Medication Safety

Empowering Frontline Nurses: A Structured Intervention Enables Nurses to Improve Medication Administration Accuracy

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During the last decade, the prevalence, cost, and harm of patient safety errors have finally received the attention they deserve. The Institute of Medicine led the charge to encourage health care practitioners to develop ways to reduce and ultimately eliminate health care errors.[1] Medication errors remain among the most common errors in hospitals and have been documented in a wide range of studies and surveys,[2] harming at least 1.5 million people and causing approximately 7,000 preventable deaths a year in the United States. Estimates of the annual costs of medication errors in hospitals range between $3.5 and $29 billion.[1–6]

There are many opportunities for medication errors to occur, given that the process of providing a new medication to a patient involves between 50 and 100 steps from the moment the physician writes the order for a medication to the eventual delivery of the drug to the patient.[3] Research shows that an equal percentage of errors are made at the prescribing and administration phases (39% and 38%, respectively).[4,6] Dispensing errors constitute 14% of medication errors. Pharmacists and nurses intercept approximately 40% of prescribing errors, and nurses intercept about 40% of dispensing errors. However, only 2% of errors committed during the medication administration process are intercepted because there is no one except the patient to intercept these errors.[6]

Although errors in medication administration are a major problem, few research studies have focused on them, largely because of the difficulty in measuring medication administration error.[7] The most common method of detecting medication administration error, voluntary self-reporting, vastly underreports the incidence of error.[8,9] During the last few years, researchers have developed a better method of detecting medication administration errors. Direct observation of medication administration, coupled with review of patient records, detects most medication administration errors. Studies using the direct observation method have found that between 6% and 33% of medication doses are incorrect.[9–13]

Nurses report that the primary causes of medication admin-

Article-at-a-Glance

Background: Seven hospitals from the San Francisco Bay Area participated in an 18-month-long Integrated Nurse Leadership Program, which was designed to improve the reliability of medication administration by developing and deploying nurse leadership and process improvement skills on one medical/surgical inpatient unit.

Methods: Each hospital formed a nurse-led project team that worked on six safety processes to improve the accuracy of medication administration: Compare medication to the medication administration record, keep medication labeled from preparation to administration, check two forms of patient identification, explain drug to patient (if applicable), chart immediately after administration, and protect process from distractions and interruptions.

Results: For the six hospitals included in the analysis, the accuracy of medication administration (as measured by the percent of correct doses administered) improved from 85% in the baseline period to 92% six months after the intervention and 96% 18 months after the intervention. The sum of the six safety processes completed also improved significantly, from 4.8 on a 0–6 scale at baseline to 5.6 at 6 months to 5.75 at 18 months.

Discussion: This study suggests that frontline nurses and other hospital-based staff, if given the training, resources, and authority, are well positioned to improve patient care and safety processes on hospital patient units. Frontline clinicians have the unique opportunity to see what is and is not working in the direct provision of patient care. To address the sustainability of the program's changes after the official project ended, each team was required to develop a sustainability plan entailing monitoring of progress, actions to ensure the improvements are built into the organizational infrastructure, and staff's interaction with leaders to ensure that the work could continue.

istration errors are systems and work-load factors such as interruptions, distractions, and patient load.[13–16] Interventions to improve working conditions for nurses have shown some success in changing processes, but actual improvements in medication administration accuracy have rarely been found. The system factors addressed in these studies included reducing interruptions and distractions,[17,18] using a dedicated medication nurse,[19] and deploying technology.[20–22]

In this article, we describe a study that breaks new ground in showing the effect of improvements in the work environment on the accuracy of medication administration as measured by direct observation.

The Integrated Nurse Leadership Program Model of Quality Improvement

The Integrated Nurse Leadership Program (INLP), developed by a nurse leader and other professionals at the University of California San Francisco Center for the Health Professions, is a quality improvement (QI) collaborative aimed at developing nurses' leadership skills and improving the processes and outcomes for a predetermined QI project.[23] The INLP "change framework" is designed to apply to any clinical problem or project. The program is designed to lead clinicians through an entire process of QI, during which INLP participants learn to innovate, test innovations, diffuse innovations throughout the hospital, and embed innovations in hospital policies and daily practice.

