Practical Strategies for Improving Patient Safety in Your Hospital

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Biggest Challenge Facing Patient Safety

- Most safety practices are still quite speculative
- We still need to try to address the many safety problems in healthcare
- How do we balance need for more evidence with need to act?

Overview

- Give examples of “Most recommended practices are still quite speculative”
- Outline framework for choosing patient safety interventions to implement
- Review specific interventions within this framework
  - Focus is on changes you could spearhead as individual hospitalists
Unfortunately, evidence base in patient safety can change quickly

Many practices with high ratings in 2001 now have serious questions

Peri-operative beta-blockers to reduce cardiac complications of non-cardiac surgery

- 5 randomized trials at time of AHRQ report
  - Total patients ~ 600 across all 5 trials
  - Substantial benefit: 1 major event averted for every 4-8 patients treated
- Not an impressively large evidence base by standards of most cardiology research, but much more robust than most patient safety research

⇒ Received 2nd highest evidence rating in AHRQ report
Recent meta-analysis identified 22 trials [up from 5] and found unclear benefit, but did find definite increases in bradycardia and hypotension serious enough to require treatment.

Retrospective cohort study of 782,969 patients who underwent major noncardiac surgery in 2000 and 2001 at 329 US hospitals. Benefit of perioperative beta-blocker treatment varied directly with cardiac risk:

- No benefit (and possible harm) among patients with revised cardiac risk index score of 0 or 1
- Significant reductions in risk of death among other patients with progressive increases in benefit for each additional point above 2 on RCRI score

Rapid Response Teams

- Simple before-after studies claiming huge benefits
  - One study notable for striking improvements in survival
  - Re-defined “cardiac arrest” as any call of the RRT
  - Increased survival after “arrest” reflects comparison between true arrests pre-RRT and calls for “I’m worried about this patient” after RRT
- Also, RRTs make more patients DNR so patients not counted as failed resuscitations
- But widely promoted
RCT of Medical Emergency Teams (aka Rapid Response Teams)

Introduction of the medical emergency team (MET) system: a cluster-randomised controlled trial

Lancet, 2005

Summary

The MET system greatly increases emergency team calling, but does not substantially affect the incidence of cardiac arrest, unplanned ICU admissions, or unexpected death.

The control arm in the RCT actually has comparable effects to the trials that were reported to be positive.
In addition to changes in evidence…

• Problems with implementation
• New errors introduced by safety interventions

Example error types

• Entering order for wrong patient due to interruption
• Delayed orders when patients not yet entered into system
• Incorrect default dosing
• Medications discontinued without clinicians being aware
• Overloading users with alerts and reminders for completeness
  → ignoring/over-riding all alerts and requests
Case in which a resident ordered vecuronium infusion for a patient on the med ward 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

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 still occurred (in only 67 hours of observation).

Patterson et al. J Am Med Inform Assoc. 2002
Quality Grand Rounds Case #12

Two patients were admitted to a large hospital with a computerized physician order entry (CPOE) system that relies on bar coded patient identification wristbands.

Mr. P (a man admitted for pneumonia, with no history of diabetes) was given the bar coded identification bracelet of Mr. D (a diabetic patient admitted with cellulitis).

→ Potentially fatal near miss – ordering insulin for Mr. P on the basis of Mr. D’s elevated glucose
Even the simplest interventions can have unintended consequences

Removal of concentrated KCl from wards
- Intended as “forcing function” that prevents the wrong thing from happening
- Example of hospital where removal resulted in surreptitious hording of concentrated KCl
  - Pharmacists spent all their time searching for KCL
  - Hazard may actually have increased

Rube Goldberg Pencil Sharpener

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.

Current State of Patient Safety

• Few established, highly effective interventions
  – most things either don’t work or we don’t if they work
• Promising interventions are often costly and complex
• They may even create new problems

But we still need to act!

