Health Professions Education

New Nurses' Views of Quality Improvement Education

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Health care providers have focused on quality at least as early as the 1860s, when Florence Nightingale proposed a standard format to present hospital statistics.[1] Quality improvement (QI) rose to the forefront of the public's attention with the Institute of Medicine (IOM)'s report *To Err Is Human*[2] in 2000 and was reinforced with the 2004 publication *Patient Safety: Achieving a New Standard for Care*.[3] The IOM established six quality aims for improvement in health care systems. The six aims state that health care should be safe, effective, patient-centered, timely, efficient, and equitable.[4] The role of registered nurses (RNs) in QI in hospitals is vital, because most hospital-based RNs provide direct care to patients. RNs' unique position as direct caregivers could have an important impact on reviewing and improving clinical practice for continuously improving patient care.[5–9]

Several nurse leaders propose that effective RN participation in QI efforts will require that RN education programs include the theory and methods of QI in their curricula.[10–13] Current efforts to improve QI education in nursing programs are led by the Quality and Safety Education for Nurses initiative (QSEN),[14] funded by the Robert Wood Johnson Foundation. The QSEN focus includes the development and dissemination of resources to assist faculty to teach QI.* Furthermore, this education should link QI to nursing practice. New nurses should enter the workforce prepared to participate in QI activities at a beginning level and should not depend on health care organizations to provide all the necessary experiences to develop these skills after graduation.[12] Similarly, others suggest that hospitals also should educate new RN employees about QI.[5,15] Although there is some evidence that RNs participate in QI projects (for example, data collection, reporting, addressing the problem, monitoring the outcome of care processes, using improved methods to design, using tools and interventions, and testing changes to continuously improve the quality and

Article-at-a-Glance

Background: Quality improvement (QI) is a focus of hospital managers and policymakers. The role of registered nurses (RNs) in QI in hospitals is vital because most hospital-based RNs provide direct care to patients. QI skills are necessary to identify gaps between current care and best practice and to design, implement, test, and evaluate changes and are essential for R.N.s to participate effectively in QI. Newly licensed registered nurses' (new nurses') positions as direct caregivers could have an impact on QI if nurses lack sufficient knowledge, concepts, and tools required for QI.

Methods: Data came from the 436 respondents (69.4% response rate) to a 2008 eight-page mailed survey to participants in a nationally representative panel survey of new nurses who graduated between August 1, 2004, and July 31, 2005.

Results: Overall, 159 (38.6%) of new nurses thought that they were "poorly" or "very poorly" prepared about or had "never heard of" QI. Their perceptions of preparation varied widely by the specific topic. Baccalaureate (B.S.) graduates reported significantly higher levels of preparation than associate degree (A.D.) graduates in evidence-based practice; assessing gaps in practice, teamwork, and collaboration; and many of the research-type skills such as data collection, analysis, measurement, and measuring resulting changes.

Discussion: Registered-nurse educational programs need to improve education about and application of QI concepts and to consider focusing QI content into a separate course to have some confidence that faculty will teach it. Despite the strong focus on QI in hospitals, new nurses do not see the connection between QI education and successfully performing their hospital jobs. Both nursing programs and hospitals should help new nurses make the connection.

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* The Web site http://www.QSEN.org is an excellent source of information about QI competencies and education for nurses.

safety of health care systems),[5] hospital quality managers report-ed that staff RNs were less likely than managers to receive for-mal training in QI and to use QI principles, methods, and tools in their daily work.[8]

In a literature review undertaken in 2008 before developing the survey and updated in 2009 and using search terms such as *quality improvement, nursing quality,* and *quality education* in MEDLINE and Cinahl and hand searching reference lists in articles, as summarized in the following section, we could not locate any systematic national studies about what RNs learn about QI in school or at their workplace—or any studies that connected education with changes in outcomes, such as decreased nosocomial infections or medication errors.

Literature Review

RNs often know that patient care quality and safety are inade-quate[16] but they lack the knowledge of how to transform their observations of problems into an effective improvement effort.[5] This failure to institute substantial changes to improve patient outcomes may be a result of RNs (particularly new graduates) lacking sufficient knowledge, concepts, skills, and tools required for QI.[1,5,17,18] RNs need skills such as (1) seeking infor-mation about outcomes of care and QI projects, (2) using tools such as flow charts, (3) participating in root cause analysis, (4) using quality measures to measure performance, and (5) using tools for understanding variation in practice. These skills are necessary to identify gaps between current care and best prac-tice and to design, implement, test, and evaluate changes. They are essential for RNs to participate effectively in QI.[12] Educational content should address using data for nursing care QI and reducing errors, collaborating with team-building skills to sustain QI,[10,12] and creating and maintaining organizational change. Hospital quality managers reported making wide use (75%) of the Plan-Do-Study-Act (PDSA) method in conjunc-tion with root cause analysis (which is often regarded as a com-ponent of PDSA), statistical process control (SPC) methods (25%), 90-day improvement cycles (14%), high-reliability methods (11%), Six Sigma methods (6%), and Toyota lean thinking techniques (6%) in their organization. Only 3% of these managers reported either not using or making minimal use of any of these QI methods.[8] Therefore, RNs might be expected to know the concepts and processes because of the rel-atively widespread use of the above methods. Similarly, pro-grams educating RNs might be expected to educate RNs about such concepts.