The central tenet of INLP is that placing frontline nurses (and other clinicians) in fundamental roles in an improvement effort is necessary to achieve successful outcomes. To enable clinicians to effectively drive improvement efforts, INLP trains individual clinicians with an 18-month curriculum designed around its change framework of developing individual skills for each of four core elements of QI: individual, team, culture, and process. Through a combination of off-site workshops and hospital-based team trainings and consultations, INLP provides training, support, and tools aimed at developing each set of skills. INLP participants work on a hospital-based QI project to apply the skills developed in the off-site workshops in real-time.

The INLP change framework relies on building clinician-led project teams to drive QI changes. Each INLP partner hospital creates or deploys a team of frontline clinicians with senior executives who support the project. The project team assumes responsibility for developing policies and procedures to codify changes, as well as for providing the internal training of frontline clinicians, staff, and managers to ensure effective implementation and sustainability of changes.

Methods

The INLP Intervention

Participating Hospitals. Seven hospitals from the San Francisco Bay area participated in an 18-month program, which ran from July 2006 through March 2008 and was designed to improve the reliability of medication administration through developing nurse leadership and process improvement skills on one medical/surgical inpatient unit. Each hospital committed $75,000 to the project and received a $75,000 grant from the Gordon and Betty Moore Foundation (Palo Alto, California, http://www.moore.org/ which also granted $5.7 million to the Center for Health Professions to develop and implement the INLP curriculum) to cover at least some of the expenses related to this project. Hospitals spent the majority of the funds on release time for nurses, including compensating nurses for time off to conduct tests of change and to attend meetings; on paying for "back filling" of nurses who were spending time on the project; and on buying meeting supplies. Of the participating hospitals, two were large academic teaching institutions, four were part of not-for-profit systems, and one was a moderate-sized independent community hospital. From these hospitals, 63 frontline clinicians participated in on-site and off-site leadership skills training and professional development.

Project Teams and Processes. Each hospital established a project team composed of 2 senior leaders from the organization, 2 frontline clinician co-leads (mostly nurses), and up to 10 frontline workers, most of whom were registered nurses. Each project team agreed to work on the following six safety processes to improve the accuracy of medication administration:

1. Compare medication to the medication administration record (MAR).
2. Keep medication labeled throughout.
3. Check two patient identifications (IDs).
4. Explain drug to patient (if applicable).
5. Chart immediately after administration.
6. Protect process from distractions and interruptions.

The INLP chose these six safety processes on the basis of their endorsement by the California Nurse Outcome Coalition (CalNOC), a collaborative alliance for nursing outcomes. CalNOC derived the processes from evidence-based literature.

The first 9 months of the INLP program focused on assembling the team and implementing system improvements on one unit. The second 11 months focused on deepening the skills of the initial team, teaching these skills to a second team, and spreading the system improvements to at least one additional unit within the hospital. The original INLP team at each hos-

Table 1. The Six Safety Processes and Examples of Implemented Changes*

Safety Process Addressed	Examples of Implemented Changes
Compares Medication to MAR	Nurses bring MAR into room.
Keeps Medication Labeled Throughout	Keep labels on all medication until nurse is at patient's bedside. All medication crushing or other preparation done at bedside.
Checks 2 Forms of Patient ID (Case Study 2)	Patient surveys asking if the nurse checked two forms of ID Developed a welcome letter to all admitted patients about the way medications are administered
Explains Drug to Patient (if applicable)	Leave label on all medications until nurse at bedside and able to discuss with patient (when appropriate)
Charts Immediately After Administration	Times reviewed on retrospective chart audits to ensure charting coincided with medication administration
Keeps Process Free of Distractions and Interruptions (Case Study 1)	Large posters developed and placed around unit that list quiet times for medication administration
	Overhead announcements at the beginning and end of quiet time for medication administration
	Medical team rounds only during non–medication administration times.
	Developing "elevator pitch" to educate other staff about importance of protected hour for medication administration†

*MAR, medicaton administration record; ID, identification.

