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Incorporating a Patient Safety and Quality Course Into the Nursing Curriculum: An Assessment of Student Gains

Fasih Ali Ahmed, MD, *† Roha Ahmad Choudhary, MBBS, ‡ Hamza Khan, MD, ‡ Farwa Ayub, MD, †
 Syed Sabih ul Hassan, MBBS, † Tahir Munir, MPhil, § Fozia Asif, MBBS, MBA, MHQS, †
 Khairunnissa Ajani, RN, PhD, || Mehtab Jaffer, MScN, || Zahra Tharani, MScN, ||
 Hanan J. Aboumatar, MD, MPH, ¶ Adil Haider, MD, MPH, ** and Asad Latif, MD, MPH §¶

Background: Training nursing students on quality and patient safety (PS) is crucial to ensuring safe healthcare practices given the key role nurses play on the healthcare team. The aim of this study was to evaluate the impact of quality and PS course on the knowledge, and system thinking of students at different stages of the undergraduate nursing course.

Methods: A 4.5-day quality improvement and PS course was conducted at the Aga Khan University School of Nursing and Midwifery for 146 second- and 139 fourth-year students. Students' knowledge, self-assessment of knowledge and skills, and system thinking were assessed using pretest and posttest.

Results: Of the total of 20 points, the course significantly improved students' knowledge by a mean of 4.91 points for second-year students (95% confidence interval [CI], 4.32–5.51) and 3.46 points for fourth-year students (95% CI, 2.90–4.02) between pretest and posttest. For systems thinking, the Systems Thinking Scale scores increased by 0.41 points (95% CI, 0.29–0.52) for second-year students and 0.33 points (95% CI, 0.22–0.44) for fourth-year students out of the total of 5 points. The self-assessment scores significantly increased on postcourse assessment for second ($P < 0.05$) and fourth-year students ($P < 0.001$). Positive experience reported by students in the narrative reflections complemented these results.

Conclusions: There was a significant increase in nursing students' knowledge, self-efficacy, and system thinking after participating in this short PS course. Replication at a national level may improve safety knowledge and skills among nursing students with subsequent gains in the safety of healthcare delivery in Pakistan.

Key Words: patient safety, quality improvement, healthcare education, nursing school curriculum, student assessment, low- and middle-income country

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Patient safety (PS) is one of the most important tenets of clinical care and a significant global concern. Deficiencies in safety

have increasingly been recognized as a preventable and common source of harm to patients.¹ Errors in clinical care are multifactorial and are often the result of system, technology, administration, and individual factors.² According to the Global Burden of Disease Study, the global average incidence of adverse events in the year 2017 was approximately 439 per 100,000 population with an increase of approximately 42% from 1990 to 2017.³ Based on various estimates, the number of deaths due to adverse events in a year approximate up to 400,000 in the United States alone, along with an economic impact of up to \$29 billion.^{4–6} These numbers emphasize the need for developing a plan to tackle these issues by integrating PS education in healthcare curricula across the board.^{7,8}

While healthcare systems often focus on identifying errors and potential sources of errors to improve PS, it is also essential to ensure that future healthcare professionals are well educated on error prevention and minimization.⁹ This approach allows students to develop critical skills needed to identify problems, solve them, and enable them to participate in improving clinical care. Several studies report that according to students' perceptions, the focus of the PS curricula is more on theoretical aspects rather than practical.^{10,11} As a result, they felt less knowledgeable and unconfident to deal with adverse events during their interactions with patients, as students and junior nurses.^{10,11} These highlight the potential benefits that can be achieved by interventions such as formal PS courses for nursing students, especially in low- and middle-income countries (LMICs), which bear the biggest brunt of medical errors.

