

Implementation as a Central Problem in Patient Safety

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Overview

- This session focuses on implementation issues
 - Will give many examples and some pointers from the 'school of hard knocks
- But, minimizing implementation difficulties begins with picking the right safety problems to solve and the right solutions for them

Implementation Principles to Keep in Mind

- Determine basis of a given safety problem
 - *Don't assume you know the answer*
 - Match proposed solution to the problem
 - Anticipate barriers to implementation
 - Pilot test
 - More formal evaluation
- } *More on these later*

Automatic Stop Orders for Urinary Catheters

	Control Ward	Study Ward	Difference
Catheter Duration	8 ± 5 days	5 ± 3 days	3 days (p = 0.03)

Cornia et al. *Am J Med.* 2003

Importance of Example

- Educational initiatives – almost certainly would have had no effect
- Local champions, opinion leaders - ditto
- Audit & feedback – possibly could have had an effect, but likely weak but would still rely on sustained vigilance by clinicians

In this case, a reminder that targeted decreased duration of catheterization was more appropriate than other potential strategies, but each problem will be different.

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Computerized Provider Order Entry

- Reports of complete implementation failures
 - Cedars-Sinai in LA (2004), CHEO here in Ottawa
- Survey of 1000 randomly selected US hospitals
- CPOE completely available at 10%
 - 50% reported participation by <50% of physicians
 - 30% reported >90% of all orders remain handwritten

Ash et al. *J Am Med Inform Assoc* 2004

Why so hard to implement?

- Many vendors have had ≤1 previous clients
 - Technical hurdles often not appreciated by IT companies coming from non-healthcare sectors
- Incompatibility with existing systems (even from the same vendor)
- Impact on workflow often ignored

Poon et al. *Health Affairs* 2004.

The screenshot shows the JAMA Archives website interface. The main article title is "Role of computerized physician order entry systems in facilitating medication errors". The authors listed are Ross Koppel, PhD; Joshua P. Shetty, MD, PhD; Abigail Cohen, PhD; Brian Abaluck, BS; A. Russell Localio, DO, MPH, MS; Stephen G. Kimmel, MD, MACE; Brian L. Strom, MD, MPH. The article is from JAMA, 2005;293:1197-1203. The abstract begins with: "Context Hospital computerized physician order entry (CPOE) systems are widely regarded as the technical solution to medication ordering errors, the largest identified source of preventable hospital medical error. Published studies report that CPOE reduces medication errors up to 91%. Few researchers, however, have focused on the existence or types of medication errors facilitated by CPOE." The objective is to identify and quantify the role of CPOE in facilitating prescription error risks. The design, setting, and participants section describes a qualitative and quantitative study of house staff interaction with a CPOE system at a tertiary-care teaching hospital (2002-2004). The main outcome measure is examples of medication errors caused or exacerbated by the CPOE system. The results state that a widely used CPOE system facilitated 22 types of medication error risks, including fragmented CPOE displays that prevent a coherent view of patients' medications, pharmacy inventory displays mistaken for dosage guidelines, ignored antibiotic renewal notices, and others.

Example error types

- Medications discontinued without clinicians being aware
- Delays in orders when patients not yet entered into system
 - One fatal example reported in previous *JAMA* piece
- Incorrect default dosing or protocol
- Overloading users with alerts and reminders for completeness
 - ignoring/over-riding all alerts and requests
- Entering order for wrong patient due to interruption

Koppel et al. Role of CPOE in facilitating medication errors. *JAMA* 2005.
Ash J et al. Unintended Consequences of IT in Health Care *J Am Med Inform Assoc* 2004

Remote CPOE error: a situation that's more than remotely possible

Case in which a resident ordered vecuronium infusion for a patient on me... instead of intended ICU patient (!)

- Two nurses verified drug, pump settings, and patient.
- Infusion was started, after which the patient began walking to the bathroom.
- Patient fell to the floor, but fortunately was able to call out for help.
- Resident was called, along with the rapid response team.
- Luckily one of the nurses questioned whether the “new drug” she had just hung could be responsible

“Improving patient safety by identifying side effects from introducing bar coding in medication administration. Patterson et al. *J Am Med Inform Assoc*. 2002

Improving patient safety by identifying side effects from introducing bar coding in medication administration.

