Front-Line Staff Perspectives on Opportunities for Improving the Safety and Efficiency of Hospital Work Systems

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Objective. To contrast the safety-related concerns raised by front-line staff about hospital work systems (operational failures) with national patient safety initiatives.

Data Sources. Primary data included 1,732 staff-identified operational failures at 20 U.S. hospitals from 2004 to 2006.

Study Design. Senior managers observed front-line staff and facilitated open discussion meetings with employees about their patient safety concerns.

Data Collection. Hospitals submitted data on the operational failures identified through managers' interactions with front-line workers. Data were analyzed for type of failure and frequency of occurrence. Recommendations from staff were compared with recommendations from national initiatives.

Principal Findings. The two most frequent categories of operational failures, equipment/supplies and facility issues, posed safety risks and diminished staff efficiency, but have not been priorities in national initiatives.

Conclusions. Our study suggests an underutilized strategy for improving patient safety and staff efficiency: leveraging front-line staff experiences with work systems to identify and address operational failures. In contrast to the perceived tradeoff between safety and efficiency, fixing operational failures can yield benefits for both. Thus, prioritizing improvement of work systems in general, rather than focusing more narrowly on specific clinical conditions, can increase safety and efficiency of hospitals.

Key Words. Patient safety, process improvement, hospital systems

Hospitals face a daunting challenge: providing safe, effective care in complex organizations strapped by heavy patient loads, limited staffing, and shrinking financial resources. Hospitals are improving their ability to provide safe, effective care, but experts agree that further gains must be achieved (Leape and Berwick 2005; Pronovost, Miller, and Wachter 2006). To achieve this

goal, the patient safety literature advises managers to improve faulty work systems rather than blame individuals for poor outcomes (Institute of Medicine 2001; Bates 2002; Cleary 2003; Leape and Berwick 2005; Shannon et al. 2007). However, the literature offers less insight into what work systems are, which ones should be prioritized for improvement, and how to utilize employees' expertise. In addition, rather than targeting faulty work systems that may affect all patients, many improvement efforts focus on specific clinical issues or patient populations, such as deploying bundles of evidence-based interventions for heart attack patients (Leape and Berwick 2005; Bradley et al. 2006). Finally, health care professionals may perceive a tradeoff between investing scarce resources in safety-related improvements as opposed to productivity-related changes. This belief can reduce progress toward both goals because of the assumptions that improving safety will reduce staff efficiency (e.g., through double-checks and redundant systems) and that improving efficiency will increase safety risks as staff are stretched thin (Pauker, Zane, and Salem 2005).

The intervention that provided data for this study required senior managers to elicit safety-related concerns from front-line staff about hospital work systems. Hospital work systems are sets of interconnected routines through which specific patient care services are accomplished. Work systems include the employees, technologies, and organizational environment required to provide the services (Carayon et al. 2006). We refer to breakdowns in the materials, information, or equipment necessary for safe patient care as "operational failures" (Tucker and Edmondson 2003; Frankel et al. 2005).

We enlisted senior manager participation because managers can facilitate both resource allocation and organizational change necessary for resolving problems that cross departmental boundaries (Frankel et al. 2005). We focused on user-identified operational failures because research has shown that front-line employees are an excellent source of work-system improvement ideas (Mukherjee, Lapre, and Wassenhove 1998; Field and Sinha 2005). In addition, high reliability organizations, organizations that operate under hazardous conditions with extremely low rates of failure, rely on front-line expertise to address system complexities (Roberts, Stout, and Halpern 1994).

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Thus, an essential element of work system improvement is empowering front-line staff to identify and prioritize issues that need to be addressed (Frankel et al. 2005).

Similar to other studies that have considered the front-line perspective of patient safety (Pronovost et al. 2004; Frankel et al. 2005; Rathert, Fleig-Palmer, and Palmer 2006), our methodology yielded concerns that were grounded in the context of direct patient care. Our findings suggest that front-line workers experience routine breakdowns in work systems that impede safety and efficiency. Therefore, both safety and efficiency—which together create value for patients—can benefit from improving work system performance.