† The "elevator pitch" is a predetermined and established sentence or two about the key attributes of the program.

pital trained the second team.

Seminars. Team members participated in eight off-site seminars one to two days in length during the course of the 18-month program and received monthly mentoring at their hospital. The trainings included both didactic and experiential education on each element of the change framework. For example, for the "process" element of QI, seminars included lectures on the science of reliability, QI models, project management, gathering and interpreting data, and the use of data in critical decision making. An overview of all eight sessions can be found in Appendix 1 (available in online article).

Executives and team leaders attended three joint seminars focused on raising awareness for nursing-initiated QI and leadership development. Team leaders also participated in a seminar focused on teambuilding.

Off-site seminars incorporated team-based exercises to allow participants to apply their new knowledge to their hospital's medication administration processes. For example, during one of the seminars, each team evaluated its hospital's data on each segment of the medication administration process and identified which segment to target for the first plan-do-study-act (PDSA) cycle. Then the team brainstormed how to improve this safety process and developed a "test of change" to implement in its hospital. Examples of tests of change included surveying staff about new forms, using new containers to hold medications, and broadcasting overhead pages about the start of quiet "time-out."

Intersession Work. Between off-site seminars, INLP staff assigned intersession work to teams. Designed to keep teams on track between sessions, intersession assignments typically included conducting at least one QI test of change every two weeks and having follow-up team meetings to discuss the test outcome, review current data, and determine next steps to continue improving the medication administration process.

Teams submitted standardized meeting notes, which INLP staff used to ensure team progress and to identify useful feedback to provide to team members. In addition, each test of change was recorded in an activities sheet so that the team could maintain a record of what was tried, its success or failure, and its impact on the medication administration process. Table 1 (above) provides examples of specific changes implemented at the study hospitals.

Team leaders typically assigned different test-of-change activities to different members, ensuring that each team member played an instrumental role in creating improvements. In addtion, each team member was expected to engage in all aspects of ensuring the program's success. For example, in a given week, one team member would be in charge of conducting the designated test of change, while another team member would be involved in presenting this improvement campaign to a senior-level committee.

To determine whether a change helped improve the reliability of a safety process, the INLP team would conduct a small test of change and then remeasure the process under evaluation. For example, to remove interruptions, a team first had to determine which type of distraction it would try to eliminate (e.g.,

phone interruptions, in-person physician interruptions). Then the team would develop an idea to reduce that particular interruption. One team focused on decreasing interruptions from phone calls by developing a phone script for the ward clerk to recite to the caller when the nurse was busy, explaining why the nurse could not take the call. The script was used for two days, at the conclusion of which the rate of interruptions was measured. If the measurement indicated an improvement, then the test of change was refined and expanded.

All teams targeted their improvement activities on the basis of data collected by observation of their medication administration process. Once a team demonstrated reliable adherence to one safety process, as demonstrated by observation data, the team would shift its focus to another safety process. Most hospitals were able to work through all six safety processes, but most hospitals spent the majority of their time addressing the interruption/distraction process, which proved to be the most difficult.

To help teams make continual progress, the INLP provided three senior consultants to support project teams in the seven study hospitals. Two of the senior consultants [including J.K.] were high-level nurse administrators, and the third was an experienced health care consultant. The senior consultant attended team meetings and assisted team leaders and members with specific problems or challenges, such as how to engage senior administrators and gain buy-in from staff outside the project, and assisted with data analysis and team collaboration. Consultants typically visited each hospital monthly and also supported project teams by phone and e-mail.

Senior consultants provided feedback about each team's progress and struggles to the INLP team, which revised curricular materials and intersession assignments to address what the consultants witnessed in the field. (*See* Sidebar 1, page 608).

Evaluation Methods

This study tested the hypothesis that improving the reliability of the medication administration process with the INLP activities would increase the accuracy of medication administration. The evaluation plan included the collection of data on accuracy and processes of medication administration at baseline and at 6 and 18 months after implementation of the INLP intervention. We excluded one hospital from the evaluation because its process of observation and counting of errors changed markedly at the 6-month time, in part because new staff did not learn the appropriate approach for data collection.