Possible Framework for Choosing Patient Safety Initiatives

• Scope of the problem being targeted
• Evidence for effectiveness of the intervention
• Costs & complexity
• Possibility of new errors or other collateral effects
• Momentum - synergy with other existing or planned efforts at your institution
Suggested Plan: Balanced diet

• Some “low hanging fruit”
  – Strong evidence + easy to implement
• Projects that will generate momentum
  – E.g., executive walkrounds
• Plan for bigger projects down the road
  – E.g., implementing computerized provider order entry

Examples of Low Hanging Fruit

1) Ultrasound guidance central line insertion
2) Reducing central line-related infections
US-guided CVC Insertion

Possible Downsides Minimal

- Potential for harm
  - May be harder to stay sterile
  - Concerns about loss of skills, but easy to address
- Cost is $10,000-15,000
  - Comparable savings per 1000 insertions
  - Can be used for PICCs as well
Preventing Central Line Infections

• Standard hand disinfection before procedure
• Full-barrier precautions (mask, gown, and cap)
• Site preparation with chlorhexidine stick
• Avoiding femoral site
• Removing unnecessary central lines

Mundane, but important interventions produce substantial reductions in central line infections
Also count towards JCAHO National Patient Safety Goal 7: “Reduce the risk of health care-associated infections”

Catheter-related bloodstream infections per 1000 catheter-days decreased from 2.7 at baseline to 0 at 3 months after implementation of the study intervention (P ≤ 0.002)...

The regression model showed a significant decrease from 0.62 (95% CI: 0.47 to 0.81) at baseline to 0.34 (95% CI, 0.23 to 0.50) at 18 months.

Specific Interventions Similar to IHI Central Line “Bundle”

• Hand disinfection
• Full-barrier precautions
• Site preparation with chlorhexidine
• Avoiding femoral site
• Removing unnecessary central lines

Pronovost et al. NEJM 2006


Bottom line: Simple interventions lead to important reductions in central line infections
How About Other ICU “Bundles”? (e.g., for preventing Ventilator Associated Pneumonia)

- Elevate the head of the bed to 30 degrees
- Peptic ulcer disease prophylaxis
- Deep venous thrombosis prophylaxis
- Mouth care every 2 hours
- Sedation vacation every 24 hours
- Repeated ready-to-wean evaluations

*Odd mixture of interventions, including ones with no impact on VAP and others with very questionable benefit*

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

The target semirecumbent position of 45 degrees was not achieved for 85% of the study time… VAP was diagnosed in eight patients (6.5%) in the supine group and in 13 (10.7%) in the semirecumbent group.

VAP Bundle

- Elevate the head of the bed to 30 degrees
- Peptic ulcer disease prophylaxis
- Deep venous thrombosis prophylaxis
- Mouth care every 2 hours
- Sedation vacation every 24 hours
- Repeated ready-to-wean evaluations

*Can be hard to achieve in practice*

*Does not reduce VAP — at best it doesn’t increase it*

*No relationship to VAP*

*Probably reduces VAP, but net benefit unclear*
So, questionable benefit to some of these bundles

Also, not easy to achieve the close to 100% compliance required to obtain the reported benefits

Other Examples of Low Hanging Fruit

#3a) Condom catheters in place of Foley catheters whenever possible
#3b) Automatic Stop Orders for Foley catheters

Complications of Foley Catheters

- Approx 20% of all hospitalized patients
  - Significant source of patient discomfort
  - Main cause of nosocomial UTI
- Insertion not indicated 25% of the time
- Continued use not indicated 50% of time
- MDs unaware of catheter 30-50% of time
Incidence of adverse outcome was 131/1,000 patient-days with an indwelling catheter vs. 70/1,000 patient-days with a condom catheter (P=.07; p=0.04 with adjustment for patient risk factors).

Patients without dementia who had an indwelling catheter were approximately five times as likely to develop bacteriuria or symptomatic UTI or to die (hazard ratio=4.84, 95% CI: 1.46-16.02; P=.01) as those with a condom catheter.