METHODS

Following recommendations from prior patient safety initiatives involving front-line workers (Pronovost et al. 2004; Frankel et al. 2005) and implementation research (Hagedorn et al. 2006), we designed a patient safety intervention called Leveraging Front-Line Expertise (LFLE), to gather input from front-line health care providers about safety-related problems. The components of LFLE that promoted information gathering included: (1) observation of front-line work systems (Work System Observations); and (2) meetings for front-line staff to express and prioritize safety concerns (Safety Communication Forums). In addition, the intervention provided a structured approach for tracking and acting upon operational failures identified. Future papers will report on intervention results and actions taken to address operational failures.

Work system observations allowed senior managers to witness challenges to providing safe patient care. During observations, four senior managers (e.g., the Chief Executive Officer [CEO], Chief Financial Officer, Chief Nursing Officer, and the Chief Medical Officer) each spent 30–60 minutes in the same work area directly observing front-line employees and work systems. To facilitate wider breadth of understanding and to prevent overload on the unit, they observed different perspectives (e.g., physician, patient, medication process, etc.) and compared observations. The management team rotated through different work areas of the hospital—such as intensive care unit (ICU), emergency department (ED), and operating room (OR)—approximately every 3 months.

Safety communication forums provided an opportunity for personnel in a specific work area to talk about operational failures. Prior research suggests that contact with more people increases effectiveness of information gathering

(Thomas et al. 2005). All personnel from the work area were invited to provide input before the forum, especially if they could not attend the meeting. This preidentification of failures enabled the unit manager to distill commonly held concerns, which staff could then highlight during intervention activities with senior managers. It also helped prevent overly vocal employees with non-representative views from dominating discussions. Communication forums were facilitated by either the patient safety liaison or a senior manager. The facilitator first generated input from staff about what processes were currently in place and functioning well that helped keep patients safe. The facilitator then elicited information about safety concerns. At the end of the meeting, attendees prioritized the concerns that were raised. Although our intervention raised a large number of safety concerns, there are undoubtedly other issues not captured by our data collection instruments that might negatively affect safety and efficiency.

Setting

We drew a stratified, random sample of 32 acute-care hospitals, representing all four census regions in the United States and three size categories, from a larger sample of 92 acute care hospitals participating in a 4-year study of safety climate. The 32 hospitals were invited to participate in an 18-month program from 2004 to 2006. Eight declined due to competing priorities or recent changes in leadership. There was no difference between the 24 participating hospitals and 68 control hospitals nor the 92 hospitals in the larger study and all U.S. hospitals on teaching status, tax status, and ownership. Four hospitals were excluded from the analysis because one closed and the other three completed observations in only one work area, leaving a final sample of 20 hospitals. None of the hospitals nor any individuals received compensation for participation, and all activities were approved by the Institutional Review Boards at the participating institutions.

Data Collection and Analysis

The intervention project staff consisted of a full-time intervention manager, a part-time project manager, and two senior researchers. As the intervention was part of a larger research project, the staff had working relationships with all intervention hospitals before initiation of the intervention. For training purposes we provided hospitals with an explanatory video, supporting documents, and an introductory call to discuss which senior managers and work areas would participate. Project liaisons at each site, typically hospitals' patient

safety officers, recorded failures on a standardized, electronic spreadsheet. The spreadsheet included fields for work area visited, activity type (observation or forum), and a description of the failure. The complete training manual and data collection forms are available at http://healthpolicy.stanford.edu/ptsafety/proj01_documents.htm.

The project team used several tactics to encourage the hospitals to complete intervention activities and record data. The intervention manager communicated at least monthly with hospital liaisons to foster progress, solve implementation problems as they arose, track activities, and provide assistance documenting operational failures surfaced by the intervention. In addition, we conducted three conference calls during which hospitals shared with each other what they had discovered through the intervention. Over the course of 18 months, a researcher visited each hospital. During the visit, the researcher shadowed a work system observation or a safety communication forum, toured work areas to see operational failures and actions taken, and interviewed the senior managers, a unit manager, and a front-line staff member. The visit by the researcher further motivated hospitals to complete intervention activities.

