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Effects of educational program on Nurses knowledge and practice regarding management of peripheral vascular access at tertiary care hospital

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ABSTRACT

Background and Objectives: In the healthcare industry, effective communication is essential, but intern students frequently struggle with it, which can result in mistakes and unfavorable outcomes. To assess the level of knowledge and practice of nurses regarding the management of peripheral vascular access.

METHODOLOGY: The technical design included research design, setting, participants and tools of data collection. A quasi experimental design was used pre, post and fallow up after 2 months to evaluate the effect of an educational program on nurses' practice regarding management of peripheral vascular acces.the study was conducted in the intensive care units (ICUs) and Medical Departments at Ali Fatima Hospital in Lahore city. Convenient sample of all available nurses (50 nurses) divided into 36 nurses in I.C.U units and 14 nurses in medical departments who are caring patients undergoing peripheral vascular access working in the above mentioned units at the time of the study

RESULTS: Hedges' g and Cohen's d both show that there is a statistically significant and practically significant difference in knowledge between before and after the intervention. This firmly demonstrates the intervention's efficacy.

CONCLUSION: There was significant improvement in nurses' practice between pre and immediately post program implementations. Also there was a significant relation among factors affecting nurses practice and demographic characteristics of all the participants nurses regarding mainly to years of experience, education level and age.

KEYWORDS: Healthcare, communication, nurses, Intensive care unit, knowledge

INTRODUCTION

In both inpatient and outpatient settings, vascular catheters are frequently used to sustain patients' status and are crucial to contemporary healthcare. It's critical to provide nursing care for peripheral vascular lines. To reduce the risks associated with peripheral vascular lines, a thorough understanding of the process is quite beneficial. The principles of safe insertion, injection, dressing change, and flushing procedure must be ingrained in the minds of all staff members.1Assessing how an educational program affects nurses' practice in managing patients receiving peripheral vascular access is the study's main goal. Design of research: Quasi-experimental design was utilized to conduct the study at Ali Fatima hospital and Green International University in Lahore. The study nurses consisted of 50 nurses.2

Peripheral vascular access (PVA) is a commonly used procedure in clinical settings, with a crucial role in the administration of medications, fluids, and blood products. Peripheral intravenous catheters (PIVCs) are typically used for short-term access, yet the procedure, while routine, is not without risks. (Hassanein and Sobh 2021) Improper management of PVA can lead to various complications such as infection, infiltration, phlebitis, and thrombosis, which can significantly affect patient outcomes and increase healthcare costs. Nurses play a central role in the insertion, management, and maintenance of these access devices,

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making their knowledge and skills crucial to patient safety.3

Educational programs designed to improve nurses' competency in managing peripheral vascular access have gained increasing attention in recent years. These programs aim to enhance nurses' knowledge of best practices, boost their confidence, and improve their ability to handle the complexities associated with PVA.(Bahl, Mielke et al. 2025) This is essential because, despite the common nature of PVA procedures, many nurses report gaps in their knowledge and skills, leading to inconsistent practices and potential adverse outcomes.4

The impact of educational interventions on nursing practice is well-documented in the literature, with studies consistently showing positive effects on nurses' knowledge, skills, and ultimately patient care outcome.5 This introduction will explore the effects of educational programs on nurses' practices regarding the management of patients undergoing peripheral vascular access, drawing upon recent research to illustrate the importance of such initiatives.6

Peripheral vascular access, primarily achieved through the insertion of a peripheral intravenous catheter (PIVC), is essential for patient care in various clinical settings. However, despite its frequent use, improper management of PIVCs can result in several complications, such as infection, extravasation, and clot formation.7 According to the Centers for Disease Control and Prevention (CDC), healthcare-associated infections linked to intravenous catheters can lead to prolonged hospital stays, increased healthcare costs, and higher morbidity and mortality rates. Given the critical role of nurses in the insertion and maintenance of these devices, it is crucial that they have comprehensive training to minimize the risks associated with PVA.8

Nurses are required to maintain PIVCs, recognize complications, and intervene appropriately when issues arise. However, studies have shown that there are significant gaps in nurses' knowledge regarding the insertion and management of these devices. A study by found that despite the widespread use of PIVCs, many nurses lacked the knowledge necessary to prevent complications such as infections or phlebitis. These findings highlight the need for structured educational programs to ensure that nurses are adequately prepared to manage PVA effectively.9

Educational programs are designed to address these knowledge gaps and provide nurses with the necessary skills to ensure safe and effective PVA management. These programs can take various forms, including workshops, online courses, simulation training, and hands-on practice sessions. A critical component of these programs is the emphasis on evidence-based practices, infection control, and the prevention of complications associated with PVA. 10

