

Enhancing Nursing Staff Clinical Skills of Pain Assessment: Impact of the Educational Course

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Abstract

Objective: To assess the impact of a newly developed educational course in terms of improvement in post-test scores in clinical skills assessment of patients with patient-controlled intravenous analgesia (PCIA) and epidural analgesia using the Likert scale among nursing staff working in a tertiary care teaching hospital.

Introduction: Nurses require certain clinical skills to assess patient's pain adequately. This can be achieved through regular on-the-job training and educational workshops. This will enhance nurses' clinical practice regarding pain assessment and improve pain treatment and patient satisfaction.

Methods: After getting approval from the Institutional Review Committee an education course was developed and implemented. A total of 86 nursing staff attended the course. Teaching methodologies included online lectures, small group tutorials, and hands-on workshops using demonstrations of locally developed videos. Pain assessment skills were assessed at the start of the workshop and the end of the session using PCIA and Epidural Likert scale assessment forms on simulated patients in this experimental, pre-and post- (single-arm) study.

Results: Eighty-six participants completed the course, of which 50 (58.1%) were female. In the clinical skill assessment of patients using PCIA, the mean difference in PCIA assessment scores of participants before and after the workshop was 13.88 (90.79%), which was statistically significant ($p < 0.001$). In the epidural skills assessment, the mean difference in the score of participants before and after the workshop was 15.09 (79.47%), which was statistically significant ($p < 0.001$).

Conclusion: The educational course had a significant impact on increasing the understanding of pain assessment among nursing staff with statistically significant improvement in their clinical skills.

Keywords: Hybrid educational course for nursing staff, Pain assessment skills, Clinical assessment of patients with patient-controlled analgesia and Epidural analgesia.

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Introduction

Pain assessment is a significant issue in post-operative patients. Routinely, ward nurses are responsible for assessing and documenting patient's pain regularly. If a patient has moderate or severe pain, they provide pain medications as per the guidance of physicians. Inappropriate acute pain management results in various physiological and psychological alterations, and economic burdens to patients. Gaps have been identified regarding post operative pain management because of a lack of awareness, knowledge, and training of nursing staff about acute pain relief.

Nurses play a pivotal role in patient care as primary responders to various healthcare concerns. Within this context, ward nurses hold a crucial responsibility for assessing and promptly addressing pain as well as managing potential side effects associated with analgesics. Therefore, they must have adequate knowledge and awareness regarding postoperative pain.^{1,2} Sayed et al. in their study demonstrated that most nursing staff (93.8%) exhibit limited awareness regarding pain assessment and its treatment. The study recommends that nursing staff should have on-the-job training and regular refresher courses to enhance their knowledge and clinical skills to improve clinical practice and patient care.³ Acute pain is a common issue and has multiple reasons, such as surgery, trauma, childbirth, burns, medical issues, natural disasters, etc. Patients' expectations for pain management are notably shaped by cultural influences and personal beliefs. In low- and middle-income countries (LMICs) healthcare staff frequently lack sufficient education on the significance of pain treatment, resulting in under utilization of available pain medications.⁴ Our population data shows the frequency of moderate to severe pain between 51.4% to 66.8%.⁵

In adequate post operative pain management carries financial, physiological, psychological, and ethical repercussions.⁶ Implementing regular in-service training and educational courses has the potential to enhance nurses' knowledge and practices leading to improvements in their overall clinical performance. Existing literature supports the favourable outcome of online education sessions on the learning ability of trainee nurses.⁷ The presented

hybrid pain education course represents a pioneering initiative in Pakistan, specifically tailored to improving nurses' clinical skills in pain assessment. The study's objectives were to evaluate the educational course's effectiveness in enhancing clinical skills related to pain assessment among nursing staff working in adult surgical and medical wards in a tertiary care teaching hospital.

Material and Methods

The authors developed an educational course focusing on pain assessment consisting of five hours of contact time. This course was conducted on five different occasions over three months (March to May 2022) at The Aga Khan University, a tertiary care teaching hospital in Karachi Pakistan. Ethical approval was granted by the Institution Ethics Review Committee (ERC# 2022-7077-20401) and permission was obtained from the chairs and nursing managers of the respective Departments. Written and informed consent was taken from all participants. Strict confidentiality measures were implemented, ensuring that participants, names, and identities were not disclosed at any time, and all collected information was kept confidential.