In contrast, new graduate RNs in a focus group led by the QSEN advisory board reported that they lacked learning expe-riences related to quality and safety competencies, including patient-centered care, teamwork and collaboration, evidence-based practice, QI, safety, and informatics.[17] Students did not believe their faculties had the expertise to teach some of the content. These student nurses lacked the language of common concepts related to safety science and QI methods. Many preli-censure nursing students graduated without ever communicat-ing a recommendation for a change in patient care to a physician.[17]

Evidence that education can increase the knowledge and awareness of staff RNs in relation to QI practices is apparent, but less information is available connecting this increase in knowledge with changes in practice.[19–21] The purpose of this study was to describe what newly licensed RNs (NLRNs) work-ing in hospitals report they learned about QI in their educa-tional programs. This article is intended to fill in this gap by reporting findings from a national sample of newly licensed registered nurses (new nurses).

Methods

SAMPLE

Data for this article came from participants in a panel survey of new nurses.[22] In 2008, we randomly selected a subset of the 2,386 participants who had responded to our Year 2 survey (response rate, 71%) and asked them about their QI education and participation. Participants in the panel survey are registered nurses who passed the National Council Licensure Examination (NCLEX) between August 1, 2004, and July 31, 2005. The panel sample was selected using a two-stage sample of RNs nested in 51 metropolitan areas (Bureau of the Census Designated areas) and 9 nonmetropolitan rural areas in 34 states* and the District of Columbia (DC). Details about the larger sample are described elsewhere.[22]

From those who responded to the Year 2 survey, we includ-ed only those who answered that they worked in hospitals. The sampling frame for the quality survey was restricted to hospital nurses because QI training at work may vary between hospitals and other settings. Accordingly, we limited the QI sample to those who worked in hospitals at Year 2. In the Year 2 survey, we had a skip pattern, in which RNs who were still in the same position at the same employer as at the time of the previous sur-vey did not have to answer a number of questions about their

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* Alabama, Arizona, California, Colorado, Connecticut, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Massachusetts, Maryland, Maine, Minnesota, Missouri, North Carolina, New Jersey, Nevada, New York, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Virginia, Washington, Wisconsin, West Virginia.

setting and position. After the first mailing for the Year 2 data collection was sent, we realized that "work hours," which was one of the skipped questions, might have changed. For RNs who had not yet responded to the survey, we changed the directions and asked that the new nurses answer all questions. However, 288 had already returned their survey following the skip pattern. Our sample thus underestimates responses from new nurses who had not changed jobs between the Year 1 and Year 2 data collection and who also responded to the first mailing of the Year 2 survey.

The sampling frame for the quality survey included the 1,694 RNs who worked in hospitals and who answered all questions in the Year 2 survey. From this group of 1,694, we randomly selected 730 RNs. We did not ask the entire 1,694 to participate because they are part of a larger study and we wanted to decrease their respondent burden. We also had financial constraints.

MEASURES

We defined QI as the "use [of] data to monitor the outcomes of care processes and use [of] improvement methods to design and test changes to continuously improve the quality and safety of health care systems."[23(p. 1)] Specific questions were developed for the survey by the research team and informed by the work of others[17,24,25] and reviewed by a five-member national expert advisory group.[22] Further, the survey was pilot tested on five hospital staff RNs. Changes were made on the basis of advisory group and staff RN comments.

DATA COLLECTION

We collected data using an eight-page mailed survey, Quality Improvement Survey: Part of the Newly Licensed Quality Improvement Survey (Appendix 1, available in online article). We sent multiple mailings to potential responders following the Dillman Tailored Design method.[26] These mailings were (1) an alert letter, (2) a letter and the survey, including a $5 incentive, (3) a reminder postcard, (4) a second letter and survey, and (5) a third letter and a survey via U.S. Postal Service next-day mail.

In addition to data collected by the QI mail survey, we included data that did not change over time, such as previous education leading to first nursing degree, that was available from the two earlier surveys of our panel survey. Those data were merged with the quality data to complete the analytic data set.

Results

PARTICIPANTS

Of the random sample of 730 RNs, 9 were undeliverable and we had no new address, 66 were not currently working in a hospital, 1 was excluded because he or she was educated outside of the United States, 4 refused to participate, and 165 did not return the surveys, leaving 460 completed surveys—resulting in a response rate of 69.4% (460/663). Of the 460 surveys, 3 were dropped because they were outliers (for example, they spent 800 or more hours per year in QI activities), and 4 were dropped because they worked in another country before receiving licensure in the United States, resulting in a sample of 453. Of those 453, 21 had either a diploma or master's degree for their first professional degree and were not included in the analyses, leaving an analytic sample of 436 to allow meaningful comparisons of associate degree (A.D.) graduates to baccalaureate (B.S.) graduates. There were no differences in age, type of first basic degree program, sex, and race between those who responded to the quality survey and those who had responded to the Year 2 survey.