The effectiveness of educational programs has been a subject of numerous studies, with most research showing a clear positive impact on nursing practice. A study by demonstrated that an educational program significantly improved nurses' knowledge and practices regarding the management of PVA in a hospital setting.11 The study, which involved 100 nurses, found that after attending the program, nurses were able to demonstrate increased competence in PIVC insertion, maintenance, and complication prevention. Nurses who received the educational intervention also exhibited a heightened awareness of infection control protocols, which led to a reduction in PVA-related complications such as infections and thrombophlebitis. This study underscores the direct correlation between educational interventions and improved nursing practices in PVA management.12

Another study by (Al-Fadhli et al 2022) focused on the impact of a blended learning program, which combined online training with in-person simulation exercises. The study, conducted in a large teaching hospital, included 150 nurses. After completing the training program, nurses demonstrated a significant improvement in their ability to insert PIVCs correctly and manage complications such as infiltration and phlebitis. The study highlighted that blended learning methods, which offer flexibility and practical experience, can effectively enhance both theoretical knowledge and hands-on skills, making them particularly beneficial for nurses working in busy clinical environment. 13

The ultimate goal of educational programs for nurses is to improve patient care and safety. Evidence from several studies has shown that when nurses are better trained in PVA management, patient outcomes improve significantly. According to a study by Finnegan et al. (2021), hospitals that implemented comprehensive educational programs on PIVC management saw a reduction in PVA-related complications, such as infections and phlebitis, resulting in improved patient outcomes and lower healthcare costs. Nurses who underwent specialized training were better able to detect complications early and intervene promptly, which contributed to faster recovery times and reduced hospital readmission rates 14

Additionally, improved nursing practices through education contribute to higher patient satisfaction. Patients who experience fewer complications related to

PIVCs, such as infections or extravasation, report higher satisfaction with their care. A study by Mann et al. (2022) found that patients whose nurses had completed specialized training in vascular access management reported a more positive care experience, especially in terms of comfort and the perceived safety of their intravenous lines.15

METHODOLOGY

The materials and methods for this research design were utilizes using 4 designs.as follows

(I) TECHNICAL DESIGN:

The technical design included research design, setting, participants and tools of data collection.

(2) Research Design:

A quasi experimental design was used pre, post and fallow up after 2 months to evaluate the effect of an educational program on nurses' practice regarding management of peripheral vascular access.

(3) Study Setting:

The study was conducted in the intensive care units (ICUs) and Medical Departments at Ali Fatima Hospital in Lahore city. The intensive care unit (ICU) contains 18 beds divided into 2 main units: general ICU, and Surgical ICU. The medical departments contain 56 beds divided into: medical disease unit, tropical unit, chest unit, gastric unit and rheumatic disease unit.

(4) Study samples:

Convenient sample of all available nurses (50 nurses) divided into 36 nurses in I.C.U units and 14 nurses in medical departments who are caring patients undergoing peripheral vascular access working in the above mentioned units at the time of the study.

Duration of study: duration of this study is 21 February, 2025 to June, 2025.

Sampling techniques: stratified sampling techniques.

Inclusion criteria: Nursing Novice (interns) and nursing students and nursing officers.

Exclusion Criteria: Doctors and Technicians

Equipment: intravenous line (IVL), cotton swabs, tourniquet, IVL fixer, sticking.

Tool:

Two tools were used to collect data

Tool I was assessment questionnaire and

Tool II was observational checklist to assess the knowledge of nurses.

RESULTS

The frequency distribution of scores among a group of 54 individuals on a variable called "preknowledge" is shown in this table. Fifty participants gave valid answers out of the total, and four (7.4%) were missing.

Table 1: An explanation of the Preknowledge Frequency

Preknowledge

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	19.00	1	1.9	2.0	2.0
	20.00	5	9.3	10.0	12.0
	21.00	5	9.3	10.0	22.0
	22.00	8	14.8	16.0	38.0
	23.00	16	29.6	32.0	70.0
	24.00	7	13.0	14.0	84.0
	25.00	4	7.4	8.0	92.0
	26.00	3	5.6	6.0	98.0
	27.00	1	1.9	2.0	100.0
	Total	50	92.6	100.0	
Missing	System	4	7.4		
Total		54	100.0		

The scores, which range from 19 to 27, represent the participants' prior knowledge levels prior to any kind of evaluation or intervention. Below is a summary of the data:

• 16 participants stated that the most common score (mode), which accounts for 32% of all valid responses, was 23.