OBJECTIVE: In addition to providing new capabilities, the introduction of technology in complex, sociotechnical systems, such as health care and aviation, can have unanticipated side effects on technical, social, and organizational dimensions. To identify potential accidents in the making, the authors looked for side effects from a natural experiment: the implementation of bar code medication administration (BCMA), a technology designed to reduce adverse drug events (ADEs). **DESIGN:** Cross-sectional observational study of medication passes before (21 hours of observation of 7 nurses at 1 hospital) and after (60 hours of observation of 26 nurses at 3 hospitals) BCMA implementation. **MEASUREMENTS AND MAIN RESULTS:** Detailed, handwritten field notes of targeted ethnographic observations of in situ nurse-BCMA interactions were analyzed using process tracing and five conceptual frameworks. **RESULTS:** Ethnographic observations distilled into 67 nurse-BCMA interactions were classified into 12 categories. We identified five negative side effects after BCMA implementation: (1) nurses confused by automated removal of order abuse by BCMA, (2) degraded coordination between nurses and physicians, (3) nurse dropping activities to reduce workload during busy periods, (4) increased prioritization of monitored activities during goal conflicts, and (5) decreased ability to deviate from routine sequences. **CONCLUSION:** These side effects might create new paths to ADEs. We recommend design revisions, modification of organizational policies, and “best practices” training that could potentially minimize or eliminate these side effects before they contribute to adverse outcomes.

PMID: 12223506 [PubMed - indexed for MEDLINE]

Example problems during bar-coding implementation

- Administration of chemotherapy prevented because staff could not place IV fast enough and originally scheduled dosing time had passed
- Nurses thought it was faster to key the patient ID in manually despite wand speed being touted by vendors.
- One mis-identification (in only 67 hours of observation)

Patterson et al. J Am Med Inform Assoc. 2002

JAMA "Safety of Patients Isolated for Infection Control?"

Isolated patients twice as likely to experience adverse events (31 vs 15 adverse events per 1000 days; $P < .001$).

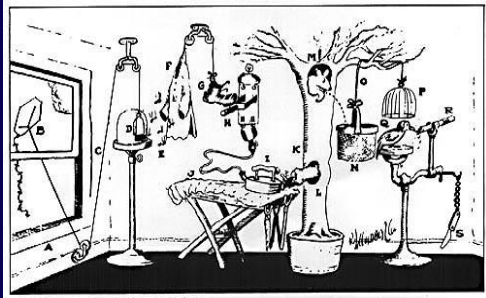
Isolated patients also more likely to

- formally complain to the hospital about their care than control patients (8% vs 1%, $P < .001$)
- have no vital signs recorded as ordered (51% vs 31%; $P < .001$)
- have days with no physician progress note (26% vs 13%; $P < .001$)

Recurring Themes In Patient Safety

- Murphy's Law
- Technologic "Revenge Effects"
- Law of Unintended Consequences

Rube Goldberg Pencil Sharpener

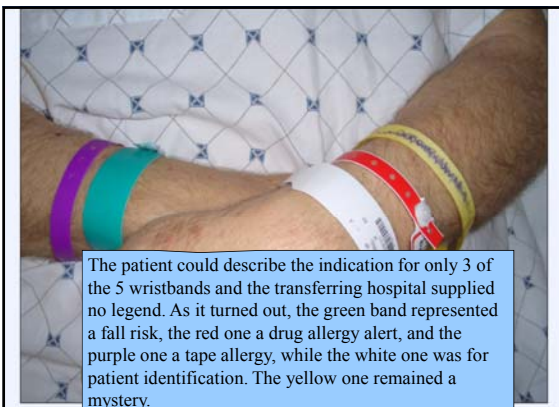


Pencil Sharpener RUBE GOLDBERG (ny) RGI 035

The Connection to Patient Safety

- This more or less captures the medication process in a typical hospital
- Most improvement efforts amount to changing the boot that throws the switch on the iron or adding another woodpecker
- These apparently simple changes can have unintended effects elsewhere in the process

These types of unintended consequences to changes in complex processes represent one of biggest barriers to improving healthcare quality and safety



The patient could describe the indication for only 3 of the 5 wristbands and the transferring hospital supplied no legend. As it turned out, the green band represented a fall risk, the red one a drug allergy alert, and the purple one a tape allergy, while the white one was for patient identification. The yellow one remained a mystery.