Data Collection

The INLP project used the CalNOC[24] method of direct observation of medication administration, coupled with patient record review, to determine the accuracy of each medication dose administered to the patient. Each hospital selected between two and eight staff nurses to serve as observers. CalNOC personnel trained the designated nurses to observe medication administration using the naïve-observer methodology. The data collection tool developed by the CalNOC is provided in Appendix 2 (available in online article).

In the naïve-observer methodology, the observer randomly selects nurses, who consent to observation, and then accompanies each nurse during the preparation of the medication, administration to the patient, and documentation.[8,10] Following the entire medication pass (multiple drug doses administered to the same patient during the same time frame), the observer then reviews the patient's chart and notes the medications ordered for the patient. Observers do not know the patient's medication orders until after the observations were made and recorded to prevent confirmation bias. The observed doses are then compared with the ordered doses. Previous research on naïve-observer methodology has concluded that little detectable bias is introduced.[8–13] Attempts to validate the errors noted during observation with voluntary reports of errors have not been successful because so few errors are reported on these voluntary incident reports.

The data recorded and subsequently available for each dose administered included whether the drug, form, dose, route, time, technique, and patient were correct and whether the processes used by the staff nurse included (a) checking two patient IDs, (b) checking the medication against the medication administration record, (c) explaining the drug to the patient, (d) keeping the medication labeled throughout the process, (e) charting the medication immediately after administration, and (f) interruption/distraction of the nurse during the preparation and administration of the medication.

The observation data were used to calculate two primary measures for evaluating the impact of the INLP QI projects. The first was a determination of the medication administration accuracy rate. Errors were classified as one or more of the following: unauthorized drug (not ordered), wrong dose, wrong form, wrong route, wrong technique (defined as the use of an inappropriate procedure or improper technique in the administration of a drug), extra dose, omission, wrong time (defined as greater than 60 minutes before or after the scheduled time for the drug), and drug not available. Each dose was classified as correct or incorrect. The number of correct doses was divid-

Sidebar 1. Case Studies

Case Study 1. Preventing Patient and Provider Complaints: *Distractions and Interruptions*

Safety Intervention
To reduce distractions and interruptions during medication administration times, Hospital A created a protected hour for nurses to focus exclusively on reconciling medication orders, administering medications, checking medication labels, and charting the administration of medications. During this hour, all calls—whether from patients, families, pharmacists, or physicians—were held, and overhead pages were not returned. On average, this intervention removed the distraction of eight phone calls and three overhead pages per nurse in an hour.

Implementation Challenge
Family members and providers expressed dissatisfaction with leaving messages and experiencing delays in receiving and communicating information about patients.

Senior Consultant's Advice
The senior consultant encouraged the team to identify the reasons why individuals called and paged nurses during the protected hour. After the team better understood the reasons for the calls and pages, the consultant advised it to develop alternatives to manage the callers' needs.

Problem Resolution
The Integrated Nurse Leadership Program (INLP) team developed a phone log, in which the unit clerk noted the type of individual calling (for example, physician, pharmacist, family member), the reason for the call, and the call resolution (for example, caller hung up feeling satisfied or frustrated). In addition, the team developed unique scripts by caller type to address why the call could not be taken at that moment. The team revised the scripts as needed until the majority of callers were satisfied.

After four weeks of using the log, the team inventoried the reasons for calls and developed specific solutions. For example, the team determined that the majority of family members call for a patient status update on how the patient fared overnight. In response, unit nurses began providing the charge nurse with a summary of this information. Then, the charge nurse could take calls from family members and address their questions and concerns.

Case Study 2. Refocusing Team Attention on Actionable Changes: *Patient Identification*

Safety Intervention
Hospital B identified an underlying problem preventing nurses from checking two forms of patient identification: Patient armbands were difficult to read because of a small and faint font. The INLP team decided to try to create new patient armbands that would be easier to read.

Implementation Challenge
The INLP team's work on the armbands stalled because of challenges in finding the appropriate committee to handle the work. Because the hospital was part of a health system, any request to change the patient armband had to be presented to a central committee at a regional level. The team spent several months first determining which committee to address and then getting on the committee's meeting agenda. In the meantime, the team failed to progress on improving any aspect of its unit's medication administration processes.