This study includes both male and female, clinical nursing instructors, registered nursing staff, nurse technicians, and healthcare assistants actively engaged in pain management at adult medical and surgical wards. Those participants who did not consent to participation, midwives working in the labour room, nurses working in out-patient units, and nurses working in the emergency department were excluded from this study. Sampling techniques were non-probability purposive sampling, and the study design was experimental, Pre and post- (single-arm).

Education Course

The hybrid education course was developed after the approval and then implemented.

Course Development

The faculty members of the Departments of Anaesthesiology and Educational Development collaborated to design a hybrid course tailored for the nursing staff working in the medical and surgical wards of the authors' hospital. The course had two components,

- i. Online (web-based on virtual learning environment, VLE)
- ii. Physical (hands-on workshop).

The online component on VLE lasted ninety minutes while the physical hands-on workshop spanned approximately five hours. The course was designed by four anaesthesia faculty members involved in providing pain services, one registered pain nurse, and two faculty members from the Department of Education Development. All members of the course group have extensive experience in teaching and take regular sessions with medical and nursing students. The course group utilised recent literature in developing the content of the course. The online component (web-based on VLE) consisted of short (10 to 15 minutes) pre-recorded presentations by subject experts and two updated articles on pain assessment and management.

Teaching methodologies included online lectures (asynchronous, prerecorded lectures and reading materials), small group discussions, problem-specific interactive learning, case-based clinical scenarios, hands-on workshops, and locally developed video-based learning. For the skills assessment, two data collection tools were developed as follows,

- i. Likert scale for the assessment of patients using PCIA.
- ii. Likert scale for the assessment of patients receiving epidural infusion.

Epidural and PCIA infusion techniques are routinely used to provide pain relief to hospitalized patients. Standardized forms are routinely utilized during pain management of patients receiving PCIA and Epidural infusion. To assess the course participants, these forms were modified to a five-point Likert scale. Initially, these modified forms underwent a pilot phase on nursing staff involved in the care of patients. After incorporating comments and suggestions from the experts, the forms were further modified and then used in this course.⁸

Implementation of the course

Communication was established with Department Chairs, and nursing managers of medical and surgical Departments/wards to disseminate

information about this course. Emails were sent requesting to nominate nursing staff for this course. The participants were selected from the nominated candidates as per the inclusion criteria for the course. Selected participants received an email containing a registration link and the consent form from the Departmental staff. Participants were asked to register on VLE, once they agreed to take part in this educational course. Written and informed consent was taken from all course participants on the day of the workshop.

Educational courses were conducted by the faculty and staff members of the Department of Anaesthesiology and skills assessment was done by the pain consultants. To facilitate the online component/session, upload educational materials, and trouble shoot a staff member received training from the IT Department. Before commencing the workshop, all facilitators and assessors were briefed about the assessment process and clinical skills assessment tools used during the workshop. All registered participants were divided into five groups of 16 to 18 each with a mixed sample of participants. The IT Department staff uploaded all learning materials onto the Virtual Learning Environment (VLE) and closely monitored the course activities. Two weeks before the hands-on workshop, a password-protected Link for learning material (pre-recorded lectures and two recent articles) was shared with the participants online on VLE. Participants were asked to listen to the lectures and read two articles before attending the hands-on workshop. In this way, a total of five hybrid educational courses were conducted in three months (March to May 2022). Assessment of the clinical skills of all participants was done at the start of the workshop and the end of the session using PCIA and Epidural Likert scale forms on simulated patients. (attached as supplementary materials)

Statistical analysis

SPSS version 19.0 (Inc. Chicago, Ill, USA) was used to enter and analyze data. For both pre-course and post-course assessment classifying under different domains for the pain assessment, PCIA, and epidural skills assessment. Only those participants who completed both PCIA and epidural skills assessments were considered for analysis.

Mean and standard deviation were estimated for descriptive analysis for each domain as well as overall performance. The mean differences were then computed along with their 95% confidence intervals (CIs). The Shapiro-Wilk and Kolmogorov-Smirnov test was used to ensure that the distribution of all variables was normal. Based on the asymmetric distribution, the paired Wilcoxon signed rank-test was used to compare and determine whether there was a statistically significant difference in the pre-test and post-test scores. A P-value of 0.05 was considered the significant threshold. The data were analyzed using R Studio 4.1.2 (R Foundation for Statistical Computing).