Following recommendations for qualitative research (Miles and Huberman 1994), we used an iterative coding process that resulted in 10 failure categories. As a starting point, we referenced Frankel et al.'s (2005) categories. Then, we modified the categories by reviewing emerging themes in our data, adding categories as necessary. For example, a large number of facility and security-related comments prompted us to add these two categories. Using this modified list of categories in our coding manual, four researchers coded a randomly selected set of failures; discrepancies were discussed as a team and revisions made to the coding manual. This pretest process was repeated with a second subset of the data until saturation was reached and no new codes needed to be developed. The final coding manual included 10 codes, definitions, inclusion/exclusion criteria, and specific examples from the data. The coding manual is available from the corresponding author upon request. The 10 different types of operational failures captured by our coding scheme had some overlap with previous studies that relied on input from front-line care providers, lending credibility to our findings (Vincent, Taylor-Adams, and Stanhope 1998; Frankel et al. 2005; Koppel et al. 2005; Rathert, Fleig-Palmer, and Palmer 2006). We assessed reliability of our codes by having two investigators independently code 100 operational failures. They achieved a nearly perfect κ value of 0.88.

In the year before the intervention, all hospitals in the larger study, including the intervention hospitals, administered a safety climate survey to all

senior managers, all physicians, and a random 10 percent sample of their staff. Intervention hospitals were encouraged to use their survey data to identify work areas where the intervention would have the greatest impact. Survey results are reported elsewhere (Singer et al. 2007).

RESULTS

The 20 hospitals collected 1,732 failures (median = 62 failures per hospital) across 173 work areas. Hospitals conducted intervention activities in a median of five work areas. The most commonly included work areas were the ED, ICU, OR, and a Medical/Surgical unit. In 14 of 20 hospitals, senior leaders expressed that the intervention enabled them to gain a deeper understanding of the operational failures their employees encountered and the actions needed to address them effectively. One CEO stated, "I think this has been very educational for each of us, not just in what we observed but also in thinking about the decision process we used to make selections."

There was variance in implementation effort across the hospitals. One hospital visited only three work areas, while four hospitals visited more than 10. Similarly, with regard to operational failures, the bottom quartile identified 42 or fewer failures while the top quartile recorded between 163 and 229 failures. Leadership involvement also differed. Five of the 20 hospitals successfully enlisted four or more senior managers to participate in work system observations and safety communication forums. At another nine hospitals, three senior managers engaged in the intervention activities. Four hospitals included two senior managers. The remaining two hospitals involved just one or none of the senior managers, instead giving primary responsibility to the patient safety officer and vice-presidents.

The two most frequently identified categories of operational failures were equipment/supply and facility design failures (18 percent each), which were reported in all 20 hospitals. The next three most frequently occurring failure types were communication/documentation (16 percent), staffing/staff development (16 percent), and medication (12 percent). These failures also were mentioned in nearly all participating hospitals. The remaining five categories included operational failures related to policies (5 percent), response time (4 percent), security (4 percent), infection control (3 percent), and task management (2 percent). Although these five categories occurred less frequently, they were prevalent and reported by 80–85 percent of the hospitals. Table 1 summarizes the results.

Table 1: Summary of Operational Failures by Category

<i>Operational Failure Category</i>	<i>Total (%)</i>	<i>Subcode Total (% within Category)*</i>	<i>Hospitals Reporting Failure (%)</i>
<i>Equipment/supply</i>	305 (18)		20 (100)
Broken, missing, insufficient		170 (56)	
Inappropriate for patient and staff needs		94 (31)	
<i>Facility</i>	304 (18)		20 (100)
Layout not conducive to patient care		142 (47)	
Maintenance and housekeeping		76 (25)	
Functionality of infrastructure (e.g., lighting)		66 (22)	
<i>Communication/documentation</i>	275 (16)		20 (100)
Poor information transfer between providers		89 (33)	
Excessive or redundant documentation		46 (17)	
Documentation errors		36 (13)	
Verbal or illegible written orders		35 (13)	
Patient identification		35 (13)	
<i>Staffing/staff development</i>	271 (16)		20 (100)
Insufficient staff/scheduling issues		132 (49)	
Staff compliance to policies (e.g., two identifiers)		58 (22)	
Staff development (education)/staff orientation		45 (17)	
Staff uncertain about protocol/need training		34 (13)	
<i>Medication</i>	214 (12)		19 (95)
Communication		62 (23)	
Equipment		55 (20)	
Staffing/staff development		27 (10)	
<i>Process/policy</i>	96 (6)		17 (85)
Patient care processes (rounding, surgery, labs)		30 (33)	
Process related to admission (too many)		19 (21)	
Process related to visitors/family		17 (19)	
Need for policy regarding staff professionalism		9 (10)	
<i>Response time</i>	72 (4)		17 (85)
<i>Security</i>	69 (4)		16 (80)
<i>Infection control</i>	54 (3)		16 (80)
<i>Task management</i>	39 (2)		16 (80)
<i>Other</i>	33 (2)		13 (65)
<i>Total</i>	1,732		

*For brevity, subcategories < 10% are not listed.