**Trial of Automatic Stop Orders for Urinary Catheters**

<table>
<thead>
<tr>
<th>Catheter Duration</th>
<th>Control Ward</th>
<th>Study Ward</th>
<th>Difference</th>
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<tr>
<td></td>
<td>8 ± 5 days</td>
<td>5 ± 3 days</td>
<td>3 days</td>
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<td>(p = 0.03)</td>
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*Cornia et al. Am J Med. 2003*

**Suggested Strategy**

- Computer or paper-based stop automatic stop order for urinary catheters
  - catheter removed after 72 h if no renewal order
  - reduces inappropriate duration of catheterization while avoiding largely futile battles at time of insertion

*Would also count towards JCAHO NPSG #7: “Reduce the risk of health care-associated infections”*
Example of not-so-Evidence-Based strategy that has low cost and little possibility for harm

Read back protocols for important telephone communications (critical labs, verbal orders)

Telephone Miscommunication

• Wrong patient taken for invasive cardiac procedure *
• Low K⁺ called to floor; clerk puts note on front of wrong patient’s chart
• Multiple other examples

* Chassin & Becher *Ann Intern Med*, 2002

‘Proof of concept’ study from 3 Labs

• 822 outgoing calls reporting critical results
  – Read back revealed 29 errors (3.5%)
  – Rate was highest for calls to docs
• Errors included
  – wrong patient (34%)
  – wrong test (31%)
  – wrong value for the test (21%)

* Barenfanger et al. *Am J Clin Pathol* 2004
Example Safety Practice #4

Read Back protocols for critical lab results and other important telephone communications

• calls to bring patients for procedures
• critical lab results
• verbal orders

Would count towards JCAHO NPSG #2: “Improve the effectiveness of communication among caregivers”
(Read-back specifically mentioned as Goal 2a)

“Low Hanging Fruit” can be pretty boring

What about some more exciting interventions?

Ones that cut across multiple specific safety problems and are uniquely related to hospitalists

Transitions in Care
“Adverse events among medical patients after discharge from hospital”

- adverse drug events (72%)
- therapeutic errors (16%)
- nosocomial infections (11%)

50% of the events judged as preventable or ameliorable

12% of all patients had a preventable post-discharge adverse event

Post-Discharge Adverse Events

- Medical service at a major academic center
- Among 400 consecutive discharges
  - 19% had adverse events within 3 weeks
  - Adverse drug events most common type, followed by procedure-related injury
  - 1/3 clearly preventable and another 1/3 could have been improved

Forster et al Ann Intern Med 2003

Safety Practice #5: Follow-up calls to patients within 48-72 h

UCSF Clin Pharmacists
  - Pharmacists meet patients prior to d/c to review meds and give education
  - Call within 48 hours
    - Handle Rx problems
    - Call MD with new symptoms

IPC call center
  - Hospitalist PDA generates D/C note for PCP and call center
  - Med assistants call all patients sent home
    - protocol driven 7’s
    - Referral to nurse then MD with problems

In both systems, about 25% of patients reached need intervention of some kind
Using an interactive voice response (IVR) system to improve patient safety following hospital discharge:

IVR reached 45 of the 77 patients (58.4%). Twenty patients (26%, 95% CI 17%-37%) indicated new or worsening symptoms, problems with their medications, or requested to talk to the clinic nurse. For 10 patients (13%, 95% CI)

This was a feasibility study: we have just completed 2 other studies (one in medical patients and one in outpatient surgical patients). Timing and number of calls are important issues. May be difficult to achieve clinically useful detection (i.e., contacting patients in time to prevent or mitigate adverse events).

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Anticoagulation control in the peri-hospitalization period:
The study included 5,380 elderly patients in Eastern Ontario between 1 September 1999 and 1 September 2000 taking oral anticoagulants. [Excluding the small percentage of patients admitted with hemorrhage] the proportion of patients with INR < 1.5 was significantly increased (P = .02).

Amounted to approximately a 15% increase in the number of patients with subtherapeutic INRs.

Patient safety concerns arising from test results that return after hospital discharge:

41% of patients had test results pending at discharge. General medicine hospitalist services at 2 academic tertiary care centers in Boston judged actionable (by researchers and by outpatient docs): 13% required urgent action.

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Examples of Actionable Results of Which Surveyed Physicians Had Been Unaware

- Patient discharged after treatment for rapid atrial fibrillation.
  - TSH sent in hospital; result returned after discharge as < 0.01 (new diagnosis)
- Patient discharged on nafcillin for facial abscess and cellulitis
  - Wound culture returned after discharge growing MRSA

Results not requiring urgent action

- Spiral CT ordered to rule out PE; final report showed lung nodules

Cohort of 888 patients discharged after hospitalization for an acute medical illness.