DEMOGRAPHIC CHARACTERISTICS

The respondents were typical of new nurses.[22,27] As shown in Table 1 (page 32), respondents were primarily female (89.6%), white (84.3%), married (54.4%), and an average 33.9 years of age, with an A.D. (56.3%) as the first professional degree.

Responders were educated in either a baccalaureate or associate degree program; RNs with advanced basic degrees were excluded from the sample. These programs differ in length and in the content provided. In the remaining analyses, we show findings for graduates of both programs together and each program separately. As shown in Table 2 (page 33), most respondents work as full-time staff nurses, with the majority equally divided between those who work in ICU/step-down units and general/specialty medical-surgical units. A.D graduates were significantly more likely to have worked in the same job for 12 or more months than B.S. graduates. B.S. graduates were significantly more likely to work full-time than A.D. graduates. The letter in the last column of Table 2 indicates between which categories there is a significant difference.

PREPARATION AND USEFULNESS OF QI TOPICS FROM NURSING EDUCATION PROGRAM

All items in Table 3 (available in online article), with the exception of the first question, had the following stem, "How prepared or unprepared were you by your basic nursing in the following quality improvement topics?" Overall, 159 (38.6%) of new nurses thought they were "poorly" prepared, were "very poorly" prepared, or had "never heard of quality improvement." In contrast, most (413 [95.6%]) thought they were "very well"

Table 1. Respondents' Demographic Characteristics*			
Variable	**Response Options**	**n**	**%**
Age range in years	24–69	432	100
Mean + S.D.	33.86 ± 8.72		
Gender	1) Male	45	10.4
(n = 432)	2) Female	387	89.6
Ethnic background	1) White Non-Hispanic	361	84.3
(n = 428)	2) White Hispanic	9	2.1
	3) Black Non-Hispanic	18	4.2
	4) Black Hispanic	0	0.0
	5) Asian	20	4.6
	6) Other	20	4.6
English as the first language	1) Yes	400	92.6
(n = 432)	2) No	32	7.4
Marital status in 2005	1) Married	235	54.4
(n = 432)	2) Not married	197	45.6
First (basic) nursing degree leading to R.N. licensure	1) Associate	243	56.3
(n = 432)	2) Baccalaureate	189	43.8
Previous work experience[†]	1) One or more summer or occasional part-time jobs	154	35.6
(n = 432)	2) Another job not in health care	146	33.8
	3) Another job in health care	319	73.8
	4) None	10	2.3
Externship	1) Yes	149	34.5
(n = 430)	2) No	281	65.5

* S.D., standard deviation; R.N., registered nurse.
[†] Respondents could choose more than one option.

or "reasonably well" prepared to prevent nosocomial infections. Only 99 (23.3%) indicated that QI training for their jobs was "very helpful."

The new nurses' quality preparation varied dramatically by the specific topic, as shown in Table 3. While a majority thought they were "very prepared" in patient-centered care, 150 (34.9%) thought they were "not at all prepared" for using error reporting systems for near miss and error reporting and 130 (30.3%) for using appropriate information technology. When asked about specific QI techniques such as root cause analysis or participating in analyzing errors, almost 50% (207) thought they were "not at all prepared." Similarly, 179 (41.7%) thought they were "not at all prepared" to use national patient safety resources.

Table 3 also shows the comparison of academic QI training between associate degree and baccalaureate degree graduates. Baccalaureate graduates reported significantly higher levels of preparation than associate degree graduates in evidence-based practice, assessing gaps in practice, and many of the research-type skills such as data collection, analysis, and measurement. Baccalaureate graduates also reported significantly higher levels of preparation than associate degree graduates in "team work and collaboration" and "measuring resulting changes." There were no differences by program type on how well prepared the

new nurses thought they were on nosocomial infections prevention, restraints and seclusion, hazards to patients and/or family, and using national patient safety resources, among others.

PARTICIPATION IN QI WORK IN THE PAST 12 MONTHS

In addition to questions about training in their academic programs, we asked new nurses about their participation in QI activities at work during the 12 months preceding data collection. Items in Table 4 (available in online article) had the following stem: "During the last 12 months how often have you personally . . ..." The new nurses did not perceive that they were participants in QI, with no differences by education. More than 29% (143) "identified good care from scientific evidence" one or fewer times per month, and 120 (28.1%) never "assessed gaps in current practice." Similarly, 198 (46.2%) never "participated in QI processes such as root cause analysis," and 173 (40.6%) never "measured resulting changes" from QI processes. There was some evidence that patient safety initiatives existed in the hospitals in which they worked, with 83.1% saying that they were able to report errors or other quality of care issues anonymously (not shown).

