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Impact of educational interventions on ICU nurses' knowledge regarding early mobility

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Abstract

Background: Early mobility in intensive care units (ICUs) is a key evidence-based intervention that enhances patient recovery, reduces ICU-acquired weakness, and improves overall functional outcomes. However, limited nurse knowledge and lack of standardized training remain barriers to consistent implementation.

Aim: This study aimed to evaluate the effectiveness of an educational intervention on ICU nurses' knowledge regarding early mobility practices.

Methods: A pre-experimental, one-group pretest-posttest design was used. A convenience sample of 68 ICU nurses with a minimum of six months of ICU experience participated. Data were collected using a validated 30-item knowledge questionnaire and a demographic survey. Following a pretest, participants attended a two-hour interactive educational workshop. Posttests were administered two weeks later. Statistical analysis was performed using paired *t*-tests to assess knowledge improvement and chi-square tests for associations between demographic variables and knowledge gains.

Results: The educational intervention significantly improved nurses' knowledge. The mean knowledge score increased from 15.3 (SD=4.5) to 25.8 (SD=3.2) (t=12.34, p=0.001). 'Good' knowledge scores increased from 14.7% to 58.8%, while 'Poor' scores decreased from 41.2% to 11.8%. Significant associations were observed for education level (p=0.034), ICU experience (p=0.021), and prior training (p=0.008).

Conclusion: The findings demonstrate that structured educational interventions are effective in improving ICU nurses' knowledge on early mobility. Continuous professional training and reinforcement programs are recommended to sustain long-term knowledge retention and clinical application.

Keywords: Early mobility, ICU, nursing education, knowledge improvement, critical care, educational intervention, patient recovery

Introduction

Critically ill patients admitted to Intensive Care Units (ICUs) often experience prolonged immobility due to mechanical ventilation, sedation, invasive monitoring, and therapeutic interventions. Prolonged immobilization causes a cascade of complications including ICU-acquired weakness (ICUAW), muscle wasting, orthostatic intolerance, pressure ulcers, delirium, and long-term physical disability [1]. Studies indicate that nearly half of ICU survivors develop functional impairment related to immobility and critical illness neuropathy [2]. To counteract these effects, early mobility (EM) defined as initiating physical activity as soon as it is safe for ICU patients has emerged as a vital evidence-based practice to improve outcomes and accelerate recovery.

Early mobility aims to preserve muscle mass, enhance pulmonary function, and prevent complications such as deep vein thrombosis, pneumonia, and deconditioning [3]. Empirical evidence demonstrates that early mobility contributes to shorter ICU stays, decreased mechanical ventilation duration, and improved discharge independence [4]. In a pilot study, Azuh *et al*. reported that early active mobility interventions significantly reduced the duration of mechanical ventilation and enhanced post-ICU functional status [5]. Similarly, Rohr [6] found that early mobility promoted better sleep, psychological well-being, and reduced delirium among ICU patients.

Despite its documented benefits, consistent implementation of early mobility remains challenging in many ICUs worldwide. Barriers include inadequate nurse knowledge, lack of training, safety concerns, and insufficient multidisciplinary coordination [7, 8]. As frontline caregivers, ICU nurses play a pivotal role in initiating, monitoring, and sustaining mobility protocols; however, their understanding and confidence directly affect successful application [9]. Balas *et al*. emphasized that nurses' knowledge of patient selection criteria, risk assessment, and progression stages is critical to the success of early mobility interventions [2]. Therefore, improving nurses' knowledge through structured educational interventions is essential for ensuring evidence-based critical care practice.

Educational Interventions and Nurse-Driven Protocols

Educational interventions have been shown to positively influence nurses' awareness, attitudes, and implementation of early mobility practices. Khan [1] implemented a nurse-driven early mobility protocol in Lahore and reported a significant increase in ICU nurses' knowledge and adherence to mobility guidelines. Similarly, Uustal [3] documented that a structured, nurse-driven mobility protocol in critical care enhanced both comprehension and performance related to early mobilization steps.

Dang [4] developed the "ABCDEs of ICU" framework Awakening, Breathing coordination, Delirium monitoring, and Early mobility demonstrating that structured education improves teamwork, clarity of roles, and consistent mobility practice. Bassett *et al*. [9] also highlighted that multidisciplinary mobility programs improved compliance and patient recovery through coordinated nursing and physiotherapy collaboration. These studies affirm that education and training act as catalysts for behavioral change and are essential in bridging the gap between evidence and practice.