Readmission rate 25% lower among patients whose outpatient physician had received D/C summary

Example Safety Practice #6: Effective transmission of discharge summaries

- Structured discharge summaries
  - Medications at discharge
  - Identification of changes from admission meds
  - Problem list
  - Pending investigations

- Yes, we all know this is supposed to happen, but often doesn’t in practice
Interventions targeting these problems with transitions in care would meet one or more JCAHO NPSGs

- Goal 2: Improve the effectiveness of communication among caregivers
- Goal 3: Improve the safety of using medications
- Goal 8: Accurately and completely reconcile medications across the continuum of care

Caveats about Medication Reconciliation

- Unclear impact for most discrepancies
- Difficult to achieve given complexities of usual workflow
- Probably is beneficial if done right
  - Trick is to figure out what “right” is
  - And, probably worth targeting subgroups of patients (number or type of medications, certain types of care transitions)
Annals case discussion emphasized issues created patient safety and graduate medical education

But, chain of events could probably have been averted with structured sign out system

Sign-out systems particularly important for hospitalists

Main outcome: unexpected complications of medical therapy that resulted in increased length of stay or disability at discharge (“adverse events”).

- Preventable AEs decreased by 30% (p < 0.10)
- Pre-intervention the odds ratio for a patient suffering a preventable AE during cross coverage was 5.2 (p=0.01)
  → 1.5 after intervention (and p=NS)

A randomized, controlled trial evaluating the impact of a computerized rounding and sign-out system on continuity of care and resident work hours

Web-based computerized rounding and sign-out system evaluated on 14 inpatient teams (6 general surgery, 8 internal medicine) at two teaching hospitals

System reduced by 50%
- the number of patients missed on resident rounds (2.5 vs 5 patients/team/month, p = 0.0001)
- the prerounding time spent hand-copying basic data (p < 0.0001)

Residents reported better sign-out quality (p = improved continuity-of-care
Safety Strategy #7: Structured sign-out system

- Systems will vary depending on
  - existing hospital information system
  - Preference for paper vs. PDA vs. Computer
- But probably a variety of achieving important benefits within any given format
  - Both studies showed improvements in efficiency as well as quality/safety

Interventions that may generate momentum or be synergistic with other initiatives

8) Executive Walk rounds
9) Rapid Response Teams

Executive Walk Rounds

- Senior executives conduct weekly visits to different areas of the hospital
  - joined by physician and nurse leaders
  - Informal sessions with frontline staff in each area
- Asks specific questions about troubling events, factors or systems issues that led to these events, suggested solutions
  - Should be non-judgmental
  - Should have plan for returning later to give follow-up

Thomas et al. BMC Health Serv Res, 2005
Despite the problems with evidence for RRTs, they can boost morale (especially for nurses) and lay ground work for other interventions that improve safety or quality.

**Evidence supporting CPOE**

**Surprisingly Weak**

- No study has shown significant reduction in harm
- Recent study in fully computerized VA system showed high rate of adverse drug events
  - Interpretation was that basic CPOE without decision support may have little impact
  - Recent outpatient study of paper versus electronic prescribing had similar interpretation
- Problems with new errors and failed implementations

**Bigger Ticket Items**

- Computerized Provider Order Entry
- and/or Electronic Medical Records
Despite these problems

• Many opportunities for improving safety if successful
• Also, computerization will happen regardless of evidence due to external forces
  ⇒ crucial for clinicians to play early roles in choice of system and the customization that occurs for each institution

CPOE Implementation

• 2002 survey of ~1000 randomly selected hospitals
• CPOE completely available at 9.6%
  – 47% reported participation by <50% of physicians
  – 28% reported >90% of all orders remain handwritten
• Additional reports of complete implementation failure
  – E.g., Cedars-Sinai in Los Angeles

Implementation Issues

• Many vendors have had one or fewer previous clients
• Impact on workflow often ignored
  – Increased time for each order
  – Time to teach new users (major issue in teaching hospitals)
• High cost
  – $10-20M for most hospitals
  – Substantial annual costs for adequate IT support
• Incompatibility with other systems within the hospital
  – even if recent and sometimes even if from same vendor

Ash et al. J Am Med Inform Assoc 2004

Poon et al. Health Affairs 2004
#10: Play active role in CPOE implementation at your hospital