Equipment/Supply Failures

Over half of the more than 300 equipment/supply failures were due to broken or missing equipment or supplies. This problem was pervasive: 85 percent of hospitals reported missing equipment or supplies. In the surgical unit of Hospital 122, a chronic deficiency of oxygen tanks meant patients were transferred between units without them. As a result, patients were more likely to become unstable, resulting in admission to the ICU and longer hospital stays. Our interviews with front-line staff reinforced the impact of equipment problems on patient care. For example, during our interview, a patient care technician on a busy 40-bed telemetry unit at Hospital 32 informed us of wasted time due to a chronic shortage of pulse oximeters, in part because equipment was removed for maintenance without replacement.

Another third of the equipment/supplies failures centered on equipment that did not meet the needs of the patients. A common concern was chairs and operating tables that did not support bariatric patients. Such failures represent systems problems that hinder the timely delivery of safe care.

Facilities Failures

Nearly half of the facilities failures were due to poor facility layout or lack of space. All but one hospital identified layout or space issues. Poor layout of the unit often made it difficult for providers to observe patients. Personnel also frequently complained of insufficient storage space, which often resulted in storage of dirty equipment in nondesignated places, such as hallways, creating a fire and infection control risk.

Another 22 percent of facility failures stemmed from a lack of functionality of the existing facility such as insufficient heating/cooling and facility cleanliness. Poor lighting and a lack of automatic doors hindered physicians and staff. For example, in Hospital 32's catheter lab, the overhead lighting was inadequate for procedures on patients' left shoulders, forcing physicians to forgo the use of protective shielding because the arm it was attached to interfered with the only movable light fixture.

Communication/Documentation Failures

One-third of communication/documentation failures were the result of poor coordination among health care providers. Physicians reported inconsistent notification from nurses about changes in patient conditions, such as abnormal test results and drops in blood pressure. Nurses commented that physicians were often difficult to reach for consultation. In addition, OR staff reported

that they were frequently uninformed about scheduling changes, which resulted in confusion and delay. Staff from all departments lamented a lack of advance notice about patient conditions—such as a need for supplemental oxygen or isolation—which created safety risks because they were unprepared when the patient arrived. Documentation was often redundant or unwieldy.

Communication/documentation failures also cause waste and rework. For example, Hospital 32's documentation of surgeons' preoperative preferences was not always correct or sufficiently precise. The inaccurate system wasted money and time because staff opened unnecessary supplies and equipment.

Staffing/Staff Development Failures

Half of the staffing/staff development failures stemmed from insufficient staffing levels. Nurses reported that timeliness and quality of care suffered when the unit was understaffed. In addition, staffing shortages in ancillary departments, such as laboratory, negatively impacted patient care and safety throughout the hospital. Finally, senior managers observed that a lack of support staff (housekeepers, secretaries) caused inefficiencies and interruptions for physicians and nurses who had to perform support staff functions (e.g., answering phones, cleaning rooms) themselves. Another 30 percent of staffing failures were related to staff development. Employees requested more orientation, continuing education, in-services, and periodic review of procedures.

Medication

The most frequent medication failures centered on communication/documentation and equipment/supplies. Together, these comprised over one-half of the medication-related operational failures. Communication issues between the units and pharmacy were mentioned, such as not knowing whether the pharmacy received a fax order, resulting in extra steps to confirm receipt.