Three Apparently Simple Examples

Head-of Bed Elevation in the ICU

- Semi-recumbent position (elevation of the head of the bed to 30°-45°) to reduce risk of ventilator association pneumonia (VAP)
 - Widely recommend as one of the ICU “bundles” in the Save 100K Lives and Safer Healthcare Now Campaigns
 - Seems like a very simple intervention

In a prospective multicentered trial, patients undergoing mechanical ventilation randomly assigned to backrest elevation of 45 degrees or supine position

Backrest elevation was measured continuously during the first week of ventilation with a monitor-linked device... In each ICU, one dedicated research nurse controlled patient position 2–3 times daily and restored backrest elevation to the randomized position when possible.

The target semirecumbent position of 45 degrees was not achieved for 85% of the study time... The achieved difference in treatment position (28 degrees vs. 10 degrees) did not prevent the development of VAP.

How could this have happened?

- How could contraindications to head-of-bed elevation occur so frequently?
- Implies perceptions of contra-indications by many staff may not be accurate
- Intervention should have been accompanied by some staff education
 - Maybe research nurse should have been tasked with educating individual clinicians as issues arose

Case & Commentary
Laboratory Medicine | February 2004
Transfusion "Slip"

The Case

A married couple, Mr. and Mrs. M, was brought to the ED after a Level 1 trauma center after a half-ton truck that struck their car. Mr. M appeared hemodynamically stable. Mrs. M had been the driver. Her blood pressure was 100/60 mm Hg, and she had signs of cervical spine injury. Both patients were typed and crossed, although the husband received red blood cells urgently.

The husband and wife patients had been placed in a trauma bay. In the confusion of stabilizing and assessing the husband, the wife's blood type was not rechecked. The husband's cross-match tube was labeled with the wife's name. This error would normally be undetectable based on the standard protocols for handling cross-matches. However, Mrs. M had previously undergone a transfusion at the same hospital. She had been typed and crossed at that time, and her husband did not share the same blood type (she was Type O and he Type A). The lab technologist in the blood bank noticed the change in blood type and inferred that a mistake must have been made. She called the ED immediately. They agreed to redraw her blood sample for re-typing, but also requested that O-negative blood be sent to the ED immediately in case the patient deteriorated. Mrs. M thus never received the wrong blood.

This case represents a very serious near miss. But for the coincidence of Mrs. M's blood type being on file at the same hospital, she would have received a potentially fatal incompatible transfusion matched for her husband's blood type.

• Husband and wife brought to ED after MVA

• Cross-match samples sent for both patients

• Mr. M's cross match tube was labeled with sticker for Mrs. M

• Fortunately, Mrs. M had undergone a C-section at same hospital and Lab Technologist noticed change in her blood type from Type O to Type A

→ called the ED immediately

Forum Messages
Lab. Med. Cases > Transfusion

manixer@yahoo.com
posted Mar 23 2004 11:57PM EST

Unfortunately, no matter how well-intentioned, any solution that requires extra effort on the part of front line people is very unlikely to succeed when the error is very uncommon and the bad actions affected by the protocol are very common. In this case, the requirement for double screening requires providers to be as much work as before each time they have to cross match someone in order to prevent a very uncommon type of error. No matter how serious that error may be, a "work around" or "routine rule violation" of some kind is bound to emerge.

"We had a similar incident..."

The solution here has been that all blood needs two screens. Unfortunately, patients routinely have both samples taken at once (i.e., at the same draw), thus undermining the safety of double samples to avoid patient labeling confusion."

Potassium Chloride Safety

Concentrated KCl resembles other iv solutions

Lethal errors involving injections of concentrated KCl

Sobering example of hospital where delays in receiving KCl from Pharmacy resulted in surreptitious hoarding of KCl on wards
→ *Increase, rather than decrease in hazard*

Implementation Issues

- Expect to occur with any new technology
 - CPOE, barcoding, smart pumps
- Expect to occur with any intervention involving reorganization of care
- Expect with any intervention that requires additional work for frontline personnel
- Expect with any 'add-on' policy

When Will Implementation Issues Not Arise?

- Basically never
- Always expect them
- Only potential exception is where you are simply throwing money at a problem to pay for more of what you already have
 - More RNs
 - More pharmacists

From the School of Hard Knocks

- Don't even attempt to solve problems that don't interest front line personnel
 - Or, at least, don't expect them to participate in the solution
- Assuming they are interested, solution must be "effort neutral"
 - Don't ask them to work harder or be more careful
- Interventions involving reorganization of work flow or major new technology require extensive ground work & early input from all personnel affected