Discussion

Nursing educators may think that they are preparing nursing

		Associate		Baccalaureate		
Variable	**Response Options**	***n***	**%**	***n***	**%**	***p* Value**
Previous job in the past 12 months (*n* = 430)	1) Worked in a different hospital or hospital system	14	5.8	24	12.8	.020
	2) Worked in a nonhospital setting or system	2	0.8	0	0.0	C
	3) Worked 12 or more months in the current job	226	93.4	164	87.2	
Unit spent most of the working time (*n* = 423)	1) Intensive care bed unit	41	17.3	48	25.8	
	2) Step-down, traditional bed unit	28	11.8	14	7.5	
	3) General/specialty unit	72	30.4	51	27.4	
	4) Operating room	18	7.6	5	2.7	.082
	5) Postanesthesia recovery	2	0.8	2	1.1	
	6) Labor/delivery room	12	5.1	18	9.7	
	7) Other	64	26.9	76	25.9	
Job title (*n* = 426)	1) Staff or general duty nurse	207	85.9	160	86.5	
	2) Head nurse or assistant head nurse	24	10.0	18	9.7	
	3) Nurse practitioner/midwife	0	0.0	1	0.5	.663
	4) Clinical nurse specialist	0	0.0	1	0.5	
	5) Researcher	2	0.8	1	0.5	
	6) Other	8	3.3	4	2.2	
Work full time or part time (*n* = 432)	1) Full time	183	75.3	163	86.2	.005
	2) Part time	60	24.7	26	13.8	
Able to report errors (*n* = 427)	1) Yes	202	84.2	153	81.8	.520
	2) No	38	15.8	34	18.2	
Ever been disciplined (*n* = 430)	1) Under review	1	0.4	0	0.0	.378
	2) No	241	99.6	188	100	

Table 2. Work Setting Characteristics*

* C: Category 2 is different than category 3.

students with needed education in QI, but the results of this nationally representative study indicate otherwise. New nurses thought that they were poorly prepared or had "never heard of QI." These findings contrast with the expectations of accreditation organizations and government recommendations about QI education. The IOM[28] noted that nurses (along with other health professionals) are not adequately prepared to provide the highest quality of care. The *Commission on Collegiate Nursing Education (CCNE)* identifies "Basic Organizational and Systems Leadership for Quality Care and Patient Safety" and "Scholarship for Evidence-Based Practice" content as essentials for baccalaureate graduates.[29(p. 3)] In particular, one of the required outcomes is that graduates "demonstrate an understanding of the basic elements of the research process and models for applying evidence to clinical practice,"[29(p. 16)] and another is to "demonstrate leadership and communication skills to effectively implement patient safety and quality improvement initiatives within the context of the interprofessional team."[29(p. 14)] Similarly, the National League for Nursing Accreditation Commission, which accredits associate degree programs, has as a standard (4.8.1) related to curriculum that states, "Student clinical experiences reflect current best practices and nationally established patient health and safety goals."[30(p. 4)] There are similar calls for quality and safety education from leaders.[17] Further, the QSEN initiative identified competency definitions and the knowledge, skills, and attitudes related to the competencies.[31] It is likely that many graduates of nursing programs would not be able to demonstrate competency for these standards. Education programs need to be challenged to do more. These programs should follow up and assess the actual performance of their graduates, measure change, and specifically address the deficiencies. As the accrediting groups recognize, improving the quality of patient care requires that new nurses be academically prepared to work in organizations that have improving QI as a goal and to work with others in the organization to improve patient care.

Results show that the nurses do not perceive training from employers as helpful, indicating that employer training efforts require additional study. Only about 23% of respondents found the training helpful for their jobs. Although there is a strong focus on QI in hospitals,[32] new nurses do not see the connection between QI education in their nursing programs and successfully performing their hospital jobs. One possible explanation is that these new nurses continue to focus on providing care to the patients for whom they are responsible and do not see themselves as having any responsibility for improv-

ing the care delivery systems at the unit or higher level that may help them provide higher-quality care in the future. As an illustration, a new nurse may have as a goal learning how to do efficient sterile dressings changes but not be worried about increasing nosocomial infection rates on her or his unit. Similarly, the new nurse may focus on obtaining the supplies that he or she needs for patients during a shift and may not be concerned that on Mondays and Tuesdays there are usually insufficient supplies on the unit for all the patients. On the basis of these results, nurse educators and hospitals should partner to implement QI education. For example, they could jointly introduce students to QI methods that hospitals actually use and could require specific QI projects as part of nurses' portfolios for graduation.

Of the several educational differences between baccalaureate and associate degree graduates, the most important was that baccalaureate graduates were more likely to have had preparation on evidence-based practice, including assessing gaps in current practice, than associate degree graduates. For organizations that have QI as a priority, hiring baccalaureate graduates rather than associate degree graduates may be more likely to move the organization toward improving quality.

LIMITATIONS

This survey did not assess actual knowledge about QI but rather asked what new nurses thought they had been taught. There is some evidence that QI education is related to improvement in knowledge for physicians.[33] The new nurses were asked to describe events about three years in the past. Memories of what happened at that distance can be influenced by events occurring during those three years. Although response bias is always a concern when there are nonresponders, the nonresponders were not systematically different from other new nurses on demographic characteristics. We did not include diploma and master's or higher degree respondents, so that findings can be generalized only to associate degree and baccalaureate graduates.