Failures related to medication equipment frequently involved automated drug dispensing (ADD) machines. These machines ran out of medications in five hospitals. Similar to studies of computerized physician order entry systems (Koppel et al. 2005), we found that the ADD machines had discrepancies that could lead to medication errors such as a mismatch between the dose in the drawer and the dose on the screen, active patients being deleted from the computer, or patients coming up on the screen who had already been discharged or who were never on that unit. The increased complexity asso-

ciated with stocking similar drugs and multiple doses of the same drug also impacted efficiency. One hospital's ICU staff complained that weekly inventory of its ADD machine took 45 minutes. The staff suggested that utilizing existing information about medication usage could facilitate substantial reductions in the number of medications stocked and hence a reduction in the time required to inventory the medication in the machines.

Policy, Response Time, Infection Control, Security, and Pace of Work

The remaining five categories cumulatively accounted for 18 percent of the operational failure data. Staff reported wait times of up to 1.5 hours for necessary supplies, such as blood products, dietary trays, and sterile equipment. There were also delays in procedures (e.g., line insertion), results from tests, and even surgeon arrival, which caused delays in treatment for patients and sometimes rework as patients waited so long they needed to be re-assessed.

Personnel also raised concerns about insufficient infection control. Poor hand washing practices were discussed at eight hospitals. Poor room layout and equipment design made it difficult to comply with infection control policies. For example, two hospitals' senior managers observed staff placing medical equipment/supplies on a nonsterile surface, such as a patient's bed, because a clean surface was unavailable. Staff also felt vulnerable because of a perceived lack of security in the hospital, especially on the night shifts and in remote areas of the hospitals. Regarding work pace, staff most commonly complained about frequent interruptions and overlapping priorities that required them to move quickly from caring for one patient to another.

DISCUSSION

Our study of operational failures at 20 hospitals builds on, but is distinct from, two similar programs that gathered front-line perspectives on patient safety. LFLE differs from Frankel et al.'s Leadership Walkrounds™ (2005) because operational failures were identified through two means: senior managers' observation of work systems and safety communication forums which enabled broad participation of unit personnel. LFLE also differed from Pronovost et al.'s "Adopt-a-unit" (2004) because senior managers observed several work areas, and did so as a group, rather than individually focusing on only one work area.

The two most prevalent types of operational failures were equipment/supply and facility failures. Previous research on hospital work environments shows that equipment failures can frustrate patient care providers and decrease

quality of care (de Leval et al. 2000; Beaudoin and Edgar 2003; Cleary 2003; Tucker 2004; Rathert, Fleig-Palmer, and Palmer 2006). As several of our examples illustrate, missing equipment typically results in people working around the issue by locating substitutes, which wastes staff time and delays patient care (Tucker 2004). Patient care delays place patients at risk for poor outcomes and prolonged pain and suffering (Derlet and Richards 2000). Poor facility design can compromise patient confidentiality and create safety risks through limited patient visibility (Carayon et al. 2006). Our results suggest two conclusions.

First, despite the prevalence of equipment and facility failures in our data, these issues have not been included as priorities in national patient safety initiatives, and we suggest that they should be. For example, equipment and facilities issues were not explicitly mentioned by the Joint Commission's 2008 National Patient Safety Goals (2007), the Leapfrog Group's quality and safety practices (2007), Agency for Healthcare Research and Quality (AHRQ)'s top 11 evidence-based patient safety practices (2001), the Institute for Healthcare Improvement's 100 K/5MM lives campaigns (Berwick et al. 2006; Institute for Healthcare Improvement 2006), or the National Quality Forum's Safe Practices for Better Healthcare (2006). Implicit in these initiatives seems to be an assumption that facilities are conducive to patient care and that all necessary equipment are available in sufficient quantities, are in good working order, and meet patient needs. However, our data suggest that these assumptions are faulty. Perhaps these issues have escaped attention because it is difficult to measure their impact with traditional clinical methods, such as randomized control trials. In addition, their seemingly idiosyncratic nature also limits national visibility. However, research has shown the pervasiveness of such problems (de Leval et al. 2000; Pronovost et al. 2004; Frankel et al. 2005; Rathert, Fleig-Palmer, and Palmer 2006; Gurses and Carayon 2007).