Results

The reliability or internal consistency of the assessment tools, the 5-point Likert scale used for the assessment of patients using PCIA was excellent,

that is 94% with Cronbach's alpha of 0.94 and 95% CI of 0.89 to 0.96. The reliability or internal consistency of the 5-point Likert scale used for the assessment of patients using epidural infusion was excellent, that is 93% with Cronbach's alpha of 0.93 and 95% CI of 0.88 to 0.96.

A total of one hundred and six (n=106) nursing staff were enrolled in this educational course and ninety-two (n=92) attended the online component of the courses. Eighty-six (n=86, 93.4%) out of 92 completed hands-on workshops of which 50 (58.1%) were female and 36 (41.9%) were male. Nursing staff included registered nurses, assistant head nurses, clinical nurse instructors, nurse technicians, and healthcare assistants. Clinical work areas, designations, and years of experience of the study participants are presented in Table 1.

Table 1: Clinical work areas, designations, and years of experience of the participants (86)

Variable	n (%)
Clinical work area	
Medical and allied ward	15 (17.4%)
Post anaesthesia care unit (PACU)	31 (36.0%)
Surgical and allied ward	40 (46.5%)
Designation	
Assistant head nurse/ Nurse instructor	6 (7.0%)
Health care assistant/ Nurse technician	17 (19.8%)
Registered nurse	63 (73.3%)
Work experience (years)	
Less than one	5 (5.8%)
One to five	46 (53.5%)
Five to ten	27 (31.4%)
More than ten	8 (9.3%)

Regarding PCIA skill assessment, the comparison of the mean PCIA step-by-step skills assessment score of participants before the workshop was 15.2 ± 8.05 and after the workshop was 29.0 ± 6.37 with

a mean difference of 13.88 (90.79%), 95% CI of 12.27-15.50 which was statistically significant ($p < 0.001$) (Figure 1).

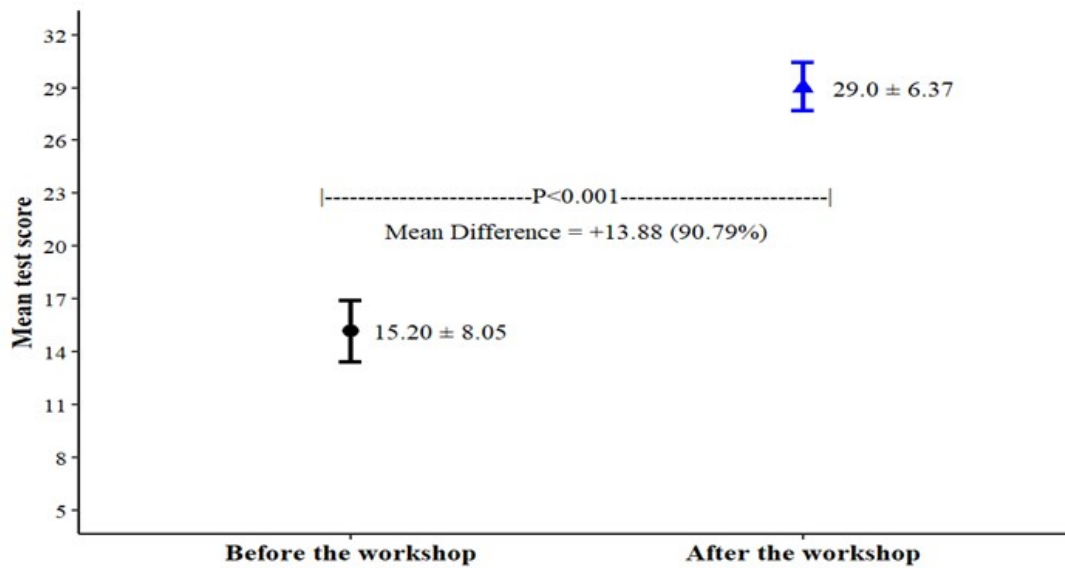


Figure 1: Overall comparison of mean PCIA skills assessment score of participants before and after the workshop (n=86)

The mean score of participants showing the overall ability to assess a patient using PCIA before the workshop was 2.20 ± 0.97 and after the workshop was 3.67 ± 0.69 with a mean difference of $+1.48$ (67.27%), 95% CI of 1.28 - 1.68, which was statistically significant ($p < 0.001$). Participants showed an overall 90.79% improvement in the skills of assessing patients using PCIA after attending the course.