Senior Consultant Advice
The senior consultant advised the team to refocus its efforts to the more immediate goal of improving medication error rates on its unit. The consultant also counseled the team about project management, understanding project scope, and prioritization.

Problem Resolution
Refocused, the INLP team developed a unit-based work-around to the armband problem. The unit instituted a second patient armband with a larger, bolder font, which enabled nurses to rely on it as a form of patient identification. At the same time, several of the team members continued to pursue a health systemwide change to the armbands, but this work was conducted outside the INLP project. Ultimately, the team was successful at the regional level, and all armband fonts are now larger.

ed by the total number of doses to calculate the accuracy rate. The second measure was a sum of six safety processes intended to improve medication administration; this value (0–6) was then used in later analyses.

Results

Medication Doses

A total of 1,841 medication doses were observed on seven units in the six hospitals with comparable data: 604 at baseline, 623 at 6 months after baseline, and 614 at 18 months after baseline. The numbers of observations at each time period were evenly distributed across hospitals.

Medication Administration Accuracy

Five of the six hospitals showed improvement in medication administration accuracy (Table 2, page 609). Overall, accuracy improved from 85% of medication doses being correct at baseline to 92% at 6 months after the intervention and 96% at 18 months after the intervention. The differences between baseline and 6 months and between 6 months and 18 months for the total group were statistically significant ($p < .05$) and represent substantial clinical improvements.

Table 2. Medication Accuracy Rate

Hospital	Time	Doses Observed	Accuracy Rate (%)
1	Baseline	98	88.8
	6 months	97	91.8
	18 months	102	85.6
2	Baseline	102	89.2
	6 months	106	91.5
	18 months	100	98.0
3	Baseline	100	98.0
	6 months	100	100
	18 months	106	100
4	Baseline	104	81.7
	6 months	100	97.0
	18 months	100	100
5	Baseline	100	81.0
	6 months	99	89.9
	18 months	100	95.0
6	Baseline	100	74.0
	6 months	121	82.6
	18 months	106	96.2
Total	Baseline	604	85.4
	6 months	623	91.8
	18 months	614	95.8

Types of Medication Errors

In the course of the study, the prevalence of different types of medication errors changed (Table 3, page 610.) The most prevalent type of error at baseline, wrong technique, showed the largest decrease—from 41 errors at baseline to just 5 errors at 18 months. (Wrong technique would be represented by, for example, administering a medication with food that should be taken on an empty stomach or administering an injection straight that should have been Z track.) During the same period, the proportion of errors that were wrong-time errors increased from 38% to 61% of all errors, even as they decreased from 33 errors at baseline to 13 at 6 months and then increased slightly to 16 errors at 18 months. These results suggest that administering medications within the specified one-hour window continues to be a challenge. Other types of medication errors were less frequent throughout.

Adherence to the Six Safety Processes

Adherence to each of the six processes improved after the intervention, and for all but one process continued to improve from 6 months to 18 months after the intervention (Table 4, page 610.) At 18 months, the observed nurses followed five of the safety processes for more than 95% of the time. The exception was freedom from distractions and interruptions; however, the proportion of doses administered while the nurse was free from distractions and interruptions increased from 60% at baseline to 84% at 18 months. The observed nurses also showed substantial improvement in charting immediately after administration and in checking two patient IDs before administration. The sum of the six safety processes improved across the study period, from an average of 4.8 before the intervention to 5.6 after 6 months and 5.75 after 18 months. The differences between baseline and 6 months and between 6 months and 18 months were statistically significant at $p < .05$.

To further understand the effect of the safety processes on medication administration accuracy, we hypothesized that the differences in medication accuracy could be attributed to the increasing use of the six safety processes. To test this hypothesis we compared the results of an analysis of variance (ANOVA) with only time period as the predictor with an analysis of covariance (ANCOVA) that included the sum of processes as the covariate. Table 5 (page 611), Panel a, presents the ANOVA of medication accuracy by time period; Panel b presents an ANOVA with sum of processes as the outcome variable by time period; and Panel c presents the ANCOVA with medication accuracy as the outcome with time period as the predictive factor and sum of processes as the covariate. When the Sum of Processes was included in the analysis, the time variable was no longer significant. This supports the hypothesis that the improvement in accuracy was due to the increasing use of safety processes.