Furthermore, even for categories in our data that were mentioned by national initiatives, such as communication, staffing, and response time, the national focus often differed from the issues raised by front-line staff in our study. For example, LFLE did highlight issues of communication handoffs and verbal orders, which were included in JCAHO's 2008 National Patient Safety Goal #2 (2007). However, LFLE communication failures not addressed by national initiatives included more basic issues such as difficulty contacting medical personnel, lack of notice about patient-procedure schedule changes, redundant documentation, and poorly designed forms that were difficult to use. LFLE issues were also more comprehensive than those in national initiatives. Consider JCAHO's Goal 2.c, which seeks improvement in timeliness of critical test results (2007). In contrast, LFLE reported a need for timely

delivery of a wide range of services, including respiratory therapy, blood products, equipment repair, and dietary trays, suggesting the need to address timely delivery of internal services more globally. Finally, LFLE suggested that while most hospitals had policies to satisfy publicized national goals, such as the use of two patient identifiers when providing care, front-line staff reported low compliance with such policies. This highlights that safety improvement is hindered by implementation rather than policy creation. Thus, the priority suggested by LFLE is removing barriers to staff compliance with existing policies, rather than creating new policies.

Issues raised by front-line staff in our study generate a complementary set of recommended patient safety priorities to those advocated by national initiatives. Many have been identified elsewhere (e.g., equipment inspection during JCAHO accreditation surveys), but they have not been highlighted as priorities by national patient safety initiatives. We propose that doing so would prove beneficial because our data, in combination with other similar studies, suggest that these issues are widespread. Furthermore, operational failures are important because they are latent failures, or system weaknesses that on their own may be insufficient to cause accidents, but in combination often lead to catastrophic events (Reason 1990; Vincent, Taylor-Adams, and Stanhope 1998). Our data also highlight the importance of achieving a base level of general work system performance before implementing more focused initiatives. For example, before hospitals can successfully implement improvements that rely on specific supplies—such as an infection-preventing surgical supply—they need to first ensure that they can consistently provide required supply items in general. Finally, our study provides insight for regulatory approaches. Findings suggest that LFLE techniques are helpful in identifying opportunities to improve safety that might otherwise go unobserved. Thus requiring similar processes that engage front-line workers may provide a more fruitful approach for system improvement than relying solely on policies. See Table 2 for a comparison of the recommended patient safety priorities related to LFLE with recommended priorities from national safety initiatives.

Our second conclusion is that in contrast to an assumption about the tradeoff between focusing on improving patient safety and efficiency (Pauker, Zane, and Salem 2005), many of the most commonly mentioned operational failures in our dataset negatively impacted both. For example, requiring health care providers to perform housekeeping and secretarial functions because of inadequate staff support interferes with the safe delivery of medical care and wastes expensive resources (Tucker and Spear 2006). Furthermore, addressing operational failures, such as missing equipment, so they do not recur, yields

Table 2: Patient Safety Priorities from LFLE Compared with National Initiatives

<i>Priorities Stemming from LFLE Operational Failures</i>	<i>JCAHO 2008 National Patient Safety Goals</i>	<i>Leapfrog Group's "Leaps"</i>	<i>AHRQ Top 11 Safety Practices</i>	<i>IHI 5 Million Lives Campaign</i>	<i>National Quality Forum (NQF) Safe Practices</i>
<i>Equipment/Supplies</i> Ensure all equipment is in working order and properly stored.	—	—	—	—	—
Ensure equipment is available for all patient populations, including bariatric patients.					
<i>Facility</i> Ensure layout allows visual monitoring of patient; is conducive to performing duties.	—	—	—	—	—
Maintenance and housekeeping needs are easily requested, confirmed, and fulfilled.					

Continued

Table 2: Continued

<i>Priorities Stemming from LFLC Operational Failures</i>	<i>JCAHO 2008 National Patient Safety Goals</i>	<i>Leapfrog Group's "Leaps"</i>	<i>AHRQ Top 11 Safety Practices</i>	<i>IHI 5 Million Lives Campaign</i>	<i>National Quality Forum (NQF) Safe Practices</i>
<i>Communication</i>					
Design information transfer to be standardized, concise, and unambiguous. Eliminate redundant documentation. Reduce verbal and illegible orders.	2a. Read-back verbal orders and critical test results 2b. Standardize do not use abbreviations 2c. Standardize hand-off communications	<i>Leap 4: NQF Safe Transfer and Communication Practices (6)</i>	—	—	3. Ensure written documentation of patient's preferred life-sustaining treatment is prominently displayed on chart 9. Read-back verbal or phone orders and critical test results 13. Standardize "do not use" abbreviations, acronyms, symbols
<i>Staffing/Training</i>					
Ensure sufficient staffing with clear action plans for when it is insufficient. Audit staff compliance with policies (e.g., 2 patient identifiers). Devote resources to	—	<i>Leap 3: ICU Physician Staffing</i> ICUs are managed by intensivists	—	—	5. Implement a nurse staffing plan that is adequately resourced and actively managed and budget resources to support nurse continuing education 6. Ensure non-nursing, direct care staffing