Regarding epidural skill assessment, the comparison of the mean epidural step-by-step skills assessment score of participants before the workshop was 19.0 ± 8.98 and after the workshop, the score was 34.1 ± 6.27 with a mean difference of 15.09 (79.47%), and 95% CI of 13.50-16.68, which was statistically significant ($p < 0.001$) (Figure 2).

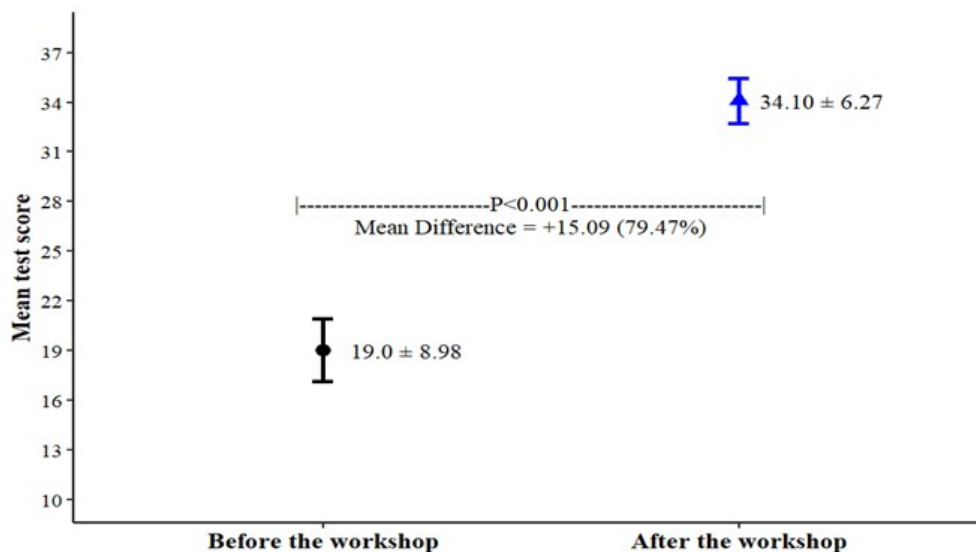


Figure 2: Overall comparison of mean epidural skills assessment score of participants before and after the workshop (n=86)

The mean score of participants showing the overall ability to assess a patient with epidural before the workshop was 2.67 ± 0.94 and after the workshop was 4.07 ± 0.59 with a mean difference of $+ 1.40$ (52.43%), and 95% CI 1.21 – 1.58, which was statistically significant ($p < 0.001$). The participants showed an overall 79.47% improvement in the skills of assessing patients receiving epidural analgesia after attending the course.

Sub-group analysis showing the effect of different variables on PCIA skills assessment scores

In the univariate analysis of PCIA-related skills, the effect of educational courses was comparable in both male and female gender ($p = 0.845$). Participants from the post-anaesthesia care unit (PACU) showed

lesser improvement in skills as compared to the surgical and medical ward nurses, but this difference was not statistically significant ($p = 0.059$). Nurse technicians and healthcare assistants showed greater improvement in skills as compared to the registered nurses, assistant head nurses, and clinical nurse instructors, but this difference was not statistically significant ($p = 0.948$).

In the multivariate analysis of PCIA, the linear regression coefficient for participants from PACU showed lesser improvement in skills scores after the course as compared to those from the medical and surgical ward, but it was not statistically significant ($p = 0.070$) (Table 2).

Table 2: Univariate and multivariable analysis showing the effect of different factors on pre and post-test skills scores for PCIA.

Variable	Univariate Models			Multivariable model		
	β (SE)	P-Value	95%CI	Adjusted β (SE)	P-Value	95%CI
Gender						
Female	Ref			Ref		
Male	0.04 (0.20)	0.845	-0.37 – 0.45	0.21 (0.22)	0.337	-0.23 – 0.65
Designation						
AHN/CNI	Ref			Ref		
RN	-0.04 (0.40)	0.922	-0.84 – 0.76	-0.14 (0.43)	0.751	-1.00 – 0.72
NT/HCA	0.03 (0.45)	0.948	-0.86 – 0.92	0.06 (0.49)	0.905	-0.93 – 1.04
Clinical area						
Surgery	Ref			Ref		
Medical	0.29 (0.27)	0.289	-0.25 – 0.84	0.40 (0.30)	0.184	-0.19 – 0.98
PACU	-0.41 (0.22)	0.059	-0.84 – 0.02	-0.43 (0.24)	0.070	-0.90 – 0.04
Experience (yrs)						
<1	0.43 (0.53)	0.429	-0.64 – 1.49	0.31 (0.55)	0.578	-0.76 – 0.83
1 – 5	0.17 (0.36)	0.640	- 0.55 – 0.88	0.03 (0.40)	0.934	-0.89 – 0.72
5 – 10	-0.04 (0.38)	0.912	-0.79 – 0.71	-0.08 (0.40)	0.840	
> 10	Ref			Ref		