Patient safety education for all members of the healthcare workforce has been recognized by various healthcare authorities and educational material has been developed to provide guidance for PS curricula. The World Health Organization published a "Patient Safety Curriculum Guide—Multi-professional Edition," which highlights the importance of integrating safety in healthcare professional education, including doctors, nurses, and paramedics.¹² Nurses are considered to play the most important role in ensuring safety and error prevention by virtue of their direct role in delivery of care and having the largest numbers in the healthcare workforce.^{13,14} However, most undergraduate nursing programs especially in LMICs like Pakistan fail to bridge the theory-practice gap, the discrepancy between the taught content and its implementation in the actual clinical settings.¹⁵ Low- and middle-income countries have been reported to have a disproportionate burden of adverse events (two-thirds) with one study done across 26 LMICs, showing that 83% of events, which compromised PS, were preventable.¹⁶ A lack of formal PS teaching means that most nurses learn to tackle these issues by dealing with them on a day-to-day basis once they start clinical practice.¹⁷

The Agency for Healthcare Research and Quality supports that nurses must be trained to identify and report PS related issues to improve clinical outcomes.¹⁸ This includes knowledge and skills toward adverse drug events, catheter-associated urinary tract infections, central line-associated bloodstream infections, practicing

From the *Division of Surgical Oncology, University Hospitals Cleveland Medical Center, Cleveland, Ohio; †Centre for Patient Safety, and ‡Dean's Clinical Research Fellow, Aga Khan University Medical College; §Department of Anaesthesiology, Aga Khan University Medical College; ||Aga Khan University School of Nursing and Midwifery, Karachi, Pakistan; ¶Armstrong Institute for Patient Safety and Quality, Johns Hopkins Medicine, Baltimore, Maryland; and **Medical College, Aga Khan University, Karachi, Pakistan
 Correspondence: Asad Latif, MD, MPH, Department of Anaesthesiology, Aga Khan University Medical College, Stadium Rd, P.O. Box 3500, Karachi 74800, Pakistan (e-mail: asad.latif@aku.edu).

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infection-control standard precautions, injuries associated from falls and immobility, hospital-acquired pressure ulcers, preventable readmissions/bounce back patients, reporting unsafe or near miss safety events, surgical site infections, ventilator-associated pneumonias and events, and venous thromboembolisms.¹⁹ Some concepts on PS are currently taught as part of the undergraduate and graduate nursing curricula in Pakistan. However, it is not incorporated into a coherent and dedicated curriculum, which reduces its effectiveness in meeting the needs of the students as well as the healthcare system.

In this article, we present outcomes of a 4 and a half-day PS module, which was introduced into the clinical year nursing students' curriculum at a major nursing school in Karachi, Pakistan. The main goals of the course were to improve student understanding of medical errors, dealing with errors and delivery of safe nursing care as individuals and within healthcare teams. The aim of our study was to evaluate this course and report on its effects on students' knowledge of PS, efficacy, and system-based thinking among nursing students at 2 different stages of their undergraduate program. We also compared the impact of this course on 2 groups of nursing students to further our understanding on the best time to introduce PS education within a nursing school curriculum.

METHODS

This study enrolled students from second and fourth year of the bachelor of science in nursing program in a PS and quality improvement (QI) course at the Aga Khan University school of nursing, a private nursing school affiliated with a tertiary care teaching hospital in 2022. The students of years II and IV were purposefully recruited as both the years are immensely crucial in nursing and are the crux of the bachelor of science in nursing degree program. The course spanned over 4 and a half days and consisted of lectures, case-based interactive discussions and activities, and hands-on skill development workshops on QI and PS. It was adapted from a 3-day PS course for medical students taught at the Johns Hopkins University School of Medicine.²⁰ We consulted the undergraduate faculty at the nursing school to modify the course with contextualized examples specific for nursing students in local settings. Before implementation, the content of the course and evaluation questionnaires were reviewed by three QI and PS experts including the director and senior manager from the Center for Patient Safety at the Aga Khan University Hospital in Pakistan as well as the director for the PS course at Johns Hopkins School of Medicine. The course was taught over 4 and a half days instead of 3 as the students had to be divided into 2 smaller groups to ensure compliance with COVID-19-related standard operating procedures.

We encountered several challenges in implementing the course. First, a 5-day block had to be secured for the entire batch of nursing students to execute the course. Second, the course had to be incorporated in the existing nursing curriculum. Third, it was challenging to identify and recruit local and international facilitators for its execution. Fourth, we encountered logistical barriers such as those related to the use of technology during execution.