new staff orientation and to ongoing staff education on new technologies and policies.

Medications

See other categories:

Communication related to medications.
Equipment related to medications.
Staffing/staff development related to medications.

3c. Prevent errors from look/sound-alike drugs
3d. Label all medications, containers
3e. Reduce likelihood of harm from anticoagulation therapy
8. Reconcile medications across the continuum of care

Leap 1: Computer Physician Order Entry (CPOE)
Leap 4: Medication management (4)

Patient self-management for warfarin (CoumadinTM) to achieve appropriate outpatient anticoagulation

Reduce harm from high-alert medications
anticoagulants, sedatives, narcotics, insulin

Prevent errors through standardization, detection, and mitigation
Medication reconciliation

levels are adequate, staff are competent, and have orientation, training, and education
7. ICUs managed by "critical care certified" physicians

12. Computer physician order entry (CPOE)
13. Standardize dose designations that cannot be used
14. Develop, reconcile and communicate an accurate medication list
15. Pharmacists actively participate in medication management systems
16. Standardize labeling and packaging of medications
17. Identify and minimize risks of high alert drugs
18. Dispense meds in unit-dose or in unit-of-use form when possible

Continued

Table 2: Continued

<i>Priorities Stemming from LFL E Operational Failures</i>	<i>JCAHO 2008 National Patient Safety Goals</i>	<i>Leapfrog Group's "Leaps"</i>	<i>AHRQ Top 11 Safety Practices</i>	<i>IHI 5 Million Lives Campaign</i>	<i>National Quality Forum (NQF) Safe Practices</i>
<i>Process/policy</i> Improve and standardize patient care processes based on cross-functional input. Streamline admissions and discharge processes. Develop process for patient overflow. Develop visitor policies.	<i>1. Improve accuracy of patient identification</i> 1a. Use 2 patient identifiers when providing care, treatment, or services	—	—	—	29. Monitor patients on long-term oral anticoagulants 25. Implement the universal protocol for preventing wrong site, wrong procedure, wrong person surgery for all invasive procedures
<i>Response time</i> Ensure timely delivery of service items, such as dietary trays, linens, laboratory results, ancillary services.	2c. Improve timeliness of critical test results	Leap 3: Intensivists return pages within 5 minutes	—	—	8. Care information is transmitted and documented in a timely manner

Security Ensure security of staff and patients (National Institute for Occupational Safety and Health 2002).				
Infection control Provide equipment to aid infection control (biohazard and sharps containers, sanitizer placement). Clean equipment (e.g., oximeters and computer keyboards). Monitor and improve handwashing and glove compliance.	7. Reduce risk of health care-associated infections 7a. Comply with WHO or CDC hand hygiene guidelines 7b. Manage all unanticipated death or major permanent loss of function as sentinel events	Leap 4: NQF healthcare-associated infections (5)	Use maximum sterile barriers with central intravenous catheters Antibiotic prophylaxis in surgical patients Use of antibiotic-impregnated central venous catheters	Prevent central-line infections Hand hygiene Maximal barrier precautions Chlorhexidine skin antisepsis Optimal catheter site selection Daily review to remove unnecessary lines Prevent surgical site infections Prevent MRSA infection
				19. Prevent ventilator-associated pneumonia through ventilator bundle practices 20. Prevent central venous catheter-associated bloodstream infections by adhering to effective methods and explicit policies 21. Prevent surgical site infections Antibiotics Hair removal Post-op cardiac surgery glucose control 22. Comply with CDC hand hygiene guidelines