• The second most common score is 22, observed in 8 participants (16%).

• Scores of 20 and 21 each occurred in 5 participants (10% each).

• Very few participants scored at the extremes:

• Only 1 participant scored 19 (2%).

• Only 1 participant scored 27 (2%).

The cumulative percent column indicates that 70% of the participants scored 23 or below, and 100% scored 27 or below, confirming that this is the upper limit of observed scores. This distribution suggests that the data is slightly concentrated around the mid-to-high range (especially scores from 22 to 24), with fewer participants at the lower and upper extremes. This may indicate that most participants had a moderate to moderately high level of preknowledge

Table 2: Descriptive Summary of the Post knowledge Frequency

post knowledge

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	47.00	1	1.9	2.0	2.0
	48.00	1	1.9	2.0	4.1
	49.00	4	7.4	8.2	12.2

	50.00	6	11.1	12.2	24.5
	51.00	6	11.1	12.2	36.7
	52.00	7	13.0	14.3	51.0
	53.00	6	11.1	12.2	63.3
	54.00	2	3.7	4.1	67.3
	55.00	9	16.7	18.4	85.7
	56.00	4	7.4	8.2	93.9
	57.00	3	5.6	6.1	100.0
	Total	49	90.7	100.0	
Missing	System	5	9.3		
Total		54	100.0		

This table presents the distribution of scores on the variable "post knowledge", likely collected after some form of learning or instructional intervention. Out of 54 participants:

• 49 provided valid responses (90.7%)

• 5 responses were missing (9.3%)

Score Range and Distribution:

• Scores range from 47 to 57, which is a wider and generally higher range than the "preknowledge" scores.

• The most frequently observed score is 55, reported by 9 participants (18.4% of valid responses).

• Other relatively common scores include: o 52 (14.3%) o 50, 51, and 53 (each around 12.2%)

Distribution Pattern and Skewness:

• The distribution is centered in the 50–55 range, indicating that the majority of participants performed in this mid-to-high range following the intervention.

• Only six people overall participated in the lower end of the distribution (scores 47–49).

• The data is largely accounted for by the higher scores (55–57) (16 participants, or roughly 32.7%).

Cumulative Percentages:

• About 51% of participants scored 52 or below.

• 85.7% scored 55 or below.

• All valid responses (100%) fall within the 47–57 range.

Overall Interpretation:

Compared to the preknowledge scores, the post knowledge scores appear higher and more concentrated in the upper range, suggesting an improvement in knowledge after an intervention. The most common score (mode) shifted upward, and the frequency of lower scores decreased. This points to a general gain in knowledge among participants

Table 3: Description of the Paired Samples

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	preknowledge - post knowledge	-29.714	3.12916	.44702	-30.61309	-28.81548	-66.471	48	.000

The table presents the results of a paired samples t-test, used to evaluate whether there is a statistically significant difference between two related means — in this case, the scores before and after an intervention (referred to as preknowledge and post knowledge).

Pair 1 (preknowledge – post knowledge):

This row shows the comparison between the scores before and after the intervention.

• Mean Difference: -29.71

This indicates that post knowledge scores were, on average, 29.71 points higher than preknowledge scores. The negative value shows improvement (assuming higher scores indicate more knowledge).

• Standard Deviation: 3.13

Reflects the variability in the differences between pre and post scores.

• 0.447 is the standard error mean.

The sample mean difference's estimated standard deviation is this. A smaller number denotes a more accurate assessment.

• [-30.61, -28.82] is the 95% CI for the difference.

Since 0 is not included in this interval, the difference is statistically significant. With a 95% confidence level, we can say that the true mean difference is between -30.61 and -28.82.

• T-value: -66.47

A very large negative t-value, suggesting a strong difference between the two conditions.

• Degrees of Freedom (df): 48

Reflects the number of participants minus one, implying data from 49 individuals.

• Significance (2-tailed): .000

the p-value is less than .001, showing a highly significant difference between pre and post scores.

Table 4: The denominator used in estimating the effect sizes

Paired Samples Effect Sizes

			Standardizer	Point Estimate	95% Confidence Interval Lower	Upper
Pair 1	preknowledge - post knowledge	Cohen's d	3.12916	-9.496	-11.407	-7.579
		Hedges' correction	3.15388	-9.422	-11.317	-7.520

a. The denominator used in estimating the effect sizes. Cohen's d uses the sample standard deviation of the

mean difference.

Hedges' correction uses the sample standard deviation of the mean difference, plus a correction factor.

