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# USP Patient Safety CAPSLink™

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### USP Patient Safety CAPSLink™

This message has been sent to you as a service of the U.S. Pharmacopeia, Center for the Advancement of Patient Safety (CAPS). USP is a not-for-profit, non-governmental organization that promotes the public health by establishing state-of-the-art standards to ensure the quality of medicines and other health care technologies. CAPS is a component of USP's Patient Safety public health program. The USP Center for the Advancement of Patient Safety was created to encourage medication error reporting, conduct data analysis and research, develop educational programs, and propose standards, recommendations, and guidelines that ultimately improve the safety and quality of patient care.

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## USP Medication Error Analysis

### Computer Entry Errors

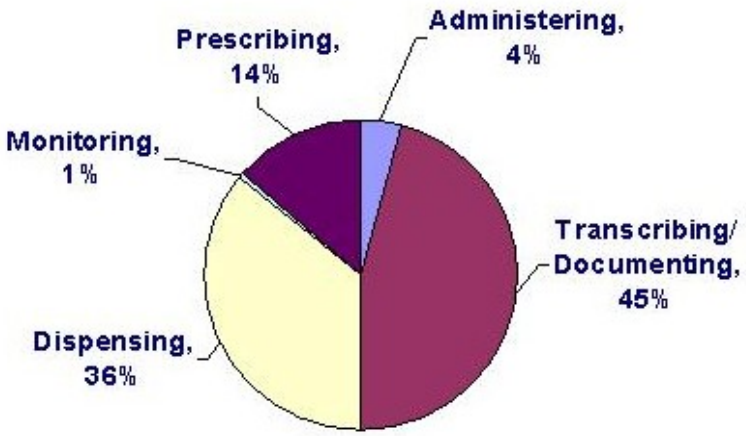
Many technological solutions have been developed to help make care processes safer and reduce errors and patient harm. Bar coding, smart pumps, CPOE, and other advances continue to evolve at a rapid pace. Early proponents of computer entry, CPOE, bar coding, etc. billed these technological advances as a panacea to improve efficiency and prevent mistakes. Clinical computer systems can function independently in a single department (e.g., “stand-alone” pharmacy system) or they can be interfaced with one or more other systems (e.g., lab,

Admission/Discharge/Transfer systems) operating within a facility. Data collected through a national voluntary medication error reporting program can help provide some evidence of where technology is meeting its promised benefits, and where there is room for improvement.

In 2003, nearly 15% of the error records (34,740 out of 235,159) reported to USP's MEDMARX$^{sm}$ program involved the use of a computer system. Computer-entry (CE) errors (involving the incomplete or incorrect entry of information into a computer system used to support the medication use process) were the 4$^{th}$ leading **Cause of Error** in that year cited in more than 27,000 records. When examining records over 5 years – the number of CE-related errors have steadily increased and collectively represent slightly more than 10% of all records from 1998 – 2003.

An examination of the origin of CE errors revealed that the combined totals for the Transcribing phase (46%) and the Dispensing phase (36%) accounted for 82% of all errors. This suggests that CE errors originate most frequently after the order is written.

Figure 1. Computer Entry Errors by Node[1]




1. Hicks, R.W., Santell, J.P., Cousins, D.D., and Williams, R.L. (2004). MEDMARX 5$^{th}$ Anniversary Data Report: A Chartbook of 2003 Findings and Trends 1999 – 2003. Rockville, MD: USP Center for the Advancement of Patient Safety.

Incorrectly entering a handwritten order into a computer system by a unit clerk or nurse on the patient-care unit creates errors in the "*transcribing phase"* and incorrectly entering a medication order into a pharmacy computer system creates errors in the "*dispensing*" phase.

CASE EXAMPLE (Nursing)

> A unit clerk in a busy emergency room selected the wrong patient from a computer list and ordered a CT scan of the abdomen. The wrong patient

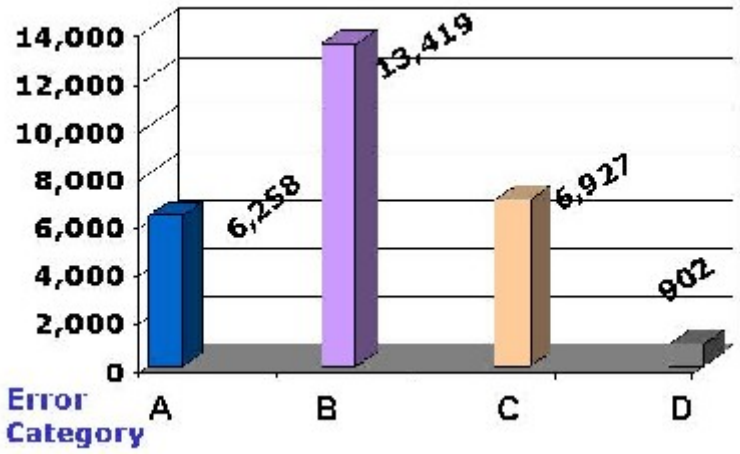
was transported to the radiology department and given a barium sulfate enema as a prep for the CT scan. The radiologist interviewed the patient, after the prep, but, fortunately before the scan, and realized the error.