Outcome = post-pre test change. Independent: Gender, Designation, Clinical working area

and Experience. General linear model, PACU: Post-anaesthesia care unit (Recovery Room)

AHN/CNI: Assistant head nurse, and clinical nurse instructors

RN: Registered nurses, NT/HCA: Nurse technicians, and healthcare assistants

Sub-group analysis showing the effect of different variables on Epidural skills assessment scores

In the univariate analysis of epidural skills, the effect of the educational course was significantly higher in the participants from the surgical ward as compared to the participants from PACU (p=0.029). Participants who have more than 10 years of experience showed more improvement in skills as compared to those who have less experience, but this difference was not statistically significant

(p=0.071). Nurse technicians, healthcare assistants and registered nurses showed less improvement in epidural skills as compared to the assistant head nurses, and clinical nurse instructors, but this difference was not statistically significant (p=0.514).

In the multivariate analysis, the linear regression coefficient for participants from the surgical ward showed significant improvement in epidural skills as compared to the participants from PACU (p=0.012). Participants who have more than 10 years of experience showed more improvement in skills as compared to those who have less experience, and the difference was statistically significant (p=0.007). (Table 3)

Table 3: Univariate and multivariable analysis showing the effect of different factors on pre and post-test scores of epidurals.

Variable	Univariate Models			Multivariable model		
	β(SE)	P-Value	95%CI	Adjusted β(SE)	P-Value	95%CI
Gender						
Female	Ref			Ref		
Male	0.08 (0.19)	0.650	-0.28 – 0.45	0.06 (0.20)	0.749	-0.32 – 0.45
Designation						
AHN/CNI	Ref			Ref		
RN	-0.07 (0.36)	0.845	-0.79 – 0.65	0.03 (0.38)	0.937	-0.73 – 0.79
NT/HCA	-0.26 (0.40)	0.514	-1.07 – 0.54	-0.37 (0.44)	0.401	-1.24 – 0.50
Clinical area						
Surgical	Ref			Ref		
Medical	-0.27 (0.25)	0.292	-0.77 – 0.23	-0.20 (0.27)	0.454	-0.73 – 0.33
PACU	-0.43 (0.20)	0.029	-0.83 – -0.04	-0.52 (0.21)	0.012	-0.94 – -0.11
Experience (yrs)						
<1	-0.28 (0.48)	0.568	-1.23 – 0.68	-0.54 (0.49)	0.273	-1.69 – -0.28
1 – 5	-0.60 (0.33)	0.071	-1.23 – 0.05	-0.99 (0.36)	0.007	-1.48 – -0.06
5 – 10	-0.47 (0.34)	0.171	-1.14 – 0.21	-0.77 (0.36)	0.034	
> 10	Ref			Ref		-1.51 – 0.43

Outcome = post-pre test change. Independent: Gender, Designation, Clinical working area and Experience. General linear model, PACU: Post-

anaesthesia care unit (Recovery Room)
AHN/CNI: Assistant head nurse, and clinical nurse instructors

RN: Registered nurses, NT/HCA: Nurse technicians, and healthcare assistants

Discussion

A hybrid educational course focused on pain assessment was conducted for nursing staff at our tertiary care hospital. The course was conducted five times to accommodate 86 nursing staff. To the best of our knowledge and upon reviewing recent literature, this initiative marked the first of its kind for nursing staff pain assessment skills development courses in our country.