Local and international faculty speakers delivered lectures on the following topics: (1) science of patient safety; (2) effective communication; (3) conflict management; (4) error disclosure; (5) learning from defects; (6) human and system factors; and (7) medical record documentation. The speakers included nurses, generalist and specialist physicians, health services researchers, healthcare safety experts, infection control practitioners, and other allied healthcare professionals. The lectures on the first 4 days were followed by 2 breakout sessions tailored to impart knowledge and skills required to practice safely as integral members of the healthcare team. The breakout sessions consisted of activities on clinical scenarios pertaining to "learning from defects,"

"communication skills" as well as infection control measures such as appropriate methods for donning and doffing of personal protective equipment. The faculty members, speakers, and the teaching methodologies were the same for students of both years. The Aga Khan University's medium of instruction is English, and therefore, all enrolled students have an above average fluency in English. However, the teaching sessions were conducted in a bilingual (English/Urdu) format to accommodate students who do not have advanced or native proficiency in either English or Urdu.

Evaluation

The course was evaluated using a pretest and posttest knowledge test and a questionnaire. These were modified and adapted from the Health Professional Education in Patient Safety Survey (H-PEPSS),²¹ the Systems Thinking Scale (STS),²² and Johns Hopkins PS course evaluation.²⁰ Participation in the survey was voluntary and informed consent for all subsections was obtained at the beginning of each survey. The questionnaire consisted of the following:

- 1) Demographics
- 2) Knowledge assessment: This section consisted of 20 multiple choice questions developed based on content areas on PS outlined in resources from Institute for Healthcare Improvement and the Agency for Healthcare Research and Quality.^{23,24}
- 3) Self-efficacy/self-assessment of knowledge and skills on PS and QI: Self-efficacy was assessed using a survey of 18 statements scored on a 5-point Likert scale. These statements cover 9 domains. The statements were developed using items from H-PEPSS,²¹ questionnaires from Aboumatar et al,²⁰ and an additional contextualized item designed by the research team. We used a post-then-pre survey approach where the survey is administered only once after the PS course is complete. Upon completion of the postcourse assessment survey, the students are asked to mark their preassessment ratings retrospectively. This method allows participants to use their current level of knowledge to create consistent measurement/ratings for the precourse and postcourse assessment.^{25,26} In our view, this method prevents overestimation of ratings on the pretest survey.^{25,26}
- 4) Systems Thinking Scale: Systems thinking allows evaluation of the structure of a larger system rather than individual actions that drives adverse events. We adopted a validated scale consisting of 20 items (18), scored on a 0- to 4-point Likert-type scale with composite scores ranging from 0 to 80.²²
- 5) Personal reflections: Students were asked to reflect on their experience of attending the course in 300 words. A thematic analysis approach was then followed to identify common themes from these reflections.

The tools described previously are available in the supplemental file, <http://links.lww.com/JPS/A475>.

Data Analysis

Means, standard deviation, and 95% confidence interval were used to conduct descriptive analysis of study variables. Precourse and postcourse composite scores were calculated for knowledge assessment, STS, and self-efficacy.

We excluded records with incomplete or absent precourse or postcourse responses as a pre-post difference in scores cannot be calculated for that student. Differences between precourse and postcourse scores of knowledge assessment and STS were then calculated and compared with a paired sample *t* test, while those for self-efficacy were compared with a Wilcoxon signed-rank test. A binary variable was generated by dichotomizing students' responses on the 5-point Likert scale for self-efficacy. "Agree"

TABLE 1. Demographics

		Year II	Year IV
Age, y	Mean ± SD	20.8 ± 1.23	22.4 ± 1.00
Language spoken, n (%)	English	79 (62.7)	99 (78.0)

and “strongly agree” were merged into one category and all other responses into a second category for comparison.

We conducted an exploratory descriptive analysis comparing the impact of this course on knowledge, skills, and system thinking of second- and fourth-year students using the independent sample *t* test. This was performed to assess any differences in the impact of the course on students of each year. The data were analyzed in Microsoft Excel (Microsoft Corporation, Redmond, Washington) and RStudio v4.2.1 (R Foundation for Statistical Computing, Vienna, Austria).