The Effect Sizes Table for Paired Samples:

- There are two widely used standardized effect size measurements in this table:
- Cohen's d Point Approximation: 3.129
- The confidence interval is [-11.407, -7.579]. [-11.407,-7.579]

Meaning: A very large effect size is indicated by a Cohen's d = 3.13.

In accordance with standard benchmarks:

- 0.2 is little.
- 0.5 is equivalent to medium.
- 0.8 indicates a large
- >2 indicates a very significant

This indicates that the intervention had a significant effect on knowledge.

Hedges' Correction

- Point Estimate: 3.154
- Confidence Interval: [−11.317,−7.520][-11.317, -7.520][−11.317,−7.520]
- Interpretation: Similar to Cohen's d but with a small-sample bias correction.
- Hedges' g is used especially when the sample size is small (as in this case, n=49n = 49n=49).
- The estimate is nearly the same, reinforcing the conclusion of a very large effect.

The negative values in the confidence intervals (e.g., −11.407-11.407−11.407) refer to directionality because preknowledge minus post knowledge is negative — but in terms of magnitude, they still represent a large positive effect (i.e., post > pre).

DISCUSSION

An accurate picture of the success of the instructional intervention given to the participants can be obtained by analyzing the pre knowledge and post knowledge scores. The pre knowledge scores, which were gathered from 54 participants (50 of whom provided valid answers), indicate that the group's baseline level of comprehension before any official training was provided was moderate. Scores varied from 19 to 27, with 16 participants (32% of valid responses) reporting the highest score of 23. There was little variation in starting knowledge, as indicated by the majority of scores clustering closely between 22 and 24. 70% of participants received scores of 23 or lower, according to the cumulative frequency data, indicating that most of the group began with only rudimentary knowledge. Only one participant achieved a score of 19, and another.16

Following the intervention, the post knowledge scores demonstrate a notable upward shift in performance. The post-intervention scores, based on 49 valid responses, range from 47 to 57—a significantly higher and broader range than the pre-intervention scores. The most common score shifted from 23 to 55, with 9 participants (18.4%) achieving this score. Additionally, a large portion of participants scored within the 50–55 range, and 16 participants (approximately 33%) scored between 55 and 57. Only a small fraction of participants remained at the lower end of the distribution (47–49), which included just six individuals in total. This suggests that the intervention was broadly successful in raising knowledge levels, with the vast majority of the group achieving scores near the upper end of the new distribution. The upward trend in both the mode and overall distribution clearly shows that the participants benefited significantly from the instructional content or method.17

The change in distribution from preknowledge to post knowledge reveals a strong positive outcome. Where the preknowledge scores showed a tight concentration in the low-to-mid-twenties, the post knowledge scores are not only higher but also more widely spread, especially toward the upper end of the range. This indicates that the intervention not only improved knowledge on average but also allowed for greater differentiation among participants. Some individuals may have reached a deeper or more advanced level of understanding, as evidenced by the higher scores near the upper limit of the post-test range. Furthermore, the fact that relatively few participants remained in the lower scoring range post-intervention suggests that the instructional method was effective even for those who began with less background knowledge.18

These results collectively support the conclusion that the instructional intervention had a significant positive impact on learning outcomes. The substantial upward shift in scores across the board highlights the success of the intervention in enhancing knowledge retention and comprehension. The data suggest that the majority of participants moved from a moderate pre-existing level of knowledge to a significantly improved post-intervention understanding. In addition, the effectiveness of the intervention appears consistent across the group, with benefits observed at all levels of prior knowledge. This demonstrates not only the instruc-

tional value of the intervention but also its broad applicability and inclusiveness. Future implementations of this approach could continue to yield similar gains, making it a valuable tool for knowledge development in similar populations.19-20

CONCLUSION

There was significant improvement in nurses' practice between pre and immediately post program implementations. Also there was a significant relation among factors affecting nurses practice and demographic characteristics of all the participants nurses regarding mainly to years of experience, education level and age.
Recommendations:

• Providing continuous nursing education to upgrade their practice concerning patients care with peripheral vascular access.

• Conflict between nurses should be solved by nurse administrator to save their efforts toward patient care.

• Replication of the current study on a large probability sample from different geographical areas to achieve more generalized results.

