Global Progress in Patient Safety and Prevention of Harmful Medication Errors

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A History of Errors

Medication error reports
Compiled by Michael R. Cohen, Assistant Editor

Error 1
An order was written, “4 U Lente Insulin.” Because of poor handwriting, the U was mistaken for an “0.” The patient received 40 units of Lente Insulin.
The abbreviation “U” should not be used; the word units should be spelled out.

100U Even typed can look like a zero
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Overdose death of cancer patient rocks Mass. hospital

By LAWRENCE K. ALTMAN
Of The New York Times

Two patients receiving experimental treatment for advanced breast cancer at one of the country’s most prestigious cancer hospitals were given massive overdoses of two chemotherapy drugs. One patient died, and the other received permanent heart damage.

The incidents occurred late last fall at Dana-Farber Cancer Institute in Boston, a Harvard teaching hospital.

The patient who died was Betsy A. Lehman, an award-winning health columnist for the Boston Globe. The news of the mishap, detailed yesterday in an article published in the Globe, was all the more unsettling because Lehman, as a health reporter, was presumably knowledgeable about her treatment and would have chosen her hospital with care.

Lehman, who was 59, died on Dec. 3 at the hospital.

A pathologist who did an autopsy did not spot the overdose. He also found no visible signs of cancer in her body.

Doctors apparently refused to heed her warnings that something was wrong.

The other patient was a 52-
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Potassium chloride concentrate

- USP container label requirements
  - Nomenclature includes “for injection concentrate”

- Storage of concentrated electrolytes in clinical areas not permitted by Joint Commission

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Wrong spinal drug fatal to 3-year-old boy with Down syndrome

HARRISBURG (AP) — A 3-year-old Middletown boy with Down syndrome died at the Medical Center after a second-year resident accidentally injected a toxic drug into his spinal canal, according to the Patriot News.

Dr. Michelle Reilly was never disciplined for the mistake, which the Dauphin County Coroner’s office concluded was responsible for the death of Michael Lee Seamske.

The accident happened on March 2 when Reilly was instructed to administer one drug into Michael’s spinal canal and inject a second intravenously to fight leukemia.

She picked up vials which was supposed to be used intravenously, and injected it into Michael’s spinal canal, medical records show.

Vernonia is fatal if administered into the spinal canal, medical guides warn.

Reilly, who is training to become a pediatrician, and a registered nurse with 1.5 months experience were the only medical personnel in.

Harrisburg PA - 1989
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Vincristine

ISMP strongly recommends against dispensing and administering intravenous Vincristine in a syringe.

Methotrexate

- Prescribing and dispensing alerts for providers
- Calendar/blister pack
  - Day of week marked
- Labeling weekly only for non-cancer diagnosis
  - No splitting of week (e.g., q12h x 3 doses)
  - Warning for patient on label and in labeling
- Patient weekly dosing info on container
- Dispense safety checklist (ISMP)

The above image illustrates an error with methotrexate. The doctor wrote for the patient to take 4 tablets weekly. But the pharmacy instructed the patient to take 4 tablets daily.
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Improvements to container labels by industry

Vitalis Company, Colombia
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Harmonizing Safe Medication Container Labeling and Packaging

Create a minimum set of best practices for labeling and packaging aimed at reducing medication errors

— On June 19 and 20, 2018, at the US Food and Drug Administration (FDA) campus in MD, created a minimum set of best practices for labeling and packaging aimed at reducing medication errors.

— Participants agreed that guidelines are needed regarding the presentation of critical label information to deal with look-alike labels, noting that logos and highly stylized graphics detract from readability of the label.

Principles agreed upon by global regulators at FDA-IMSN summit

— Use metric units for products, and eliminate ratio expressions

— Eliminate potentially error-prone abbreviations and dose designations on labels, such as U for units, IU for international units, or trailing zeros (e.g., 1.0) to express strength

— Prominently display cautionary statements on carton and immediate container labels of neuromuscular blockers, potassium chloride concentrate injection, methotrexate, and other selected error-prone medications

— Include both the per mL and the per container quantity, not the per mL quantity alone, when presenting the concentration for injectables
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Principles agreed upon by global regulators at FDA-IMSN summit

— Use contrasting label backgrounds for the printing on glass ampules, and recommend font size and label orientation, to improve readability

— Physically link or integrate diluents with drugs/vaccines that are powders

— Increase the adoption of ready-to-use/ready-to-administer syringes, premixed IV solutions, unit-dose packaging, and other more efficient, safer packaging, while considering the overall cost of implementation