Discussion

In the project described in this article, we sought to understand how to apply known approaches to improve the reliability of medication administration using the INLP change framework. Medication administration accuracy rates improved after the INLP intervention and were sustained for 18 months. Data also showed that the safety processes used to ensure medication accuracy improved and, in fact, explained the improvement in accuracy rates. Wrong-time medication errors seemed the most intractable to change.

One key factor associated with the project's success was the upfront establishment of a clearly defined goal. Each hospital project team agreed to a 50% improvement in its medication administration accuracy rate, and each hospital achieved that goal within 6 months and maintained the improvement through the 18-month study period.

A second key factor was that while each hospital focused on improving its adherence to the six safety processes, each individual project team chose activities customized to its hospital to accomplish this. The most successful project teams understood

Table 3. Medication Administration Errors

Type of Error	Baseline	6 Months	18 months
Total Medication Doses in Error	88 (15% of doses)	51 (8% of doses)	26 (4% of doses)
Wrong Technique	41 (46% of errors*)	25 (49% of errors)	5 (19% of errors)
Wrong Time	33 (38%)	13 (25%)	16 (61%)
Wrong Dose	5 (6%)	1 (2%)	2 (8%)
Wrong route	5 (6%)	1 (2%)	0
Drug Not available	3 (3%)	5 (10%)	4 (15%)
Wrong form	3 (3%)	0	0
Extra dose	1 (1%)	3 (6%)	2 (8%)
Unauthorized Drug	0	2 (6%)	1 (4%)
Omission	0	2 (4%)	0

* Percentages add to > 100 because some doses had more than one error type.

Table 4. Safety Processes Observed During Administration*

	Proportion of Doses		
Activity	Baseline	6 Months	18 Months
Compares Medication to the MAR	98.7	98.9	99.5
Keeps Medication Labeled Throughout	89.0	97.2	99.2
Explained Drug to Patient (if applicable)	82.8	97.4	96.7
Charted Immediately After	75.8	96.7	99.0
Checks Two Patient IDs	70.8	95.4	96.1
Free of Distractions and Interruptions	60.2	76.8	84.4
Sum of Processes (0–6) Mean	4.8	5.62	5.75

* MAR, medication administration record; ID, identification.

that any change to medication administration would only endure if the change made sense to the frontline staff and improved each nurse's work flow.

Other, secondary improvements captured during the course of this project stemmed from the new knowledge gained. For example, one hospital's project team worked to "upstream" its QI efforts into medication dispensing (rather than only administration) by identifying safety processes for pharmacy. This team improved the process of updating the order set every night (for example, removing medications that should be discontinued on a certain date) so that the medications sent by pharmacy would be accurate on the basis of the updated order sets. These processes were not strictly captured in the project as funded by the grant.

Finally, hospital project teams seemed to benefit from access to an external support agent (that is, the senior consultant) to help drive change. Compared with hospital staff who have many competing priorities such as meeting accreditation and regulatory requirements and ensuring sufficient staffing, the senior consultants were readily available to help work through problems and roadblocks. In a survey of all INLP members (on a five-point Likert scale), 95% of the team members rated the senior consultants as either "extremely valuable" or "valuable."

The size of the improvement in medication error rates and sum of safety measures scores varied across the hospitals. Some of the difference can be explained by the hospitals' baseline performance; hospitals that began with high medication accuracy rates had a smaller opportunity for improvement than those hospitals that began with lower accuracy rates.

Notably, the approach of teams that achieved the best improvement in accuracy rates differed from that of the less successful teams. One of the characteristics of the teams with the best improvement was the higher frequency of team meetings, which enabled frequent and regular communication. Teams that were more successful were those that met regularly, typically at least once a week. Because of the small scale of each improvement cycle, meeting regularly helped teams to continuously advance during each segment of the process.