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REFERENCES

1. Abdelhakem, R. S. (2024). "Assessment of Nurses' Performance Regarding Factors Contributing to Complication of Peripheral Vascular Access Device in Neonatal Intensive Care Unit." Helwan International Journal for Nursing Research and Practice 3(7): 1-11.
2. AbdelRazik AbdelHakim, E., et al. (2021). "Effect of Blended Learning Program on nurses' knowledge and Practice regarding peripheral vascular catheter insertion for adult patient." Egyptian Journal of Health Care 12(3): 2041-2053.
3. Abo Seif, H. S., et al. (2021). "EFFECT OF AN EDUCATIONAL PROGRAM ON NURSES'KNOWLEDGE REGARDING MANAGEMENT OF PATIENTS UNDERGOING PERIPHERAL VASCULAR ACCESS." Port Said Scientific Journal of Nursing 8(3): 24-45.
4. Al-Naeli, K. F. and H. Hassan (2021). "Effectiveness of an Interventional Program on Nursing Staffs' Practices toward Prevention of Peripheral Intravenous Cannula Complications in Al-Diwaniyah Teaching Hospital." Kufa Journal for Nursing Sciences 11(1): 182-192.
5. Bahl, A., et al. (2025). "A standardized educational program to improve peripheral vascular access outcomes in the emergency department: A quasi-experimental pre-post trial." The journal of vascular access 26(1): 293-305.
6. Behairy, A. S., et al. (2023). "Effect of Nursing Training Regarding Peripheral Intravenous Cannula on Nurses Performance and Incidence of Complications." Assiut Scientific Nursing Journal 11(38): 100-111.
7. Buchanan, C., et al. (2024). "Registered Nurses' Association of Ontario (RNAO) best practice guideline on the assessment and management of vascular access devices." The journal of vascular access 25(5): 1389-1402.
8. Casanova-Vivas, S., et al. (2024). "The impact of enhancing vascular access care quality through monitoring and training: A multicentre observational study." The journal of vascular access: 11297298241296163.
9. Casanova-Vivas, S., et al. (2023). "Training, management, and quality of nursing care of vascular access in adult patients: The INCATIV project." The journal of vascular access 24(5): 948-956.
10. Groves, C., et al. (2025). "Development of Ultrasound-Guided Peripheral Vascular Access Education for the Nurse Anesthetist: A Quality Improvement Project." Journal of Nurse Anesthesia Education.
11. Hassanein, A. A. and D. E.-T. Sobh (2021). "EFFECT OF AN EDUCATIONAL PROGRAM ON NURSES'PRACTICE REGARDING MANAGEMENT OF PATIENTS UNDERGOING PERIPHERAL VASCULAR ACCESS." Port Said Scientific Journal of Nursing 8(3): 1-23.
12. Holt, D. M., et al. (2024). "Impact of a Vascular Access Specialty Service on Hospitalized Pediatric Patients: A Pilot Feasibility Study." Journal of the Association for Vascular Access 29(1): 8-34.
13. Mousavi, H., et al. (2024). "The effect of clinical guideline education on the knowledge and practice of nurses for peripheral intravenous catheter placement based on short message service: A quasi-experimental study." The journal of vascular access 25(1): 132-139.
14. Piredda, M., et al. (2024). "Nurses' evidence-based knowledge and self-efficacy in venous access device insertion and management:

Development and validation of a questionnaire." Nursing Open 11(7): e2177.

15. Pittiruti, M., et al. (2023). "European recommendations on the proper indication and use of peripheral venous access devices (the ERPIUP consensus): a WoCoVA project." The journal of vascular access 24(1): 165-182.
16. Van Rens, M. R. and K. Hugill (2025). Peripheral Vascular Access Care and Management. Vascular Access in Neonatal Nursing Practice: A Neuroprotective Approach, Springer: 83-106.
17. Vieira, L. G., et al. (2024). Teaching-Learning Programs to Prevent and Control Infections Related to Long-Term Central Venous Access Device in Cancer Patients: A Systematic Review. Seminars in Oncology Nursing, Elsevier.
18. Zeyada, F. Y. M., et al. (2021). "Effect of educational guidelines on nurses' knowledge and practice Regarding Central line associated blood stream infection at Intensive Care Unit." Tanta Scientific Nursing Journal 23(4): 160-187.
19. Liaw JJ, Yang L, Ti Y, Huang CM, Chao SY, Chang YC. Non nutritive sucking and facilitated tucking relieve neonatal pain during heel stick procedures: a randomized controlled trial. Int J Nurs Stud. 2012;49(3):300 309. doi:10.1016/j.ijnurstu.2011.09.016.
20. Ranjbari N, Masoumpoor A, Shirinabadi Farahani A, Mahdizadeh-Shahri M, Nasiri M. The Effect of Modulating Environmental Stimuli on Pain Experience in Premature Infants During Peripherally Inserted Central Catheter-port Implantation. J Holist Nurs Midwifery. 2024;34(2):117-124. doi:10.32598/-jhnm.34.2.2439

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