Qualitative Analysis

Themes were assigned to all reflections using Microsoft Excel (Redmond, WA) by 2 independent reviewers. Upon comparison of these assignments, any discrepancies were resolved via discussion in the presence of a senior reviewer. Subsequently, a number of mentions for each theme were counted and tabulated

Ethical Approval

Exemption was obtained from Aga Khan University’s Ethics and Review Committee for this study (2021-5976-16957).

RESULTS

A total of 146 second-year and 139 fourth-year students attended the course on PS and QI, respectively. The mean age of second-year students was 20.8 ± 1.2 years and fourth-year students were 22.4 ± 1.0 years. Some prior form of training on PS or QI had already been received by 18 fourth-year students (14%). Of these, 15 students (83%) had received it from Coursera, 3 (17%) from Open Resources, 2 (11%) from the Johns Hopkins School of Medicine, and 2 (11%) from other sources. Among second-year students, none had received prior training on PS or QI. The demographic information of the participants is summarized in Table 1.

Knowledge Assessment

One hundred forty-three (97.9%) second-year and 129 (92.8%) fourth-year students attempted the precourse assessment, whereas 142 (97.3%) second-year and 138 (99.3%) fourth-year students attempted the postcourse assessment of this section. As shown in Table 2, 140 (95.9%) second-year and 128 (92.1%) fourth-year students completed both pretest and posttest of the knowledge assessment section after exclusion of surveys with missing or incomplete responses. They showed a mean increase of 4.91

points (35.8%) and 3.46 (26.5%) of a maximum of 20 points from preassessment to postassessment (95% CI, 4.32–5.51, *P* < 0.001, for second year and 95% CI, 2.90–4.02, *P* < 0.001, for fourth year). The pretest and posttest mean scores were 13.72 ± 3.48 and 18.64 ± 2.44 and 13.04 ± 2.86 and 16.5 ± 2.56 for second year and fourth year, respectively.

System Thinking Scale

One hundred twenty-seven (87.0%) second-year and 127 (91.4%) fourth-year students attempted pretest assessment, whereas 126 (86.3%) second-year and 134 (96.4%) fourth-year students attempted the posttest assessment of this section. As shown in Table 2, 100 (68.5%) second-year and 112 (82.4%) fourth-year students completed the precourse and postcourse STS after exclusion of surveys with missing or incomplete responses. The mean scores significantly increased by 0.41 (10.93%) points (95% CI, 0.29–0.52, *P* < 0.001) and 0.33 (8.27%) points (95% CI, 0.22–0.44, *P* < 0.001) for second year and fourth year, respectively. The precourse and postcourse completion scores out of the maximum of 5 points were 3.75 ± 0.55 and 4.16 ± 0.67, and 3.99 ± 0.57 and 4.33 ± 0.52 for second year and fourth year, respectively.

Self-assessment of PS Knowledge and Skills

One hundred twenty-six (86.3%) second-year and 134 (96.4%) fourth-year students attempted the precourse and postcourse assessment for this section. Table 3 shows the self-assessment ratings of the students by nurse training year. Of 146 second-year and 139 fourth-year students, 107 (73.3%) and 129 (92.8%) completed their self-assessment, respectively. The results for second year showed significant increase in knowledge self-assessment ratings in all domains (*P* < 0.05) except in “human and environmental factors” and the “culture of safety.” The results from fourth year showed a statistically significant (*P* < 0.001) increase for all 9 domains. Second-year participants had higher scores in three of the following 9 domains: infection control (91.6%), teamwork (87.9%), and effective communication (87.9%) on postcourse assessment. The highest scoring domains for fourth-year participants were infection control (97.8%), “effective communication” (95.4%), error disclosure (93.8%), and human and environmental factors (92.3%).