IMPLICATIONS

Educational programs may need to focus QI content into a separate course to have some confidence that faculty will teach this content. There is some reported success separating out the content.[34] Strategies need to be evaluated and results disseminated so that nursing programs can learn what does and does not work. As part of the QESN initiative, investigators received responses from 195 nursing schools (31% response rate), the majority of whom said that they included content related to QI. Fewer than 18% had a dedicated course about QI.[23] Slightly more than 50% of responders thought that their faculties were expert/very comfortable teaching evidence-based-practice. Responders from baccalaureate programs were more likely to rate faculty more expert/very comfortable than responders from associate degree programs. However, evidence-based practice is not the same as using QI techniques to improve practice. This finding suggests that for those nursing programs that integrate QI content into clinical and other courses, almost 50% of those teaching these courses may be less than "very comfortable" teaching QI content. It is also possible that faculty have not received adequate training in implementing practice changes, in part because many do not actively practice nursing in hospitals. On the basis of that survey and the findings from the current study, it is clear that nursing programs have much room for progress. Physician educators have similar deficiencies.[33]

There are some examples of successful educational innovations in undergraduate nursing programs. In one program, QI concepts were successfully integrated into a community health course.[35] In another example, New York University's College of Nursing is educating all full-time nursing faculty about evidence-based practice so that they in turn can teach it to students at all levels (baccalaureate, master's, and doctoral). The program is in its third year.

The fact that, despite the great concern about QI among hospitals, new nurses did not report involvement in QI contrasts with findings from a survey about hospital QI activities, to which 470 (11%) hospitals of 4,237 that were sent surveys in 2006 responded. Responses indicated that overall 64% of nurses were actively or very actively involved in QI training and that 42% used QI in their daily work.[8,15] We could locate no consensus by hospitals regarding when new nurses should have an active role in QI activities. Some might argue that new nurses must first become comfortable providing direct patient care. On the other hand, if new nurses are part of the QI process as early as the orientation program and during their work with preceptors, they may incorporate QI into their practice and serve as important links in the process. There has been some success by hospitals in teaching nurses about QI,[36] but the process of role modeling and implementing QI is less clear.

Conclusion

Although a substantial amount of work has been done to improve QI education since the respondents to this survey graduated, there remains much to do. Nursing educators and the nursing program accreditors, employers, government, and philanthropy should make QI education their highest priority. **J**

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Online-Only Content

See the online version of this article for

Table 3. Preparation and Usefulness of Quality Improvement Topics from Nursing Education Program

Table 4. Participation in Quality Improvement at Work During the Past 12 Months

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Table 3. Preparation and Usefulness of Quality Improvement Topics from Nursing Education Program*							
		Total		Associates		Baccalaureate	
Variable	Response Options	n	%	n	%	n	%	P Value†
How well or poorly did your basic nursing education program prepare you to use quality improvement processes to improve the quality of care in your job? (n = 413)	1) Very well	35	8.5	23	10.1	12	6.5	.632
	2) Reasonably well	219	53.0	123	53.9	96	51.9	
	3) Poorly	82	19.9	43	18.9	39	21.1	
	4) Very poorly	25	6.1	13	5.7	12	6.5	
	5) I have never heard of quality improvement	52	12.6	26	11.4	26	14.1	
How prepared or unprepared were you by your basic nursing program in the following quality improvement topics?								
Patient-centered care (n = 429)	1) Not at all prepared	10	2.3	8	3.3	2	1.1	.241
	2) Somewhat prepared	180	42.0	103	42.9	77	40.7	
	3) Very prepared	239	55.7	129	53.8	110	58.2	
Team work and collaboration (n = 423)	1) Not at all prepared	18	4.2	15	6.3	3	1.6	.016 B
	2) Somewhat prepared	225	52.7	132	55.0	93	49.7	
	3) Very prepared	184	43.1	93	38.8	91	48.7	
Evidence-based practice (n = 3)	1) Not at all prepared	33	7.8	27	11.4	6	3.2	.000 C
	2) Somewhat prepared	175	41.4	113	47.9	62	33.2	
	3) Very prepared	215	50.8	96	40.7	119	63.3	
Safety (n = 422)	1) Not at all prepared	9	2.1	7	3.0	2	1.1	.410
	2) Somewhat prepared	124	29.4	69	29.2	55	29.6	
	3) Very prepared	289	68.5	160	67.8	129	69.4	
Restraint and seclusion (n = 427)	1) Not at all prepared	68	15.9	40	16.6	28	15.1	.911
	2) Somewhat prepared	227	53.2	127	52.7	100	53.8	
	3) Very prepared	132	30.9	74	30.7	58	31.2	
Infection control (n = 27)	1) Not at all prepared	12	2.8	7	2.9	5	2.7	.571
	2) Somewhat prepared	183	42.9	108	45.0	75	40.1	
	3) Very prepared	232	54.3	125	52.1	107	57.2	
Pain management (n = 429)	1) Not at all prepared	17	4.0	10	4.1	7	3.7	.845
	2) Somewhat prepared	211	49.2	121	50.2	90	47.9	
	3) Very prepared	201	46.9	110	45.6	91	48.4	
Using appropriate information technology or strategies to reduce reliance on memory (n = 429)	1) Not at all prepared	130	30.3	64	26.7	66	34.9	.054
	2) Somewhat prepared	214	49.9	132	55.0	82	43.4	
	3) Very prepared	85	19.8	44	18.3	41	21.7	
Hazards to patients and/or families (n = 427)	1) Not at all prepared	55	12.9	33	13.8	22	11.8	.759
	2) Somewhat prepared	255	59.7	140	58.3	115	61.5	
	3) Very prepared	117	27.4	67	27.9	50	26.7	
Hazards to colleagues (team) (n = 427)	1) Not at all prepared	72	16.9	40	16.6	32	17.2	.623
	2) Somewhat prepared	244	57.1	134	55.6	110	59.1	
	3) Very prepared	111	26.0	67	27.8	44	23.7	
Using organizational error-reporting systems for near miss and error reporting (n = 430)	1) Not at all prepared	150	34.9	80	33.2	70	37.0	.707
	2) Somewhat prepared	217	50.5	125	51.9	92	48.7	
	3) Very prepared	63	14.7	36	14.9	27	14.3	
Participating in analyzing errors and designing system improvements (n = 430)	1) Not at all prepared	214	49.8	118	49.0	96	50.8	.907
	2) Somewhat prepared	175	40.7	99	41.1	76	40.2	
	3) Very prepared	41	9.5	24	10.0	17	9.0	