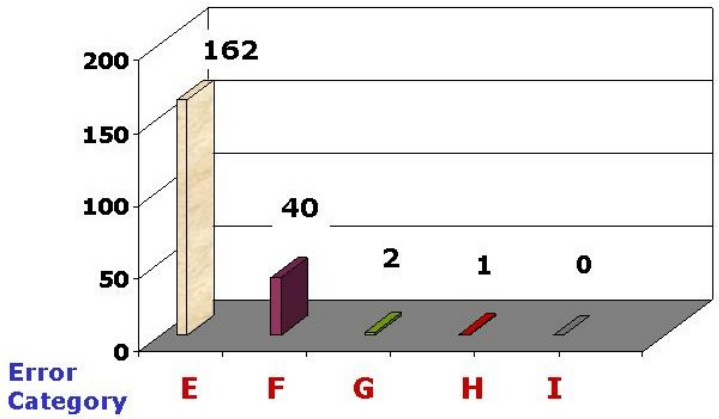
CASE EXAMPLE (Pharmacy)

The pharmacy department received an order for metoprolol 12.5mg to be given twice a day. The pharmacy computer system defaulted to 25 mg so the pharmacist edited the order by backspacing over the dose, but failed to include the decimal point. The pharmacy sent a computer-generated medication administration record to the nursing unit with the dose printed out as 125mg. The patient subsequently was given a ten-fold overdose twice before the error was caught. The patient became hypotensive and needed additional medical treatment to correct the adverse affects.

Nearly three quarters (71%) of the errors did not reach the patient (Categories A or B) while only 0.74% (n=205) were found to be harmful (Categories E-H). See Figure 2.

Figure 2. Error Category Index associated with Computer entry records[1]
(n = 27,711)



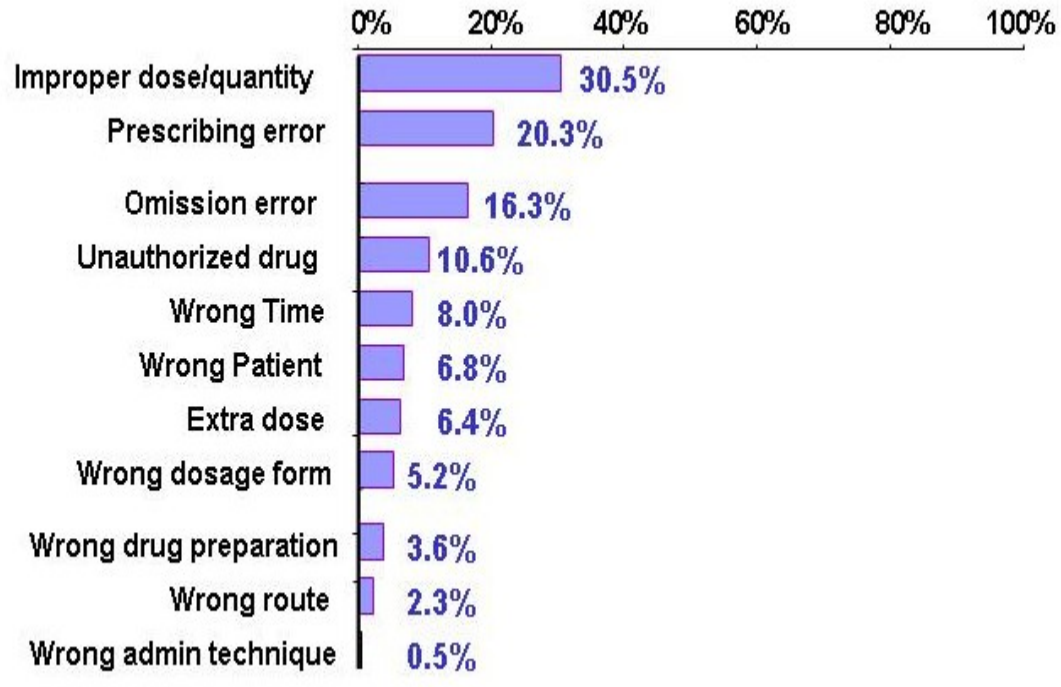



1. Hicks, R.W., Santell, J.P., Cousins, D.D., and Williams, R.L. (2004). MEDMARX 5th Anniversary Data Report: A Chartbook of 2003 Findings and Trends 1999 – 2003. Rockville, MD. USP Centerfor the Advancement of Patient Safety.