Comparing Second Year and Fourth Year

As shown in Table 4, students in both years had improvement in their PS knowledge (precourse to postcourse assessment MD: 4.91 ± 3.57 for second year compared with MD: 3.46 ± 3.19 for fourth year), although second-year students showed significantly greater increase in knowledge scores than fourth year (*P* = 0.001). Students of both years had comparable increase in their STS scores (second year MD: 0.41 ± 0.58; fourth year MD: 0.33 ± 0.60). As displayed in Table 5, fourth-year students displayed greater increase in their self-assessment scores for PS knowledge and skills from precourse to postcourse assessment when compared with second

TABLE 2. Knowledge Assessment and STS Scores

	Assessment	n	Pretest Score, Mean ± SD	Posttest Score, Mean ± SD	Mean Difference (95% CI)	<i>P</i> *
Year II	Knowledge	140	13.72 ± 3.48	18.64 ± 2.44	4.91 (4.32–5.51)	<0.001
	STS	100	3.75 ± 0.55	4.16 ± 0.67	0.41 (0.29–0.52)	<0.001
Year IV	Knowledge	128	13.04 ± 2.86	16.5 ± 2.56	3.46 (2.90–4.02)	<0.001
	STS	112	3.99 ± 0.57	4.33 ± 0.52	0.33 (0.22–0.44)	<0.001

**P* values were calculated by paired sample *t* test.

TABLE 3. Student Self-assessment of Patient Safety Knowledge

Domain	Self-assessment of Knowledge (Pre)		Self-assessment of Knowledge (Post)		Z	P*
	Mean ± SD	Percent Agree/Strongly Agree	Mean ± SD	Percent Agree/Strongly Agree		
Year II (n = 107)						
Teamwork	4.10 ± 0.82	72.0	4.28 ± 0.67	87.9	-2.171	0.030
Effective communication	4.24 ± 0.73	76.6	4.41 ± 0.68	87.9	-2.292	0.022
Risk management	4.04 ± 0.81	65.4	4.27 ± 0.66	79.4	-2.341	0.019
Human and environmental factors	4.20 ± 0.79	80.4	4.31 ± 0.85	86.0	-1.314	0.189
Recognition and reduction of harm	4.06 ± 0.77	68.2	4.20 ± 0.69	76.6	-2.082	0.037
Culture of safety	4.15 ± 0.76	72.0	4.27 ± 0.67	80.4	-1.742	0.082
Infection control	4.31 ± 0.83	79.4	4.59 ± 0.67	91.6	-3.691	0.000
Error disclosure	4.02 ± 1.14	71.0	4.28 ± 0.87	84.1	-2.203	0.028
Medical documentation	4.05 ± 1.10	72.0	4.36 ± 0.79	86.9	-3.216	0.001
Year IV (n = 129)						
Teamwork	3.91 ± 0.80	63.6	4.32 ± 0.55	86.1	-5.522	≤0.001
Effective communication	4.19 ± 0.79	74.4	4.58 ± 0.45	95.4	-4.204	≤0.001
Risk management	3.90 ± 0.89	62.8	4.25 ± 0.55	79.9	-3.525	≤0.001
Human and environmental factors	4.01 ± 0.86	73.6	4.35 ± 0.70	92.3	-3.874	≤0.001
Recognition and reduction of harm	3.90 ± 0.88	62.8	4.31 ± 0.60	84.5	-5.125	≤0.001
Culture of safety	4.06 ± 0.82	70.5	4.41 ± 0.53	89.2	-4.706	≤0.001
Infection control	4.43 ± 0.71	83.0	4.81 ± 0.46	97.7	-5.827	≤0.001
Error disclosure	3.96 ± 1.00	71.3	4.45 ± 0.64	93.8	-4.975	≤0.001
Medical documentation	3.97 ± 1.03	67.4	4.41 ± 0.67	91.5	-4.222	≤0.001

*Wilcoxon signed rank test.

year in “teamwork,” “recognition and reduction of harm,” “culture of safety,” and “error disclosure” ($P < 0.001$).