The effectiveness of the course was evident through a statistically significant increase in the clinical skills of the participants after attending the course ($p < 0.001$). This enhancement in the clinical skills of nurses will help them to apply their knowledge thereby improving patient care that will lead to better patient outcomes and heightened patient satisfaction. Despite extensive research, educational initiatives, the introduction of new delivery methods, potent analgesics, and adherence to clinical practice guidelines, appropriate treatment of postoperative pain is a challenge for physicians and nursing staff worldwide.⁹

In this study, the impact of the hybrid educational course was shown by an overall 79.47% improvement in the skills of assessing patients with epidural analgesia after attending the course using a 5-point Likert scale on simulated patient. Thus, improvement in pain management skills was achieved by the nurses, as evidenced by the improvement in skills scores after the workshop. Studies about the feasibility and effectiveness of simulation-based teaching for nurses demonstrated a marked improvement in acquired knowledge about epidural analgesia after the workshop, and a significant improvement in assessment of block and in relating the clinical findings and adverse effects of epidural analgesia.¹⁰

Kasahun et al. reported moderate to severe pain in 70% of adult patients after elective surgeries.¹¹ It is essential to treat the pain because insufficient pain relief results in various morbidities.¹² Sharma et al. recommended a routine approach to pain assessment and documentation with other vital signs as it may lead to better management of postoperative pain.¹³

In another study, Elshamy et al. demonstrated that following the introduction of a pain management program for nurses, there were statistically significant improvements in the nurses' knowledge. Post-intervention, nurses' responses improved substantially from 50.2% to 85.8%. They confirmed the impact of the pain management training program in increasing the knowledge of nurses and the quality of nursing care to patients with acute postoperative pain.¹⁴

Latina et al. found that Italian nurses across various clinical areas exhibited varying levels of knowledge and attitudes toward patients with pain. However, they observed a significant improvement in knowledge and practices for pain management after the training program.¹⁵ In a study by Liu et al. from China, a pain management educational program resulted in a significant improvement in the knowledge of nurses, selected pain management practices, documentation, and patient satisfaction after the pain management educational program.¹⁶ Similarly, Hong et al. reported that, after the implementation of a web-based educational program for nurses, the clinical knowledge of nursing staff and the quality of acute pain management of patients showed a significant improvement.¹⁷ Aqel et al. demonstrated that the knowledge and attitude of nurses to patients with complex cancer pain improved after the implementation of the pain education program.¹⁸

In this study, the effectiveness of a hybrid educational course was shown by an overall 90.79% improvement in nurses' skills in assessing patients receiving PCIA after attending the course. This is like another study reported by Lucia et al. They evaluated knowledge of pain assessment and treatment in nurses trained via the online module (video-based). They showed that nurses' knowledge improved after the training session with significant improvement in clinical skills.¹⁹ In our study, the online component of the course was developed on VLE containing video-recorded lectures and updated articles for reading, and during the course, a video-based teaching method was used to educate nurses about bedside clinical skills. A similar study by Nezar et al. conducted an in-service education program that consisted of several educational methods such as video-based

learning and case-based discussion and providing teaching and learning materials. They demonstrated an increase in knowledge and attitudes among nurses about pain after attending the program.²⁰

Gareth Drake et al. highlighted the multidimensional role of nurses in pain management service and advocated for empowering nurses to conduct didactic teaching and clinical skills sessions related to the utilization of pain assessment tools.²¹ Parvizy et al. observed that nurses are influenced by the patient's behaviour. They reported an increase in knowledge and attitude four hours after the teaching sessions. Their study findings indicated that 81% of nurses perceived patients to overexpress pain and assessments of ward nurses reflected a negative attitude towards pain assessment.²² Chun-Hua Zhang et al. have also reported improvement in nurses' knowledge and attitudes regarding pain management of patients after the implementation of the Pain Education Program (PEP). The ability to use the Changhai Pain Scale to assess the intensity of pain was improved after the PEP.²³

Germossa et al. have reported that nurses' knowledge and attitudes about pain management markedly improved after on-the-job training.²⁴ In another study, Lucia et al. conducted an E-Learning session for nurses on pain and showed high satisfaction of nurses with the training methodology, learning material, knowledge acquired, and the ability to apply knowledge to routine clinical practice.¹⁹ Similar to our findings, other authors have reported improvement in skills after educational sessions using different educational strategies. Conducting hybrid educational courses and workshops is the start of a practice change in pain assessment training that will lead to effective pain treatment for admitted patients.