— Develop product-specific world safety standards; for example, standard packaging for non-oncologic methotrexate to prevent accidental daily use and overdoses

— Include barcodes on packages so they can be scanned at the bedside or other locations where medications are dispensed or administered by healthcare providers

Improvements in container labeling and packaging

Published FDA guidance for industry

Safety Considerations for Product Design to Minimize Medication Errors
Guidance for Industry

U.S. Department of Health and Human Services
Food and Drug Administration
Center for Drug Evaluation and Research (CDER)

April 2016
May 2015
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USP Standards

Standards changed to improve safety
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https://www.medicationsafetyboard.com/
### National Medication Error Reporting System

- **Early warning system**
  - Issue nationwide hazard alerts and press releases

- **Learning**
  - Dissemination of information and tools

- **Change**
  - Product nomenclature, labeling, and packaging changes, device design, practice issues

- **Standards and Guidelines**
  - Advocates for national standards and guidelines

### Where does ISMP get its information?

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<tr>
<th>Consumer MERP</th>
<th>Practitioners</th>
<th>ISMP MERP/VERP</th>
<th>FDA MedWatch</th>
<th>Other sources</th>
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MERP: National Medication Errors Reporting Program
VERP: National Vaccine Errors Reporting Program
IMSN: International Medication Safety Network
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Medication error case reports

- FDA has Memorandum of Understanding (MOU) agreement with ISMP to share publicly available medication error information
- FDA and ISMP hold regular monthly meetings to discuss regulated product issues. We meet in person twice annually.

ISMP relationship with the U.S. Food and Drug Administration (FDA)

- Discuss regulated product issues
  - Nomenclature
  - Labeling, packaging
  - Relationship between medication and medical device
- FDA Advise-ERR publications
- ISMP and FDA share fellowship program
- FDA guidance statements based in part on ISMP reporting program findings
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Process when hazard or error reported to ISMP – Every report is indispensable!

1. **Report received and entered into ISMP database**
2. **ISMP professional staff review every report and gather additional information if necessary**
3. **Report identified as requiring further investigation for sharing the lessons learned**
4. **Further investigation conducted, with additional resources accessed**
5. **Realistic, measurable and attainable recommendations identified along with ambitious recommendations to drive further improvements**

- **Hazard/error story & recommendations shared via news letters and direct conversations with FDA, manufacturers, vendors, other regulatory agencies & other key stakeholders**
- **Aggregate data from error databases analyzed and published periodically**

**Provider error reporting programs**

- Narrative information driven by provider and/or consumer altruism
- A key to success globally
- Always confidential, can be legally shielded from discovery if requested
- Interact with regulators, standards organizations, accreditors, professional organizations, pharmacovigilance agencies
Are we making progress?

- Increased reporting of medication errors and focus on safety
- Support for root cause analysis
- Improvements in safety culture
  - Problems now addressed as “system issues” vs. “people issues”
  - Accreditation standards (Government, Accreditors, etc.)
    - National Patient Safety Goals
    - International Patient Safety Standards (Joint Commission International)
    - Medication Management Standards
- Identification of high alert drugs

[Image of ISMP List of High-Alert Medications in Acute Care Settings]

https://ismp.org/recommendations/high-alert-medications-acute-list
Targeted Medication Safety Best Practices for Hospitals

Purpose: Inspire widespread adoption of consensus-based best practices on specific error-related issues that continue to harm patients and/or cause death.

- Revised every two years since 2014
- Hospitals and health systems can focus their medication safety efforts on these Best Practices, which are realistic and have been successfully adopted by numerous organizations.
- While targeted for the hospital-based setting, some Best Practices are applicable to other healthcare settings.

2020-2021 Targeted Medication Safety Best Practices

Purpose: inspire widespread adoption of consensus-based best practices on specific error-related issues that continue to harm patients and/or cause death

- Primary target areas:
  - IV vincristine
  - Oral methotrexate
  - Patient weights in metric units
  - Neuromuscular blocking agents
  - High alert drug via smart pumps
  - Availability of antidotes and rescue agents
  - Use of oral syringes
  - Oral liquid dosing devices
  - Glacial acetic acid
  - Eliminate liter bags of sterile water
  - Use of technology for IV admixture compounding
  - Being proactive by using information about errors happening elsewhere
  - Eliminate promethazine
  - Verify and document a patient’s opioid status and level of pain
  - Limit variety of medications for removal using the override function.
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ISMP Websites

www.ismp.org  www.medsafetyofficer.org  www.consumermedsafety.org

Drug Name Mix-ups
Look-alike and Sound-alike Drug Names

- Benzonatate × Soothe
- Caramuel × p.o. × q.a.d.
- Zynara 10 mg × 30 p.d.
- Omear 25 mg p.o. bid. take with food