Analysis of Students’ Reflections

One hundred twenty-six students (86.3%) from second year and 134 (96.4%) from fourth year wrote personal reflections on the course. As depicted in Figure 1, 14 common themes were identified from these reflections. The most frequently emerging theme was “importance of teamwork and communication,” mentioned by a total of 135 students (52%), coming up in 67 (53%) of second year and 68 (51%) of fourth-year reflections. A total of 114 students (44%) talked about the “importance of PS,” mentioned by 46 (37%) second-year and 68 (51%) fourth-year students. Conflict management was also mentioned by 44 (35%) second-year and 66 (49%) fourth-year respondents. Another common theme identified was “using standardized tools such as checklists” to avoid patient harm, mentioned by 54 (43%) second-year and 53 (40%) of fourth-year students. Excerpts from the reflections are displayed in Table 6.

DISCUSSION

Preserving PS and preventing harm during the provision of care is an important component of nursing education.¹⁰ However, formal

training and practices surrounding PS are often lacking in LMICs when compared with more developed countries. Nursing education regarding PS is therefore vital in these regions to reduce disparities in quality of care.²⁷ To bridge this training gap, we created and implemented a short course for 2 groups of undergraduate nursing students at different stages in their clinical nursing education to further our understanding on the best time to introduce PS education within a nursing school curriculum. Our findings showed a significant increase in students’ PS knowledge, self-efficacy, and system thinking for both groups of students. Second-year students had significantly higher scores in the knowledge component on postcourse assessment and showed significantly greater gain in knowledge during the course in comparison to fourth-year students. Students of both years showed improvement in system thinking after the course.

Second-year students scored significantly higher in the posttest knowledge assessment (18.64 ± 2.44 , $P \leq 0.001$) than fourth-year students (16.50 ± 2.56 , $P \leq 0.001$) and showed a significantly greater gain in PS knowledge in comparison (mean difference of gain of 1.45 [29.53%], $P = 0.001$). One reason for this could be the increased time available to second-year students compared with fourth-year students to prepare for the assessment of the module. An interesting approach to evaluating differences in knowledge between different year groups has been taken by

TABLE 4. A Comparison of Years II and IV Knowledge Assessment and STS Scores

Assessment	Diff. Post- Pre Test Score* (II)	Diff. Post-Pre Test Score† (IV)	Difference Mean (95% CI)
Knowledge	4.91 ± 3.57 (n = 140)	3.46 ± 3.19 (n = 128)	-1.45 (-2.27 to -0.64)
STS	0.41 ± 0.58 (n = 100)	0.33 ± 0.60 (n = 112)	-0.08 (-0.24 to 0.09)

*Values for pretest and posttest scores are presented as mean ± SD.

†P values were calculated by an independent sample t test.

TABLE 5. Comparative Difference in Mean Scores for Patient Safety Knowledge in Students

Domain	Self-assessment of knowledge (Diff. Post- Pre- test) II (n = 107)	Self-assessment of knowledge (Diff. Post- Pre-test) IV (n = 129)	Z	P*
	Mean ± SD	Mean ± SD		
Teamwork	0.17 ± 0.66	0.42 ± 0.77	-2.625	0.008
Effective communication	0.17 ± 0.57	0.38 ± 0.81	-1.637	0.102
Risk management	0.22 ± 0.73	0.34 ± 0.90	-0.784	0.433
Human and environmental factors	0.11 ± 0.82	0.34 ± 0.88	-1.843	0.066
Recognition and reduction of harm	0.13 ± 0.65	0.41 ± 0.83	-2.731	0.006
Culture of safety	0.12 ± 0.61	0.35 ± 0.80	-2.631	0.009
Infection control	0.27 ± 0.71	0.38 ± 0.71	-1.597	0.110
Error disclosure	0.25 ± 0.96	0.49 ± 1.05	-2.176	0.030
Medical documentation	0.31 ± 0.92	0.44 ± 1.06	-0.990	0.322
Overall	0.19 ± 0.55	0.38 ± 0.63	-2.580	0.010

*Wilcoxon rank-sum test

Bressan et al.²⁸ They followed the same student groups each year, their performance were measured at the end of year 1, 2, and 3, and they found that the knowledge on PS issues remained stable.