- Lack of clinician input consistently identified as factor in failed implementation efforts
  - Inattention to work flow leads to excessive numbers of screens, inappropriate alerts, opportunities for new errors, etc.
- Hospitalists intimately familiar with workings of numerous areas of hospital and work well with other key groups (nurses, pharmacists)

Take home points

- Have a plan for choosing new initiatives
  - Some “low hanging fruit”
    - Strong evidence + easy to implement
  - Projects particularly ripe for hospitalists
    - Interventions targeting transitions in care
  - Projects that will generate some momentum
  - Use that momentum plus careful planning to prepare for bigger projects down the road
    - E.g., computerized provider order entry
A Note of Caution on Root Cause Analyses

- RCAs are detailed, aviation-style analyses of major accidents (e.g., wrong site surgery, inpatient suicide)
- Make complete sense and represent advance over traditional blame-centered approach focused on whoever last touched the patient
- Also make sense for hospitalists to be involved with given their clinical breadth as generalists
- But,…

Annals of Internal Medicine

Learning from Our Mistakes: Quality Grand Rounds, a New Case-Based Series on Medical Errors and Patient Safety

Among all types of medical errors, cases in which the wrong patient undergoes an invasive procedure are sufficiently distressing to warrant special scrutiny. As such, the institution endorses such procedures, and the medical literature contains no discussions about them. This article examines the case of a patient who was mistakenly taken for another patient’s invasive cardiac procedure. After reviewing the case and the results of the institution’s “root-cause analysis,” the discussants discovered at least 17 distinct errors, no single one of which could have caused this adverse event by itself. The discussants illustrate how these specific “active” errors interacted with a few underlying “latent conditions” (system weaknesses) to cause harm. The most remediable of these were absent or misused protocols for patient identification and informed consent, systematically faulty exchange of information among caregivers, and poorly functioning teams.

Summary of Events

- Incorrect patient was sent to the cardiac catheterization laboratory.
- Despite being a nurse, the technician was not aware that the patient was in the cath lab.
- The wrong patient was misidentified by the physician and the nurse.
- The patient was sedated and incorrectly moved to the cardiac catheterization laboratory.
- The cardiac catheterization was performed on the wrong patient.
- The patient was discharged from the hospital.

“This article examines the case of a patient who was mistakenly taken for another patient’s invasive cardiac procedure.”
The “Swiss Cheese Model” of Major Accidents & Errors

Other Examples Errors

System problems

- Patchwork of information mini-systems
- Hyper-specialized service lines
- Off service patients
- Physician coverage
  - MD had never met patient

Unsafe acts

- Incomplete patient ID
- Ignoring major red flags
  - Lack of pertinent documentation
  - Patient's repeated statements that she is not supposed to go for this procedure
### Problems Tackled after the RCA

<table>
<thead>
<tr>
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<th>Unsafe acts</th>
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<tr>
<td>• Fragmentation of care</td>
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<td>• Sending patient off ward without order</td>
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<td>• Physician coverage system</td>
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<td>– Patient repeatedly stated that she is not supposed to go for this procedure</td>
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<tr>
<td>• Name tag system</td>
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<td>• Informed consent process</td>
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### Intensive investigation and root cause analysis by multidisciplinary team at an institution with high-level interest in patient safety

- New policy that all patients must have order in chart to leave floor for tests or procedures

**Case represents the rule, not the exception**

### Not Entirely a Surprise

- Purpose of detailed investigations of critical incidents is to identify “latent errors” (system problems) instead of focusing only on “active errors” (like unsafe acts)
- But systems problems are the hardest ones to solve
  - Often very complex
  - Require substantial investment of resources
  - Reflect competing institutional goals
Subtle, but important example

- In setting of an RCT
  - Dosing errors associated with increased mortality
  - But, same association observed in placebo group
  > **Same risk factors that predispose patients to have poor outcomes also predispose them to have medication errors**

_A Note of Caution on RCAs_

- Make sense for hospitalists to be involved with given their clinical breadth as generalists
- But, they can consume a lot of effort that eventually produces only superficial changes of unclear benefit
- They can also be very interesting and fun, so probably worth trying 1 or 2 if opportunities arise and seeing how they go at your institution