Preventing drug name mix-ups

- Drug name development
  - Published FDA guidance for industry
  - FDA premarket screening
    - Phonetic and orthographic computer analysis (POCA)
    - Simulation review by internal staff
    - Expert analysis and summary in conjunction with New Drug Application (NDA)
  - Use of “Tall Man” letters (metroNIDAZOLE 500 mg vs. metFORMIN 500 mg)
    - Important new issue is first few letter characters and similar strengths
  - Indication-based prescribing
    - Premarket practitioner testing
    - Role of trademark testing firms and premarket testing of labeling & packaging
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FDA Guidance Statements

Guidance for Industry

Best Practices in Developing Proprietary Names for Drugs

DRAFT GUIDANCE

This guidance is being circulated for comment purposes only.

Consumer and patient safety is a top priority and the FDA is committed to ensuring that the chemical names of prescription drugs are clear and unambiguous.

This document provides guidance and best practices for industry on how to develop proprietary names for prescription drugs. It is intended to help manufacturers ensure that their drug names are safe and effective for consumers.

U.S. Department of Health and Human Services

Center for Drug Evaluation and Research (CDER)

Center for Biologics Evaluation and Research (CBER)

May 2021

Adoption of safety technologies

- Elimination of handwritten prescriptions
  - NY State Rule
  - More than 90% of US Hospitals e-Prescribe
  - More than 90% of Pharmacies accept e-Prescribing
  - More than 80% doctor offices have available e-prescribing
  - Many states require for controlled drugs

- Screen selection errors have increased due to typing first few letter characters and getting similar names on screen
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Adoption of safety technologies

- FDA regulations require that certain human drug and biological product labels contain a **bar code** consisting of, at a minimum, the National Drug Code (NDC) number (21 CFR 201.25).
- Bedside bar code scanning (drug and patient)
- Community pharmacy bar coding, screen imaging, DUR, adjudication of Rx, etc.

Adoption of safety technologies

- “Smart” infusion pumps in hospitals
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Automated dispensing cabinets

— Limitations imposed when removing medications on override

IV workflow systems (imaging, scanning, weighing, of compounded sterile products, etc.)
Sterile compounding safety

- Technology solutions (e.g., systems that include barcode scanning verification of ingredients, gravimetric verification of drug and diluent volumes, and/or robotic image recognition) are utilized to augment manual processes for preparing and verifying CSPs.

- Barcode scanning is linked to the patient specific order to identify products used in the preparation of CSPs.

- ISMP guidelines call for both bar coding and gravimetrics to be used when preparing chemotherapy and, ideally, for pediatric CSPs (several semiautomated-manual systems and highly automated robotic systems utilize bar coding and gravimetrics).

Prefilled premixed ready to use

- Too many nurses and anesthesia personnel still must prepare their own doses, thus risking error

- Some compounding by pharmacy could be eliminated by use of ready to use products
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ISMP Guidance
ISMP guidelines, ISMP self assessments, ISMP safe practice lists (look-alike drugs, tall man letters, safe electronic communication, etc.)

Medication Safety Guidelines
Most guidelines are driven by multi-disciplinary summits that include a review of the literature, assessment of reported errors, and input from experts. Final statements are developed by consensus decision making.
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New standards to prevention catheter misconnections

- ENFit
- NRFit

Emphasis on safety in healthcare

- Improvements in safety culture
  - Problems now addressed as “system issues” vs. “people issues”
- Safety committees in hospitals
- Medication safety officers
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More efforts to educate patients about safe medication use

Where should further efforts be directed to improve medication use safety?

- Reduced reliance on nurses and anesthesiologists to prepare medication doses
- Greater availability of premixed IV medication solutions in flexible containers
- Greater availability and use of prefilled, ready to use medication syringes
- Availability of container bar code or radiofrequency identification (RFID)
  - For use by pharmacists in sterile and nonsterile compounding, product inventory and storage, and product dispensing
  - For unit dose packaging or patient packs so medications can be scanned at point of care
- Manufacturer adherence to guidelines established by global regulators and the International Medication Safety Network
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Where should further efforts be directed to improve medication use safety?

— Creation of independent, voluntary provider error reporting programs that focus less on data than learning what went wrong and what needs to be done to prevent problems in the future

— Increased cooperation between independent provider error reporting programs, regulators, standards organizations, accreditors

— Increased cooperation between manufacturers and independent provider reporting programs

— Mandated patient education regarding information needed for safe use of certain identified high alert drugs

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