Fourth-year students had significantly higher pretest scores in the STS component in contrast to second-year students. Clinical exposure and experience may have allowed fourth-year nursing students to retain solutions to PS concerns due to a greater number of direct patient interactions, working within teams in a clinical setting, and may have had to face these issues more imminently as compared with second-year students. By the end of the course, however, the second-year cohort did show significant gain in STS scores with comparable results in the posttest. It can thus be interpreted that this course has helped second-year students advance their systems thinking as much as it helped fourth-year students.

Both second- and fourth-year students had a significant increase in self-efficacy scores for most domains after the course. We can deduce that both groups of students felt that the course helped in building the skills they need to practice safely. Previous literature has shown how self-efficacy scoring helps academic and health care leaders to gather information about the level of QI

knowledge and skills of respective faculty or staff. The scoring helps highlight opportunities for targeted intervention aimed at improving and incorporating QI competencies into nursing education and practice.²⁹ Existing studies have also reported increase in safety incident reporting with self-efficacy defined as an individual’s competence to tackle response to PS issue.³⁰ Fourth-year students demonstrated higher gain in self-efficacy scores compared with second-year students. This suggests that the course may have also helped in boosting confidence and helped reinforce concepts, knowledge, and skills relating to PS that may have been taught at an earlier stage of clinical education. Moreover, prior training on QI and PS at baseline among fourth-year students may have augmented this phenomenon.

Kim et al.¹³ compared findings from an undergraduate course for nursing students at different years of their education using a pre-post test approach. They used experimental and control groups to show effectiveness of the PS course. They observed that scores in all studied components (attitude, skills, and knowledge) significantly increased as a result of the course, in all 3 years. Dimitriadou et al.³¹ compared PS outcomes using the H-PEPSS

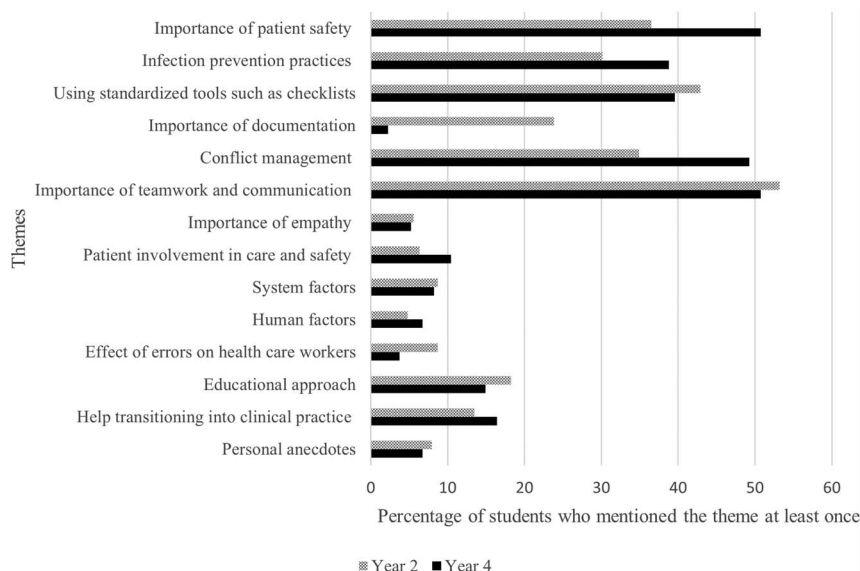


FIGURE 1. Themes from Students’ Reflections.