Strengths and limitations

This course enhances the basic knowledge, awareness, and clinical skills of nurses in pain assessment. The absence of a control group (without intervention) limits the ability to conclusively attribute the observed effect of the intervention. Secondly, due to logistical constraints, we did not assess retention of clinical skills. Testing clinical skills soon after the course may not ensure long-term retention of clinical

skills. Furthermore, as this study was conducted at a single centre, the results may not be generalized. Since the participants, facilitators, and assessors belong to the same institution, the chance of bias in the clinical assessment of skills cannot be eliminated.

Conclusion

The educational course focusing on pain assessment showed statistically significant improvement in the clinical skills of the nursing staff after attending the course. There was an overall 90.79% improvement in the clinical skills of participants in assessing patients using PCIA and a 79.47% improvement in the clinical skills of participants in assessing patients using epidural infusion.

Regular pain assessment is needed for optimal care and a better outcome for patients. Such educational courses should be regularly conducted for a better understanding and implementation of pain assessment tools. Such educational courses should be conducted in all tertiary care and teaching hospitals and be included as part of the orientation session for nursing staff so that pain management and patient satisfaction can be improved.

This manuscript adheres to the SQUIRE 2.0 Guidelines for Quality Improvement Studies.²⁵

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Availability of data and materials

The data is available from the corresponding author upon request.

Ethical Clearance: Ethical approval was granted by the Institution Ethics Review Committee (ERC# 2022-7077-20401) and permission was obtained from the chairs and nursing managers of the respective Departments. Written and informed consent was taken from all participants. Strict confidentiality

measures were implemented, ensuring that participants, names, and identities were not disclosed at any time, and all collected information was kept confidential.

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References

- Al-Sayaghi KM, Fadlalmola HA, Aljohani WA, Alenezi AM, Aljohani DT, Aljohani TA, et al. Nurses' Knowledge and Attitudes Regarding Pain Assessment and Management in Saudi Arabia. *Healthcare (Basel)*. 2022;10(3):528. doi:10.3390/healthcare10030528
- Eaton LH, Meins AR, Mitchell PH, Voss J, Doorenbos AZ. Evidence-based practice beliefs and behaviours of nurses providing cancer pain management: a mixed-methods approach. *Oncol Nurs Forum*. 2015;42(2):165-173. doi:10.1188/15.ONF.165-173
- Sayed SM, Abo Zead SE, Ayoub MT, Desouky AA. Awareness of Surgical Nurses Regarding Pain Assessment and Management (Suggested Nursing Guidelines). *Assiut sci. nurs. j*. 2019 ;7(16):157-65. doi: 10.21608/asnj.2019.61534
- Junkins S, Goloshchapov D, Sindt JE. Pain in low resource environments. *Curr Anesthesiol Rep*. 2017 ;7:23-9. doi: 10.1007/s40140-017-0193-x
- Ismail S, Siddiqui AS, Rehman A. Postoperative pain management practices and their effectiveness after major gynecological surgery: An observational study in a tertiary care hospital. *J Anaesthesiol Clin Pharmacol*. 2018 (4):478-484. doi:10.4103/joacp.JOACP_387_17
- Ferreyra G, Long Y, Ranieri VM. Respiratory complications after major surgery. *Curr Opin Crit Care*. 2009 Aug;15(4):342-8. doi:10.1097/MCC.0b013e32832e0669
- Ali KA, Khalil HE, El-Sharkawy FM. Impact of online remote education on the learning process among nursing students. *Open J. Nurs*. 2020 ;10(9):810-30. doi: 10.4236/ojn.2020.109057
- Pires SM, Monteiro SO, Pereira AM, Stocker JN, Chaló D de, Melo EM. Non-technical Skills Assessment Scale in Nursing: Construction, development and validation. *Rev Lat Am Enfermagem*. 2018;26(0). doi:10.1590/1518-8345.2383.3042
- Thienthong S. Clinical guidance for acute postoperative pain management 2019 The Royal College of Anesthesiologists of Thailand (RCAT) and The Thai Association for the Study of Pain (TASP). *Thai J Anesthesiol*. 2020;46(1):47-70.
- Sawhney M, Wong M, Luctkar-Flude M, Jussaume L, Eadie C, Bowry R, et al. Using Simulation to Enhance Education Regarding Epidural Analgesia for Registered Nurses. *Pain Manag Nurs*. 2018;19(3):246-255. doi:10.1016/j.pmn.2017.10.011
- Kasahun HG, Agizew TB, Temesgen MM, Ashagrie HE. Assessment of acute postoperative pain management and associated factors after elective surgery among adult surgical patients: a prospective cross-sectional study. *IJS Short Rep*. 2022 ;7(1):e37. doi:10.1097/SR9.0000000000000037
- Baratta JL, Schwenk ES, Viscusi ER. Clinical consequences of inadequate pain relief: barriers to optimal pain management. *Plast Reconstr Surg*. 2014;134(4 Suppl 2):15S-21S. doi:10.1097/PRS.0000000000000681
- Sharma SK, Thakur K, Mudgal SK, Payal YS. Acute postoperative pain experiences and satisfaction with its management among patients with elective surgery: An observational study. *Indian J Anaesth*. 2020;64(5):403-408. doi:10.4103/ija.IJA_33_20
- Elshamy K, Ramzy E. The effect of postoperative pain assessment and management monitoring program on surgical nurses' documentation, knowledge, attitudes, and patients' satisfaction at Mansoura University Hospitals. *J. Am. sci*. 2011;7(10):500-16.
- Latina R, Mauro L, Mitello L, D'Angelo D, Caputo L, De Marinis MG, et al. Attitude and knowledge of pain management among Italian nurses in hospital settings. *Pain Manag Nurs*. 2015;16(6):959-67. doi:10.1016/j.pmn.2015.10.002
- Liu X, Li L, Wang L, Herr K, Chen Q. Implementation and evaluation of a pain management core competency education program for surgical nurses. *Int J Nurs Sci*. 2020;8(1):51-57. doi:10.1016/j.ijnss.2020.09.008
- Hong SJ, Lee E. Effect of evidence-based postoperative pain guidelines via web for patients undergoing abdominal surgery in South Korea. *Asian Nurs Res (Korean Soc Nurs Sci)*. 2014;8(2):135-42. doi:10.1016/j.anr.2014.05.005
- El-Aqoul A, Obaid A, Jarrah I, Al-Rawashdeh K, Al Hroub A. Effectiveness of Education Program on Nursing Knowledge and Attitude toward Pain Management. *Asia Pac J Oncol Nurs*. 2020;7(4):382-388. doi:10.4103/apjon.apjon_17_20