## Types of Error with CE Records

The three most frequently reported **Types of Error** associated with CE records were: *Improper dose/quantity* (i.e., wrong dose or wrong quantity); followed by *Prescribing error*, and *Omission error* (Figure 3).

Figure 3. Types of Error with Computer Entry (CE) Records[1, 2]




1. Hicks, R.W., Santell, J.P., Cousins, D.D., and Williams, R.L. (2004). MEDMARX 5th Anniversary Data Report: A Chartbook of 2003 Findings and Trends 1999 – 2003. Rockville, MD: USP Centerfor the Advancement of Patient Safety.

2. Data based on 25,286 records

Errors involving *Improper dose/quantity* were seen in 30.5% of CE error records compared to 23% for all 2003 records. This suggests that there is a higher probability of selecting the wrong dose or quantity when a computer-entry system is involved in processing the order.

Two-thirds of the *Improper dose/quantity* errors originated in either the *Transcribing* or *Dispensing* **Nodes** indicating that the incorrect dose is being entered (or selected) after the order was written or dictated by the prescriber. Again, CE systems that are not fully integrated across all components of the medication use process can and do introduce errors. Certain **Types of Error** (e.g., *Improper dose/quantity*) are also introduced into the process when the CE system has poorly designed data entry screens, inappropriate drug dosing defaults, inadequate planning regarding the human-technology interface, and inadequate clinical decision support rules.

**Causes of Error Associated with CE**

Over 66% of the records documenting *Computer entry* as a **Cause of Error** also selected at least one additional cause. This suggests that CE is unlikely to be the sole cause of the error and should be reviewed in relation to other proximal causes (e.g., transcription inaccurate/omitted, computer software, abbreviations, and knowledge deficit). The three most frequently reported **Causes of Error** associated with CE were: *Performance deficit* (52%), *Transcription inaccurate/omitted* (28%), and *Knowledge deficit* (27%). Errors associated with *Abbreviations* comprised 8.5% (n=1,570) of all CE errors and occurred when prescribers used an incorrect abbreviation, which led to an error, or when pharmacy information systems used short cut keys (i.e., mnemonics) to pull up product names.

Case Example of CE Error Involving Mnemonics

> An order for gentamicin 50mg was entered into the pharmacy computer system using short-cut codes and the default dose of 80 mg populated the dose field, but was not changed. A label for 80 mg was generated, the product prepared, but upon final check by the pharmacist the dosage discrepancy was discovered and this error was intercepted before reaching the patient.

The intent of CE systems was to improve upon the safety problems and inefficiencies associated with the manual processing of medication orders including:

- Illegible handwriting
- Misinterpretation of abbreviations

- Insufficient knowledge of drug-drug , drug-allergy information, and more broadly insufficient access to patient information

- Problems related to handoffs, and communication breakdowns (e.g., orders not getting pulled off the chart, miss-transcription of physician's order onto the Kardex ®, or MAR, pharmacy receiving an unclear copy and then attempting to enter the orders into its system without the benefit of having pertinent patient or lab information).

These problems have not disappeared with the use of computer entry systems. Where there is not a complete electronic medical record that ties all CE together, practitioners must still process paper leading to safety problems including those associated with illegible handwriting. Also, limitations on character length in the data entry screens for CE systems forces IT programmers to truncate or abbreviate drug names, dosing frequency, dosage forms, etc. Further, excessive drug-drug or drug-allergy alerts in some CE systems have led the user to ignore such warnings creating a challenge to strike the right balance between the number of alerts clinically necessary with the desire for time efficiency in entering orders.

**Recommendations:**

1. Culture: Staff reluctance to understand and properly use CE systems can critically hamper their use. Initially, it may take staff more time to process medication orders. Therefore, understanding how each professional will use the system and addressing their special needs is essential to ensuring broad acceptance.

2. Training: The amount of time and resources needed to train all staff (not just physicians, but pharmacy, nursing, and clerical staff) in the use of a truly integrated IT system should not be underestimated. A good resource to determine an approximation of the training time needed is to speak with other facilities who have already implemented organization-wide CE systems.

3. Integration: CE systems must be fully integrated throughout the medication use process. Piecemeal applications that do not cohesively "talk" with one another are a source for medication errors.