TABLE 6. Excerpts From Students’ Reflections

Theme	Quote	Student Group
Importance of PS	“... This session helped me in understanding how the safety of patients is so important and how a simple mistake from a healthcare provider can put the patient in a deadly situation...”	Year II
	“... Made me realize how patient safety is important and how carefully we have to work in the patient area...”	Year IV
Using standardized tools such as checklists	“... I have learned to perform checklists and double check for any errors, to complete documentation on time and not override any order or assume anything on my own regarding patients...”	Year II
	“... We need to follow the protocols like SBAR, ALEEN, etc in order to deal systematically with events on the wardside...”	Year IV
Importance of teamwork and communication	“... This course helped me understand the importance of communication between healthcare professionals. Collaboration between health care workers is necessary to provide effective care towards patients...”	Year II
Conflict management	“... I learnt many new things which I haven’t heard before like conflict management in which we came to know how to communicate with the family and make them calm so that the risk of conflict will decrease...”	Year IV
Infection prevention practices	“... Learning about infection control management, where and when to wash and scrub hands, how to don and doff personal PPEs was really enjoyable and informative...”	Year II
	“... I know what to do when entering the room of a patient on isolation precautions. I know how to use personal protective equipment such as gowns, gloves, masks and when it is appropriate...”	Year IV
Importance of documentation	“... Documentation is very important to communicate with the care providers so we have to document whatever we did and we have to check the documentation as well to give best care to the patient.”	Year II
Educational approach	“... I really like the way they use examples so that we can understand the concepts very easily. The way you taught us was incredible and the session was very interactive that I like the most...”	Year II
	“... The best part of this course is group activity and peer work help me to learn from my colleagues and the interaction with faculty helps me to gain knowledge about patient safety from their experience.”	Year IV
Help transitioning into clinical practice	“... it was much needed as we are in a transition phase from students to professionals, this understanding will immensely help me to work and collaborate with other healthcare professionals to improve patients and healthcare system outcomes.”	Year II

ALEEN, Anticipate, Listen, Empathize, Explain, Negotiate; SBAR, Situation, Background, Assessment, Recommendation.

tool, between year 3 and 4 nursing students. This provides a similar comparison between younger and less experienced students and those higher up. They found that fourth-year students performed much better in all dimensions and had a higher level of significant agreement than year 3 students. These findings contrast from our findings where a clear-cut superiority in all components was not seen in the older students.

Personal reflections allowed students to express their own ideas regarding the concept of PS and gave them a chance to reflect on their interpretation of the subject. Both similar, overlapping, and differing themes were seen in the second- and fourth-year students’ reflections. The most frequently seen comment in both student groups was emphasizing the importance of PS. Use of standardized communication tools such as Situation, Background, Assessment, Recommendation and Anticipate, Listen, Empathize, Explain, Negotiate was the second most frequently mentioned theme by both student groups. The students noted these to be helpful in dealing with clinical situations that they face, such as resolution of conflicts and effective team communication. Infection prevention was an important and dedicated component of the module and even more significant in the context of the ongoing pandemic. One notable difference noted between both groups was the recognition of patient involvement in their care and management plan as means to prevent medical errors. Fourth-year students mentioned this almost twice as often as the

second-year students. One reason for this could be that fourth-year students have had greater patient interaction in clinical settings as compared with second-year students as well as prior courses that emphasized patient involvement patient-centered care. Morey et al³² performed a qualitative study across multiple nursing student groups to explore nursing students’ experience with PS events that they were involved in. They found 3 commonly recurring themes in the focus group interview.³² These included the importance of patient involvement in PS issues as seen in our own student reflections. They believed that patient’s involvement in care allows healthcare workers to understand an adverse situation from the patient’s point of view, which helps in preventing errors. It has been demonstrated by Vaismoradi et al³³ that nursing students value interactive PS education rather than just theoretical and didactic learning. Our interactive approach to this PS module was appreciated by the students in their reflections and was mentioned by both classes.

This study has several limitations. First, to ensure compliance with standard operating procedures relating to the control of spread of COVID-19, a limited number of sessions were conducted virtually. Didactic sessions involving students were also often split into different groups contributing to technical difficulties. Second, the pre-post design of the study with self-assessments is also subject to social desirability bias. Third, because of the nature of the study design, we were unable to conduct a long-term

assessment of skills and knowledge acquired and eventually retained from the module. Fourth, this study was conducted at only one nursing school at a major academic center. Because of a possible lack of resources and skilled personnel at other institutions, our results may not be generalizable to the nursing student population in the rest of Pakistan.

CONCLUSIONS

We were able to conduct a PS and quality improvement course for nursing students at 2 different stages in training, which resulted in overall gain in knowledge on PS. Our study provided an opportunity to explore impact of this course among preclinical and clinical year nursing students and found it to be beneficial at both times. Our next step will be to follow up with these students during their clinical practice to assess their preparedness in recognizing and dealing with medical errors in clinical settings.

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