Table 5. Analysis of Variance Results*

	Sum of Square	*Df*	*F*	*P* Level
a. Medication Accuracy by Three Time Periods				
Between Groups	3.309	2	20.70	.000
Within Groups	146.903	1,838		
Total	150.212	1,840		
b. Sum of Safety Processes by Three Time Periods				
Between Groups	276.400	2	184.853	.000
Within Groups	1,301.609	1,741		
Total	1,578.009	1,743		
c. Medication Accuracy by Time Period with Safety Processes as Covariate				
Covariate	6.013	1	90.130	.000
Between Groups	0.187	2	1.398	.247
Within Groups	116.087	1,710		
Total	1,609.00	1,744		

* Df, degrees of freedom.

The successful teams followed specific, targeted small improvements on the basis of their data. Teams that stayed focused on the outcome goal (improving the reliability of medication administration) fared better than teams that got sidetracked by attempting to tackle issues one step removed from the medication process. Understanding where the project scope ends was a critical performance element for teams.

To address the sustainability of the program's changes after the official project ended, each team was required to develop a sustainability plan. The plan asked each team to detail three aspects of sustainability: (1) how the team was going to monitor progress (for example, what existing organizational infrastructure was already in place or needed to be developed), (2) specific actions each team planned to take or had taken to ensure the improvements had been built into the organizational infrastructure (for example, job descriptions, new roles, policies, councils), and (3) how the staff were going to interact with the organization's leaders to ensure that this work could continue. The plans were submitted to the INLP at time of program completion and again at 6 months and 12 months postprogram completion. Preliminary data suggest that the study hospitals have been successful in sustaining their improvements in medication administration accuracy on the pilot units and extending their improvements to an additional 57 units. (Data current as of September 2009 suggest that the aggregate improvement in medication accuracy on these 57 units was 63.2% from baseline.)

Implications

This study suggests that frontline nurses and other hospital-based staff, if given the training, resources, and authority, are well positioned to improve patient care and safety processes on hospital patient units. Frontline clinicians have the unique opportunity to see what is and is not working in the direct provision of patient care. By catching, correcting, and removing underlying causes of suboptimal care processes, frontline clinicians can contribute positively to patient safety and quality. Unfortunately, hospitals too often fail to actively involve staff nurses and other frontline clinicians in QI initiatives.

A critical component of the INLP intervention was the provision of focused training, including the development of professional self-development skills, team-based skills, organizational cultural skills, and process improvement skills, to frontline clinicians. INLP work to date suggests that many frontline nurses and clinicians lack the skills, initiative, and time to participate effectively in QI activities. To make significant progress on patient safety issues, this study suggests that hospitals need to invest in developing the skills of frontline clinicians.

Another key component of the INLP change framework was giving frontline nursing staff a leadership role in the QI project, from identifying problems to devising and testing solutions. In each case, hospital executives supported the nurse leaders, but the staff nurses and other frontline clinicians really drove the change.

Our research suggests that with training and support, nurses can be more than just critical in care delivery; they can be instrumental *leaders*, partnering with executive management to help design effective, lasting solutions to the institution's quality of care challenges. Additional research and studies are needed to help isolate the elements of clinician training and internal and external support that have the most impact on QI goals.

Beyond medication administration, we believe there is opportunity for the INLP change framework to help improve patient quality in any well-defined areas such as sepsis management, ventilator-associated pneumonia, and cardiac care for emergency department patients. Additional studies testing the INLP intervention and similar interventions will help advance our understanding of frontline clinicians and the role they can and should play in patient QI. J

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Online-Only Content

See the online version of this article for

Appendix 1. Integrated Nurse Leadership Program (INLP) Curriculum Syllabus

Appendix 2. Medication Observation Sheet

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Online-Only Content

Appendix 1. Integrated Nurse Leadership Program (INLP) Curriculum Syllabus*

Program Objectives: Frontline staff participate in an 18-month leadership training program, at the end of which they will be able to identify and solve any clinical or system problem in the hospital.