4. Staffing: Given that nearly 15% of the reported medication error reports to USP related to the use of computers, and the likely prospect that the use of IT will only expand and influence clinical operations, consider including a full time IT expert within key clinical departments (medicine, pharmacy, nursing, laboratory) as a critical, and standard staff member.

5. Flexibility: The intent of CE systems is to enable knowledge to be accessible and applied more uniformly. In order for this to happen, they must be integrated, flexible, and accommodating to unique and special workflows (e.g.,

emergency room or operating room) and unique patient clinical conditions ultimately resulting in a complete electronic medical record.

6. Information Accessibility: One of the disconnects with CE systems leading to improper dose errors is not having the patient's clinical diagnosis and purpose for each medication order at the time of order entry. The patient's diagnosis and co-morbidities should be a robust component of CE and CPOE systems.

7. Human -Technology Interface: Mapping the medication use process to examine the combination of manual steps and CE activities should uncover potential failures (e.g., computer software, poor screen display) and error-prone practices (e.g., use of abbreviations). Human factors engineering" can also help identify latent workplace conditions (e.g., distractions) that can cause errors in the human-technology interface.

Pressure is mounting for greater adoption of CE systems without the benefit of in-depth scientific research or evidence of their benefits or pitfalls. Health care practitioners need to know what problems have been reported heretofore so they can help their facility build a successful and safe strategy related to the use of information technology. Findings from a voluntary error reporting program can be valuable in identifying IT system deficiencies, increase awareness of problem areas, and help vendors and practitioners make changes that improve patient safety.

The above information represents a small portion of data and information contained in USP's MEDMARX 5th Anniversary Data Report: A Chartbook of 2003 Findings and Trends 1999-2003. For complete data findings related to computer entry errors, CPOE errors, and more see: www.usp.org and go to the USP Store web page.

## In the News...

### 1. CAPSLink Readership Survey

As announced in the previous two issues, we are surveying readers of this newsletter in an effort to continuously improve its quality. The intent of the survey is to gauge the perceived value of the information, recommendations, and news items. As a token of appreciation for your time in taking this survey, USP will send each respondent a **Similar Drug Names Poster**-a wall poster for easy reference listing look-alike and sound-alike drug names known to cause confusion and potential medication errors when handwritten or communicated verbally. http://www.usp.org/survey/CAPS/Reader05E.html

### 2. FDA Updates

Confusion between Reminyl and Amaryl: Healthcare professionals were notified

in October about errors resulting from confusion between Reminyl (galantamine hydrobromide), a drug used for Alzheimer's, and Amaryl (glimepiride), used for diabetes mellitus. Various adverse events, including severe hypoglycemia and death have occurred.
http://www.fda.gov/medwatch/SAFETY/2004/safety04.htm#Reminyl

Warning on Use of Avastin with Chemotherapy: Healthcare professionals were recently notified about risks of administering Avastin (bevacizumab) in combination with the chemotherapeutic agent 5-FU (5-fluorouracil IV). Avastin and 5-FU are used in combination format to treat patients with metastatic carcinoma of the colon/rectum. The FDA reports that arterial thromboembolic events such as angina, myocardial infarction, transient attacks and cerebral infarctions occurred in patients taking the combination format of Avastin and 5-FU rather than the chemotherapeutic agent (5-FU) alone.

New Guide for Cordarone: Pharmacists and physicians were notified of a new Medication Guide for Cordarone (amiodarone hydrochloride tablets). The FDA regulation 21CFR 208 requires that a Medication Guide be provided with each prescription that is dispensed for products that the FDA determines pose a serious and significant public health concern. A list of currently approved Medication Guides are available at:
http://www.fda.gov/medwatch/SAFETY/2005/safety05.htm#Cordarone

The list of drugs for which the FDA mandates extra written drug information be provided at the filling and re-filling of prescriptions:
http://www.fda.gov/cder/Offices/ODS/labeling.htm

## 3. JCAHO Updates

National Patient Safety Goal Modified: The 2005 national patient safety goal to standardize the abbreviations, acronyms and symbols used throughout an organization was recently modified. The goal applies only to orders and medication-related documents and includes preprinted forms.
http://www.jcaho.org/about+us/news+letters/jcahonline/jo_01_05.htm

National Summit on Medical Abbreviations: On November 23, the Joint Commission hosted the National Summit on Medical Abbreviations with its co-conveners. Fifty professional societies and associations and interest groups participated in the Summit to discuss medical errors related to the misuse and misinterpretation of abbreviations, acronyms, and symbols. The resulting recommendations of the Summit are scheduled to be posted on the Joint Commission's web site in January.
http://www.jcaho.org/About+Us/News+Letters/JCAHOnline/jo_01_05.htm#summit

Requirement for "Free Flow" Protection on Infusion Pumps is Revised: The requirement of "free flow" protection on infusion pumps under the National Safety Goal has been clarified to note that IV administration sets that offer free flow protection can be used rather than requiring the pump itself to have the free flow

protection.