Continued

Table 2: Continued

<i>Priorities Stemming from LFL E Operational Failures</i>	<i>JCAHO 2008 National Patient Safety Goals</i>	<i>Leapfrog Group's "Leaps"</i>	<i>AHRQ Top 11 Safety Practices</i>	<i>IHI 5 Million Lives Campaign</i>	<i>National Quality Forum (NQF) Safe Practices</i>
<i>Task management</i>					
Develop communication systems that minimize interruptions.	—	—	—	—	23. Immunize health care workers against influenza

LFL E, Leveraging Front-Line Expertise; AHRQ, Agency for Healthcare Research and Quality; ICU, intensive care unit.

benefits for both patient safety and staff efficiency (Shannon et al. 2007). Scarce staffing resources become more efficient as people increase time spent caring for patients and reduce time spent locating functional equipment and supplies. Providing staff with more reliable work systems represents a complementary strategy to increasing staffing levels—with its commensurate improvement in staff satisfaction, reduced turnover, and patient care outcomes (Aiken et al. 2002). In addition, expected payment reforms, such as Medicare's proposal to not reimburse hospitals for treatments stemming from preventable medical errors, will increase the financial benefits of improving work systems (Pear 2007).

Limitations and Future Research

As with any study, this study has limitations to generalizability. First, there was variation in implementation effort and style across the hospitals. Although the hospitals were randomly selected, willingness to sustain effort required for intervention activities could not be standardized. Although we provided standardized material and support to all hospitals, each hospital's implementation was unique. For example, some senior managers observed work areas as a group while others observed individually. Thus, the types of failures that were uncovered might vary with implementation style.

Second, our dataset of operational failures likely fails to capture the complete set of safety and efficiency issues faced by the hospitals. Our intervention was designed to elicit only safety-related operational failures. Therefore, our data might underreport efficiency-related failures. However, this strengthens our finding of synergy between safety and efficiency because we did not ask about efficiency-related concerns directly, but rather they emerged embedded in the safety-related set of concerns. While front-line staff were encouraged to speak openly, it is possible that interpersonal risks associated with speaking up, including fear of shame or retribution, may have presented a barrier to complete disclosure (Tucker and Edmondson 2003). Furthermore, the data were recorded by each hospital's liaison, rather than by an outside researcher, perhaps resulting in reporting bias. However, field notes from our visits to the hospitals were congruent with liaison-submitted documentation. In addition, we relied on the hospital liaisons to remove nonsafety-related failures before submitting their data as they understood the broader context in which the issues were raised. Nonetheless, some of the issues raised may have been outside of the domain of safety. In summary, issues identified likely represent a subset of what might have been recommended with a broader mandate.

Implications

Despite the theoretical connection between latent errors, such as the operational failures in our study, and more serious accidents (Reason 1990; Vincent, Taylor-Adams, and Stanhope 1998), empirical validation of this link remains limited. A notable exception is a study of cardiac surgery by de Leval et al. (2000), which found that multiple, simultaneous latent failures were associated with negative patient outcomes. Future studies could measure the impact of work system improvements based on front-line staff input, such as those suggested by LFLE, on more serious errors and staff efficiency. Furthermore, both research and practice would benefit from studies that examined effective organizational structures and processes for resolving operational failures raised by front-line staff. Should the staff members who raised the issue be involved in finding and implementing countermeasures, or should operational failures be handed off from the front-line staff member who identified the issue to a dedicated problem solver? Similarly, how should organizations balance the need for work-unit level autonomy to resolve failures with the need for organization-wide participation and standardization of solutions? These remain important topics for future research.

CONCLUSIONS

Our research enabled front-line workers to surface safety-related operational failures. Our analysis showed that the issues raised by front-line staff were underrepresented in high-profile initiatives to improve patient safety and, if remedied, could result in improvements to both safety and efficiency. As health care becomes increasingly reliant on technology and technical supplies, the importance of ensuring that these vital components—as well as other components of hospital work systems—are readily accessible to staff will become increasingly important. Addressing these failures provides opportunities for improving efficiency of staff and safety for all patients.

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SUPPLEMENTARY MATERIAL

The following supplementary material for this article is available online:
Appendix SA1. Author matrix.

This material is available as part of the online article from <http://www.blackwell-synergy.com/doi/abs/10.1111/j.1475-6773.2008.00868.x> (this link will take you to the article abstract).

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