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Table 3. Preparation and Usefulness of Quality Improvement Topics from Nursing Education Program (continued)*

Variable	Response Options	Total		Associates		Baccalaureate		P Value†
		n	%	n	%	n	%	
Using national patient safety resources, initiatives, or regulations for professional development (n = 429)	1) Not at all prepared	179	41.7	106	44.0	73	38.8	.444
	2) Somewhat prepared	194	45.2	107	44.4	87	46.3	
	3) Very prepared	56	13.1	28	11.6	28	14.9	
Using national patient safety resources, initiatives, or regulations in local care settings (n = 428)	1) Not at all prepared	147	34.3	88	36.5	59	31.6	.484
	2) Somewhat prepared	215	50.2	119	49.4	96	51.3	
	3) Very prepared	66	15.4	34	14.1	32	17.1	
Engaging in root cause analysis when errors or near misses occur (n = 429)	1) Not at all prepared	207	48.3	118	49.0	89	47.3	.872
	2) Somewhat prepared	171	39.9	96	39.8	75	39.9	
	3) Very prepared	51	11.9	27	11.2	24	12.8	
Using QI model: FADE (n = 425)	1) Not at all prepared	285	67.1	158	66.4	127	67.9	.923
	2) Somewhat prepared	104	24.5	60	25.2	44	23.5	
	3) Very prepared	36	8.5	20	8.4	16	8.6	
Using QI model: PDSA (n = 422)	1) Not at all prepared	263	62.3	155	65.7	108	58.1	.232
	2) Somewhat prepared	119	28.2	59	25.0	60	32.3	
	3) Very prepared	40	9.5	22	9.3	18	9.7	
Using QI model: Six-Sigma-DMAIC/DMADV (n = 421)	1) Not at all prepared	313	74.3	179	75.5	134	72.8	.631
	2) Somewhat prepared	83	19.7	43	18.1	40	21.7	
	3) Very prepared	25	5.9	15	6.3	10	5.4	
Using QI model: CQI (n = 420)	1) Not at all prepared	243	57.9	137	57.8	106	57.9	.685
	2) Somewhat prepared	137	23.6	75	31.6	62	33.9	
	3) Very prepared	40	9.5	25	10.5	15	8.2	
Using QI model: TQM (n = 416)	1) Not at all prepared	306	73.6	174	74.7	132	72.1	.619
	2) Somewhat prepared	87	20.9	45	19.3	42	23.0	
	3) Very prepared	23	5.5	14	6.0	9	4.9	
Data collection (n = 427)	1) Not at all prepared	107	25.1	83	34.6	24	12.8	.000 B
	2) Somewhat prepared	226	52.9	108	45.0	118	63.1	
	3) Very prepared	94	22.0	49	20.4	45	24.1	
Data analysis (n = 427)	1) Not at all prepared	116	27.2	90	37.5	26	13.9	.000 A,B
	2) Somewhat prepared	227	53.2	109	45.4	118	63.1	
	3) Very prepared	84	19.7	41	17.1	43	23.0	
Measurement (n = 427)	1) Not at all prepared	116	27.2	85	35.4	31	16.6	.000 B
	2) Somewhat prepared	227	53.2	114	47.5	113	60.4	
	3) Very prepared	84	19.7	41	17.1	43	23.0	
Project implementation (n = 423)	1) Not at all prepared	156	36.9	110	46.2	46	24.9	.000 B
	2) Somewhat prepared	195	46.1	97	40.8	98	53.0	
	3) Very prepared	72	17.0	31	13.0	41	22.2	
Use of QI data analysis or project monitoring tools	1) Not at all prepared	208	48.9	139	58.2	69	37.1	.000 B
	2) Somewhat prepared	170	40.0	80	33.5	90	48.4	
	3) Very prepared	47	11.1	20	8.4	27	14.5	
Flowcharting process (n = 426)	1) Not at all prepared	137	32.2	84	35.1	53	28.3	.303
	2) Somewhat prepared	219	51.4	116	48.5	103	55.1	
	3) Very prepared	70	16.4	39	16.3	31	16.6	