Pharmacy Directors Weigh 24-Hour Coverage Proposal: A new proposal currently under review requires organizations to ensure that a pharmacist reviews new medication orders even after the hospital's pharmacy is closed. http://www.ashp.org/news/ShowArticle.cfm?id=9195

### 4. NPSF 2005 Congress

The National Patient Safety Foundation (NPSF) will host the Seventh Annual Patient Safety Congress May 4-6, 2005, in Orlando, Florida. The 2005 Congress entitled, "Let's Get On With It! - Round 2," will focus on critical improvements that save lives and reduce harm. Posters will be a cornerstone of the NPSF Patient Safety Congress, highlighting solutions that have resulted in significant and tangible improvements in culture. The deadline for receipt of abstracts is February 11, 2005. http://www.npsf.org/congress

### 5. Revisions Proposed to USP Sterile-Compounding Chapter

The United States Pharmacopeia (USP) invites comments on the revisions proposed to general chapter 797, "Pharmaceutical Compounding---Sterile Preparations." Once USP processes the comments on these revisions, it will publish the new version in an upcoming issue of Pharmacopeial Forum and state the date on which the revisions become official. Comments on this summarized proposal should be compiled as soon as possible and sent to Dr. Claudia Okeke at cco@usp.org.
http://www.usp.org/standards/proposed797Revisions.html

### 6. Tool Assists Pharmacies with USP <797> Compliance

A web-based tool co-developed by ASHP and Eric Kastango can help pharmacies comply with USP General Chapter <797> Pharmaceutical Compounding – Sterile Preparations. The interactive tool employs a database containing more than 600 questions to help users assess risk levels, perform a gap analysis, and improve patient safety during all aspects of the sterile compounding process. www.797complianceadvisor.com

### 7. Briefing on Hospital Patient Safety Culture Survey

AHRQ, in partnership with others, will host a toll-free conference call on February 15, from 2:00 p.m. to 3:30 p.m., EST, to discuss the *Hospital Survey on Patient Safety Culture*. The purpose of the call is to arm those interested in adopting this tool with tips and techniques for administering the survey. You may participate by calling 1-877-918-3008 and using "8310257" as the passcode. The survey is currently available online. Print copies may be ordered by calling 1-800-358-9295

or by sending an e-mail to ahrqpubs@ahrq.gov

## 8. Minnesota Issues Report on Adverse Events

This month, the Minnesota Department of Health released a report on the occurrence of 27 adverse preventable events in Minnesotahospitals (based on the National Quality Forum list of “never” events). In all, 30 of 145 hospitals reported at least one "never" event between July 2003 and October 2004. Some of the most respected -- and largest -- hospitals were among those reporting the most errors in the first of what is planned to be an annual report.
http://www.health.state.mn.us/patientsafety/

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### USP Medication Error Reporting Programs:

**MEDMARX**®—USP's comprehensive, Internet-accessible, anonymous medication errors reporting program, and quality improvement tool. The program facilitates productive and efficient documentation, tracking, trending, and prevention of medication errors.

**Medication Errors Reporting (MER) Program**—presented in cooperation with the Institute for Safe Medication Practices, this nationwide program makes it possible for health professionals to report medication errors confidentially and anonymously to USP.

### Other USP patient safety resources:

- MEDMARX Annual Data Summary reports—provides readers with a wealth of information on reported error events including patterns in the types, causes, and level of harm associated with medication errors.
- *Understanding and Preventing Medication Errors: A Resource for Healthcare Practitioners*—a CD toolkit with practical guidelines, forms, and templates to help healthcare facilities improve error-reduction initiatives.
- *Advancing Patient Safety in U.S. Hospitals: Basic Strategies for Success*—a book in which hospitals share stories about how they reduced medication errors and promoted safer patient care.
- Medication Safety Pocket Reference—a pocket-sized reference booklet containing listings of similar drug names and dangerous abbreviations that could cause medication errors. Contact custsvc@usp.org and ask for item #3227702.
- Similar Drug Names Poster—a wall poster for easy reference listing look-alike and sound-alike drug names known to cause confusion and potential medication errors when handwritten or communicated verbally. Posters are packaged in quantities of 1(item # 3728251) 10 (item # 3728252) and 50 (item # 3728253). Contact custsvc@usp.org and ask for the appropriate item number.

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