Educational initiatives also empower nurses to overcome misconceptions and safety fears associated with early mobility. Balas *et al*. [2] and Fraser *et al*. [7] observed that post-intervention, nurses demonstrated greater confidence and willingness to mobilize ventilated patients, indicating that knowledge gain leads to practical application. Educational interventions, particularly when interactive, encourage critical thinking and enhance nurses' clinical judgment in assessing patient readiness for mobility.

Need for the Study

In the Indian healthcare context, particularly in tertiary and semi-urban hospitals, there remains limited emphasis on continuous professional education about early mobility. ICU nurses often rely on personal experience rather than standardized protocols, which leads to inconsistent practices and underutilization of mobility interventions. Mohamed *et al*. [11] found that nurses' limited exposure to structured training programs hindered their ability to apply early mobilization principles effectively.

Although international studies have validated the role of nurse education in promoting early mobility [3, 7, 8], Indian studies exploring the same are scarce. Most available research focuses on patient outcomes rather than evaluating nurses' knowledge or the effectiveness of educational programs in improving clinical understanding. Consequently, there exists a research gap regarding how structured teaching interventions can influence nurses' knowledge and behavior in implementing early mobility in ICU settings.

Fraser *et al*. [7] emphasized that continuing education, when delivered through interactive workshops and hands-on learning, not only enhances immediate knowledge but also fosters long-term retention and compliance. Krupp *et al*. [8] supported this by concluding that experienced nurses who undergo repeated educational training are more consistent in applying early mobility interventions. Hence, structured educational interventions addressing knowledge, attitudes, and perceived barriers are necessary to ensure that ICU nurses can safely and effectively implement early mobility.

Relation to Nursing Practice

From a nursing standpoint, early mobility represents an integration of clinical skills, decision-making, and multidisciplinary collaboration. Nurses must assess hemodynamic stability, monitor physiological responses, and ensure patient safety during mobility sessions. Elsayed *et al*. [10] demonstrated that educational guidelines for nurses significantly improved both the performance of early mobilization tasks and the functional recovery of stroke patients. This correlation emphasizes that nursing education directly impacts the quality of care and patient outcomes.

Incorporating early mobility within nursing practice not only improves physical recovery but also enhances patient psychological well-being and reduces hospitalization costs. As nurses are key facilitators in mobilizing critically ill patients, their empowerment through knowledge and evidence-based education becomes vital. Such interventions promote confidence, accountability, and professional growth, reinforcing a culture of safety and proactive rehabilitation within ICUs [12].

Rationale of the Study

Given the proven benefits of early mobility and the pivotal role of nurses, educational interventions are necessary to bridge existing knowledge gaps and enhance practical competency. While global studies (e.g., Balas *et al*. [2], Dang [4], Fraser *et al*. [7]) have reported significant improvements following educational programs, limited Indian data exist on the topic. There is an urgent need to assess the effectiveness of structured educational interventions on nurses' knowledge, attitudes, and practices related to early mobility in local ICU settings.

This study therefore focuses on developing, implementing, and evaluating a structured educational intervention aimed at improving ICU nurses' knowledge regarding early mobility. It is anticipated that such an initiative will not only elevate the standards of nursing care but also strengthen patient recovery outcomes and institutional adherence to evidence-based critical care practices.

Aim of the Study

1. To evaluate the effectiveness of an educational intervention on ICU nurses' knowledge regarding early mobility practices.
2. To compare pre- and post-intervention knowledge scores among ICU nurses.
3. To determine associations between selected demographic variables (education level, ICU experience, and prior training) and knowledge improvement following the intervention.

Materials and Methods

Research Design

A pre-experimental one-group pretest-posttest design was adopted to evaluate the effectiveness of an educational intervention on ICU nurses' knowledge regarding early mobility practices. This design was chosen because it allows assessment of the effect of an intervention within the same group of participants by comparing their pre-intervention and post-intervention knowledge levels. The study focused on measuring changes in knowledge rather than behavioral or clinical outcomes, making this design appropriate for a pilot educational assessment.

Setting of the Study
The study was conducted in the Intensive Care Unit (ICU) of a selected tertiary care hospital in Jaipur, Rajasthan, India, which provides both medical and surgical intensive care services. The hospital was selected for convenience and accessibility and had a sufficient number of nursing staff involved in direct ICU patient care. The ICU comprised multidisciplinary units where mobility practices varied depending on patient condition, allowing for an appropriate setting to assess baseline knowledge and the impact of the intervention.