19. Muñoz-Narbona L, Cabrera-Jaime S, Lluch-Canut T, Castaño PB, Roldán-Merino J. E-Learning course for nurses on pain assessment in patients unable to self-report. *Nurse Educ Pract.* 2020;43:102728. doi:10.1016/j.nepr.2020.102728
20. Salim NA, Joshua R, AbuBaker NA, Chehab F, Jose A. Effect of a nursing in-service education program on nurses' knowledge and attitudes towards pain management in a governmental hospital in the United Arab Emirates: experimental random assignment study. *Dubai Medical Journal.* 2020;2(4):146-52. doi:10.1159/000503560
21. Drake G, de C Williams AC. Nursing Education Interventions for Managing Acute Pain in Hospital Settings: A Systematic Review of Clinical Outcomes and Teaching Methods. *Pain Manag Nurs.* 2017;18(1):3-15. doi:10.1016/j.pmn.2016.11.001
22. Parvizy S, Tarvirdinasab S, Raznahan R, Aliakbari M. The effect of pain management training in workshop on the knowledge, attitude and self-efficacy of pediatric nurses. *J Family Med Prim Care.* 2020;9(6):2880-2884. doi:10.4103/jfmprc.jfmprc_92_20
23. Zhang CH, Hsu L, Zou BR, Li JF, Wang HY, Huang J. Effects of a pain education program on nurses' pain knowledge, attitudes and pain assessment practices in China. *J Pain Symptom Manage.* 2008;36(6):616-27. doi:10.1016/j.jpainsymman.2007.12.020
24. Germossa GN, Sjetne IS, Hellesø R. The Impact of an In-service Educational Program on Nurses' Knowledge and Attitudes Regarding Pain Management in an Ethiopian University Hospital. *Front Public Health.* 2018;6:229. doi:10.3389/fpubh.2018.00229
25. Ogrinc G, Davies L, Goodman D, Batalden P, Davidoff F, Stevens D. SQUIRE 2.0 (Standards for Quality Improvement Reporting Excellence): revised publication guidelines from a detailed consensus process. *BMJ Qual Saf.* 2016;25(12):986-992. doi:10.1136/bmjqs-2015-004411.