Module 1: 2-Day Off-Site Training
Overall Objective: Understand INLP program, the role of a leader, how to build and lead a team, how to plan and conduct a test of change, how to evaluate your progress and report out, and how to develop and actualize a vision statement.

Session 1: Introduction of Tools and Program
Session 2: Leadership and Understanding Your Personality Preferences (MBTI)
Session 3: Developing and Building Teams
Session 4: Content-Focused Technical Lecture
Session 5: Model for Improvement

Module 2: 1-Day Off-Site Training
Overall Objective: Gain insight into how to motivate and influence others, explore personal response to change, gain tangible skills in project management, understand various quality improvement (QI) approaches to problem solving, and understand how to manage and resolve conflict.

Session 1: Understanding and Using Data to Drive Improvement
Session 2: Program Expectations: Review
Session 3: Project Management 101
Session 4: Change Management
Session 5: Managing Conflict

Module 3: 1-Day Off-Site
Overall Objective: Engender greater buy-in and involvement from physicians, gain greater coordination between physicians and nurses, enforce shared mental model, learn new knowledge through peer review and sharing, gain tangible skills in process mapping.

Session 1: Technical Discussion and Data Review with Clinician Experts
Session 2: Developing and Motivating Others
Session 3: Process Mapping
Session 4: Strategic Communications

Module 4: 1-Day Off-Site
Overall Objectives: Gain greater understanding of strategic planning, build skills in strategic communications, expand knowledge of reliability science and cognition, develop strategies for spread.

Session 1: Deeper Dive: Reliability Science and Cognition
Session 2: Building Consensus: Using your SWOT and stakeholder analysis to develop alliances and partnerships
Session 3: Effective Communication

Module 5: 1-Day Off-Site
Overall Objectives: Gain buy-in from senior executives, strengthen team-centered work processes, develop mid-term goals

Session 1: Team Presentations with Executives
Session 2: Team-Based Work Centered on Goal Development via Structured Debriefing
Session 3: Mid-Range Goal Planning Based on Data and Developing Next Test of Change (TOC)

Module 6: 1-Day Off-Site
Overall Objectives: Learn about spreading and sustaining successes, strengthen Problem-recognition and problem-solving skills, learn how to manage ambiguity.

Session 1: Spread and Sustainability
Session 2: Learning Agility: Problem Solving and Dealing with Ambiguity
Session 3: Peer Sharing

Module 7: 1-Day Off-Site
Overall Objectives: Engender greater buy-in from "distracters and allies," develop stronger flow processes maps, gap analysis

Session 1: Develop Targeted Interventions for Those Stakeholders Who Will Help You Deploy Initiative
Session 2: Build Next Phase of Flow Process Mapping to Gain Greater Efficiencies from Micro-System
Session 3: Identify Current Standing, Compare to Goal, Conduct Gap Analysis with Targeted TOC to Close

Module 8: ½-Day Off-Site
Overall Objectives: Share results of the project with others.

* SWOT, strengths, weaknesses,opportunities, and threats.

Online-Only Content

Appendix 2. Medication Observation Sheet

Medication Administration Observation
Data Collection Meds Administered

Unit: _____ Patient Code Number _____ Date/Time: _____

Medical Patient ___ Surgical Patient ___

Nurse: RN ___ LPN ___

Dose Number	Drug, Dose, Route, Form, Date, Time	Administration Process (Y/N)	Accuracy (Complete after comparison to patient's orders)
[number consecutively for each patient]	[write in information]	__ 1.Compares med with med administration record __ 2.Distraction or interruption during preparation or administration __ 3. Med labeled throughout process from preparation to administration __ 4. Checks 2 forms of patient ID __ 5. Explains med to patient __ 6. Charts med immediately after administration	( ) Accurate ( ) Unauthorized Drug* ( ) Wrong Dose ( ) Wrong Form ( ) Wrong Route ( ) Wrong Technique** ( ) Extra Dose ( ) Omission ( ) Wrong Time ( ) Drug Not Available Mark at least one and all that apply

*Drug not ordered for this patient.

**Examples: improper crushing; drug to be given on empty stomach, given with food.