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Table 3. Preparation and Usefulness of Quality Improvement Topics from Nursing Education Program (continued)*							
		Total		**Associates**		**Baccalaureate**	
Variable	**RESPONSE OPTIONS**	*n*	%	*n*	%	*n*	%	*P* Value†
Measure current performance (*n* = 426)	1) Not at all prepared	151	35.4	95	39.6	56	30.1	.113
	2) Somewhat prepared	211	49.5	113	47.1	98	52.7	
	3) Very prepared	64	15.0	32	13.3	32	17.2	
Assess gaps in current practice (*n* = 427)	1) Not at all prepared	182	42.6	118	49.2	64	34.2	.007 B
	2) Somewhat prepared	199	46.6	101	42.1	98	52.4	
	3) Very prepared	46	10.8	21	8.8	25	13.4	
Systematically apply tools and methods to improve performance (*n* = 427)	1) Not at all prepared	160	37.5	103	42.9	57	30.5	.022 B
	2) Somewhat prepared	199	46.6	105	43.8	94	50.3	
	3) Very prepared	68	15.9	32	13.3	36	19.3	
Measure resulting changes (*n* = 426)	1) Not at all prepared	178	41.8	112	46.7	66	35.5	.017
	2) Somewhat prepared	191	44.8	104	43.3	87	46.8	
	3) Very prepared	57	13.4	24	10.0	33	17.7	
Repeat steps: measure current performance to measure resulting changes until desired performance is achieved (*n* = 425)	1) Not at all prepared	217	51.1	130	54.4	87	46.8	.089 B
	2) Somewhat prepared	163	38.4	90	37.7	73	39.2	
	3) Very prepared	45	10.6	19	7.9	26	14.0	
Monitor sustainability (*n* = 425)	1) Not at all prepared	221	52.0	139	58.2	82	44.1	.014 B
	2) Somewhat prepared	162	38.1	81	33.9	81	43.5	
	3) Very prepared	42	9.9	19	7.9	23	12.4	
Well or poorly basic program prepared to prevent nosocomial infections (*n* = 432)	1) Very well	182	42.1	102	42.0	80	42.3	.691
	2) Reasonably well	231	53.5	130	53.5	101	53.4	
	3) Poorly	18	4.2	11	4.5	7	3.7	
	4) Very poorly	1	0.2	0	0.0	1	0.5	
Training that you have had in quality improvement is helpful or unhelpful to do your job (*n* = 425)	1) Have not had training	96	22.6	54	22.5	42	22.7	.335
	2) Very helpful	99	23.3	55	22.9	44	23.8	
	3) Somewhat helpful	183	43.1	109	45.4	74	40.0	
	4) Not very helpful	47	11.0	22	9.2	25	13.5	

* QI, quality improvement; FADE, Focus, Analyze, Develop, Execute, and Evaluate, PDSA, plan, do, study, act; Six-Sigma-DMAIC/DMADV, Sigma-Define, Measure, Analyze, Improve, Control/Define, Measure, Analyze, Design, Verify; CQI, continuous quality Improvement; TQM, total quality management.

† A: Category 1 is different than category 2; B: Category 1 is different than category 3; C: Category 2 is different than category 3.

