelines on Preventing Medication Errors in Hospitals. American Society of Health-System Pharmacists 1993; 50: 305-314; Cohen M, et al Preventing Medication Errors in Cancer Chemotherapy. Am J Health-Syst. Pharm. 1996; 53: 737-746; Cullen D. The Effect of Pharmacist Participation as a Member of the Patient Care Team in Reducing Adverse Drug Events in a Medical Intensive Care Unit. Presentation at Annenberg Conference 1998; 42 CFR 482.25 (b) (9).

6. ***Provide physicians, nurses, pharmacists, and all other clinicians involved in the medication administration process with orientation and periodic education on ordering, dispensing, administering, and monitoring medications.***

    - **Rationale:** Lack of knowledge of the drug is one of the most common causes of medication error. Orientation and periodic education programs for all clinicians

involved in the ordering, preparation, and administration of medications, especially high-risk drugs is one way to address this problem.

- **Supporting Literature and/or Standards:** Cohen M, et al. Preventing Medication Errors in Cancer Chemotherapy. Am J Health-Syst. Pharm. 1996; 53: 737-746; Leape LL, et al. Systems Analysis of Adverse Drug Events. JAMA 1995; 274: 35-43; Joint Commission on the Accreditation of Healthcare Organizations Standards 1998.

7. Educate patients in the hospital, at discharge, and in ambulatory settings about the safe and accurate use of their medications.

- **Rationale:** Education of patients about the safe and effective use of their medications promotes patient involvement in their own care and is an important component of any medication error reduction strategy.

- **Supporting Literature and/or Standards**: Joint Commission on the Accreditation of Healthcare Organizations Standards 1998; ASHP Guidelines on Preventing Medication Errors in Hospitals. American Journal of Hospital Pharmacists. 1993: 50:305-14; 105 CMR 130 343.

8. Have a pharmacist available on-call after hours of pharmacy operation.

- **Rationale:** When not present in the hospital, pharmacy expertise should be available 24 hours a day on-call as a resource for clinical personnel to answer questions and facilitate medication distribution after hours.

- **Supporting Literature and/or Standards**: ASHP Guidelines on Preventing Medication Errors in Hospitals. American Journal of Hospital Pharmacists. 1993: 50:305-14; Crawford S. Systems Factors in the Reporting of Serious Medication Errors. Presentation at Annenberg Conference 1988; 42 CFR 482.25 (a) (2).

Best Practice Recommendations in the Area of Computerization:

Long-Term:

1. ***Implement computerized prescriber order entry systems when technically and financially feasible in light of a hospital's existing resources and technological development.***

    - **Rationale**: Much has been written about the beneficial impact of automation in the prescriber medication ordering process. Computerized prescriber order entry reduces errors significantly in a variety of ways, including: eliminating handwriting errors; decreasing the potential for wrong drug selection; ensuring that orders are complete and in the proper form; providing dose checking; providing immediate access to patient information; and providing computerized checks for drug interactions, contraindications, and allergies.

      In a recent study at one hospital, preventable adverse drug events (ADEs) were found to cost over $4,000 each. A computerized physician order entry system reduced serious medication errors by more than half in the study. Direct savings from the reduction of ADEs were estimated to be in excess of $500,000 annually at this hospital and overall savings from all decision support interventions related to order entry to be between $5-10 million per year. While the costs at a teaching hospital are likely to be higher than at community hospitals, the finding that patients with preventable ADEs had an increase in length of stay of several days may be applicable.

    - **Supporting Literature and/or Standards:** Bates D, et al. Effect of Computerized Physician Order Entry and a Team Intervention on Prevention of Serious Medication Errors. JAMA 1998; 280: 1311-1316; Bates D, et al. The Costs of Adverse Drug Events in Hospitalized Patients. JAMA. 1997; 227: 307-311; Raschke, Robert A, et al. A Computer Alert System to Prevent Injury from Adverse Drug Events. JAMA 1998; 280: 1317-1320.

2. ***Encourage pharmacy system software vendors to incorporate an adequate standardized set of checks into computerized hospital pharmacy systems (e.g. screening for duplicate drug therapies, for patient allergies, potential drug interactions, drug/lab interactions, dose ranges).***

    - **Rationale:** Computerized pharmacy systems that automatically check orders and provide appropriate alerts to practitioners through the pharmacist can have a powerful impact on reducing medication errors. In Massachusetts, hospitals use several vendors for their computerized pharmacy system. These systems vary in the level of controls that are in place in the computerized pharmacy checking process. Software vendors should incorporate a minimum level of computer checks into computerized pharmacy systems to catch errors in the medication process prior to administration.

- **Supporting Literature and/or Standards**: ASHP Guidelines on Preventing Medication Errors in Hospitals. American Journal of Hospital Pharmacists. 1993; 50-305-14. Cohen M. ISMP Medication Safety Alert. Institute for Safe Medication Practices. 1998; 3: 25.

3. Encourage the use of computer-generated or electronic medication administration records (MAR).

- **Rationale:** Use of computer-generated MARs is one way to minimize the opportunity for errors associated with the transcription of orders. These may be printed by computer or be paperless. An ideal system would be one in which a prescriber uses a computerized system to order a medication, the order is reviewed by pharmacy, and the MAR is generated for use in the nursing medication administration process. In this system, all three disciplines would be working from one database; transcription would be minimized or eliminated.

- **Supporting Literature and/or Standards**: Pepper G. Errors in Drug Administration by Nurses. American Journal Health-System Pharmacist 1995; 52: 390-395.

4. Consider the use of machine-readable coding (i.e. bar coding) in the medication administration process.

- **Rationale:** Modern technology allows for the use of barcode or electronic readers to verify that the correct medication and dose have been selected for administration to the appropriate patient. This technology is already in use for some areas of drug distribution. Drug manufacturers and software developers should be encouraged to take advantage of this technology to minimize the opportunity for administration errors.

- **Supporting Literature and/or Standards**: Top Priority Actions for Preventing Adverse Drug Events in Hospitals. Recommendations of an Expert Panel. American Society of Health-System Pharmacists 1996.

Prepared by: Leslie Kirle at MHA, 5 New England Executive Park, Burlington, MA 01803
781-272-8000, ext. 124 or lkirle@mhalink.org