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Table 4. Participation in Quality Improvement at Work During the Past 12 Months							
		Total		Associates		Baccalaureate	
Variable	**RESPONSE OPTIONS**	***n***	**%**	***n***	**%**	***n***	**%**	**P Value**
During the last 12 months, how often have you personally . . .								
Identified good care	1) Never	97	18.5	49	20.3	30	16.0	
from scientific evidence	2) Once	46	10.7	20	8.3	26	13.9	
(*n* = 428)	3) More than one time, but less							.300
	than once a month	119	27.8	64	26.6	55	29.4	
	4) Once per month	76	17.8	45	18.7	31	16.6	
	5) More than once per month	108	25.2	63	26.1	45	24.1	
Measured current performance	1) Never	99	23.2	55	22.9	44	23.5	
(*n* = 427)	2) Once	60	14.1	35	14.6	25	13.4	
	3) More than one time, but less							.827
	than once a month	99	23.2	51	21.3	48	25.7	
	4) Once per month	70	16.4	42	17.5	28	15.0	
	5) More than once per month	99	23.2	57	23.8	42	22.5	
Assessed gaps in	1) Never	120	28.1	67	27.8	53	28.5	
current practice	2) Once	58	13.6	37	15.4	21	11.3	
(*n* = 427)	3) More than one time, but less							.595
	than once a month	94	22.0	56	23.2	38	20.4	
	4) Once per month	74	17.3	39	16.2	35	18.8	
	5) More than once per month	81	19.0	42	17.4	39	21.0	
Systematically applied tools	1) Never	107	25.2	64	26.7	43	23.4	
and methods to improve	2) Once	44	10.4	22	9.2	22	12.0	
performance	3) More than one time, but less							.353
(*n* = 424)	than once a month	103	24.3	59	24.6	44	23.9	
	4) Once per month	80	18.9	39	16.3	41	22.3	
	5) More than once per month	90	21.2	56	23.3	34	18.5	
Repeated these steps:	1) Never	165	38.8	94	38.3	71	38.2	
identified good care from	2) Once	33	7.8	15	6.3	18	9.7	
scientific evidence and	3) More than one time, but less							.445
systematically applied tools	than once a month	94	22.1	55	23.0	39	21.0	
and methods to improve	4) Once per month	62	14.6	31	13.0	31	16.7	
performance until desired	5) More than once per month	71	16.7	44	18.4	27	14.5	
performance is achieved								
(*n* = 425)								
Measured resulting changes	1) Never	173	40.6	98	40.8	75	40.3	
(*n* = 426)	2) Once	49	11.5	26	10.8	23	12.4	
	3) More than one time, but less							.933
	than once a month	87	20.4	47	19.6	40	21.5	
	4) Once per month	63	14.8	38	15.8	25	13.4	
	5) More than once per month	54	12.7	31	12.9	23	12.4	
Monitored sustainability	1) Never	198	46.6	108	45.4	90	48.1	
(*n* = 425)	2) Once	48	11.3	26	10.9	22	11.8	
	3) More than one time, but less							.851
	than once a month	76	17.9	43	18.1	33	17.6	
	4) Once per month	59	13.9	37	15.5	22	11.8	
	5) More than once per month	44	10.4	24	10.1	20	10.7	
Participated in quality	1) Never	198	46.2	117	48.3	81	43.3	
improvement processes such	2) Once	65	15.2	29	12.0	36	19.3	
as root cause analysis	3) More than one time, but less							.276
(*n* = 429)	than once a month	80	18.6	45	18.6	35	18.7	
	4) Once per month	46	10.7	29	12.0	17	9.1	
	5) More than once per month	40	9.3	22	9.1	18	9.6	

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		Total		Associates		Baccalaureate		
Variable	**Response Options**	**n**	**%**	**n**	**%**	**n**	**%**	**P Value**
Worked in a team to improve processes or system of care as a result of errors that were reported back to your unit (n = 427)	1) Never	142	33.3	81	33.8	61	32.6	.392
	2) Once	67	15.7	31	12.9	36	19.3	
	3) More than one time, but less than once a month	82	19.2	45	18.8	37	19.8	
	4) Once per month	68	15.9	41	17.1	27	14.4	
	5) More than once per month	68	15.9	42	17.5	26	13.9	
Involved in a specific clinical effort to improve a system or pattern of patient care on your unit (n = 431)	1) Never	104	24.1	65	26.9	39	20.6	.425
	2) Once	58	13.5	32	13.2	26	13.8	
	3) More than one time, but less than once a month	130	30.2	68	28.1	62	32.8	
	4) Once per month	62	14.4	31	12.8	31	16.4	
	5) More than once per month	77	17.9	46	19.0	31	16.4	
How often have you participated in any of the following to reduce nosocomial infection in your unit?								
Using appropriate strategies to improve hand washing compliance across all clinical professionals who care for patients (n = 432)	1) Never	25	5.8	11	4.5	14	7.4	.342
	2) Rarely	18	4.2	12	4.9	6	3.2	
	3) Sometimes	40	9.3	27	11.1	13	6.9	
	4) Most of the time	127	29.4	70	28.8	57	30.2	
	5) Always	222	51.4	123	50.6	99	52.4	
Communicating concerns about the risk of spreading antibiotic-resistant bacteria (n = 432)	1) Never	35	8.1	19	7.8	16	8.5	.975
	2) Rarely	36	8.3	20	8.2	16	8.5	
	3) Sometimes	105	24.3	61	25.1	44	23.3	
	4) Most of the time	120	27.8	65	26.7	55	29.1	
	5) Always	136	31.5	78	32.1	58	30.7	
Participating in analyzing nosocomial infection rates (n = 430)	1) Never	212	49.3	124	51.2	88	46.8	.488
	2) Rarely	80	18.6	39	16.1	41	21.8	
	3) Sometimes	56	13.0	35	14.5	21	11.2	
	4) Most of the time	42	9.8	22	9.1	20	10.6	
	5) Always	40	9.3	22	9.1	18	9.6	
Developing strategies to prevent and control nosocomial infections (n = 432)	1) Never	163	37.7	98	40.3	65	34.4	.429
	2) Rarely	77	17.8	38	15.6	39	20.6	
	3) Sometimes	82	19.0	48	19.8	34	18.0	
	4) Most of the time	57	13.2	33	13.6	24	12.7	
	5) Always	53	12.3	26	10.7	27	14.3	
Are you currently involved in quality improvement process? (n = 411)	1) No	299	72.7	169	73.8	130	71.4	.592
	2) Yes	112	27.3	60	26.2	52	28.6	
Are you rewarded for your contributions to your hospital's performance on quality improvement? (n = 112)	1) No	69	61.6	37	61.7	32	61.5	.989
	2) Yes	43	38.4	23	38.3	20	38.5	

Table 4. Participation in Quality Improvement at Work during the Past 12 Months (continued)