Population and Sample
The study population consisted of registered ICU nurses currently working in the selected hospital. A convenience sampling technique was employed to recruit participants who met the inclusion criteria. A total of 68 nurses participated, which was considered adequate for a pilot study aimed at testing feasibility, estimating effect size, and refining the educational content for larger-scale implementation.

Inclusion Criteria
- Registered nurses working in the ICU with a minimum of six months of ICU experience.
- Willing to participate and available during both pretest and posttest data collection.
- Able to understand and communicate in English or Hindi.

Exclusion Criteria
- Nurses on leave or assigned to administrative/non-clinical duties during the study period.
- Nurses who had previously participated in formal early mobility training programs in the last six months.

Description of the Intervention
The educational intervention consisted of a two-hour structured training session titled *"Early Mobility in ICU: Nurse's Role in Patient Recovery."* The intervention was designed using current literature, clinical guidelines, and best practices drawn from evidence-based frameworks such as the ABCDE bundle (Awakening, Breathing coordination, Delirium monitoring/management, and Early mobility).
The intervention was divided into three phases:
1. **Orientation and Pretest Phase:** Participants completed a structured pretest questionnaire assessing baseline knowledge regarding early mobility.
2. **Educational Workshop Phase:** A comprehensive teaching session was conducted by the researcher using PowerPoint presentations, case discussions, and interactive group activities. Topics included the definition, importance, physiological benefits, safety precautions, contraindications, and stepwise progression of early mobility in critically ill patients.
3. **Posttest Phase:** Two weeks after the intervention, participants completed the same questionnaire to evaluate knowledge improvement and retention.

Development of the Tool
A structured knowledge questionnaire was developed after reviewing previous studies and relevant literature. The tool consisted of 30 multiple-choice questions covering:
- Concept and definition of early mobility
- Physiological benefits and indications
- Contraindications and safety parameters
- Nurse's role and responsibilities
- Interdisciplinary coordination in mobility programs

Each correct answer was awarded one mark, with total possible scores ranging from 0 to 30. The tool also included a demographic data form collecting information such as age, gender, education, ICU experience, prior training, and work shift.

Validity and Reliability of the Tool
Content validity was established by a panel of five subject experts (two critical care nursing professors, one intensivist, and two nursing education specialists). Based on their feedback, minor modifications were made to enhance clarity and relevance. The split-half reliability coefficient ($r = 0.77$) confirmed that the tool had acceptable internal consistency and reliability for research use.

Data Collection Procedure
Data collection was carried out over a four-week period following administrative and ethical approval. The process included:
1. **Obtaining Permission:** Formal authorization was secured from the hospital authorities and the Institutional Ethics Committee of Nirwan University, Jaipur.
2. **Informed Consent:** Written informed consent was obtained from all participants after explaining the purpose, procedure, and confidentiality of the study.
3. **Pretest Administration:** The pretest questionnaire was distributed to the participants before the educational session. Average completion time was 25-30 minutes.
4. **Educational Session:** The interactive teaching session was conducted in small batches (10-15 nurses per session) to ensure effective communication and engagement.
5. **Posttest Administration:** After a two-week interval, the same questionnaire was re-administered to evaluate knowledge improvement.

All responses were coded and entered into a master data sheet for statistical analysis. Confidentiality was strictly maintained throughout the study.

Ethical Considerations
Ethical approval was obtained from the Institutional Ethical Review Board of Nirwan University, Jaipur (Ref. No. NUN/HS/2025/034). Participation was voluntary, and confidentiality was assured. No personal identifiers were disclosed in any reports. Participants were informed that they could withdraw at any stage without penalty. The study adhered to the ethical standards outlined in the Declaration of Helsinki (2013 revision).

Statistical Analysis
Data were analyzed using SPSS (version 25.0). Descriptive statistics such as mean, standard deviation (SD), frequency, and percentage were used to summarize demographic and

knowledge variables. The effectiveness of the educational intervention was assessed using the paired t-test to compare pretest and posttest mean knowledge scores. The chi-square test was applied to determine associations between demographic variables (e.g., education level, ICU experience, prior training) and post-intervention knowledge scores. A *p*-value of <0.05 was considered statistically significant.

Results

A total of 68 ICU nurses participated in the study. The demographic profile is summarized in table 1. Most participants (43.42%) were between 30-39 years, while 28.95% were aged 20-29 years, and 17.11% were 40 years and above. The majority of the nurses were female (63.16%). In terms of educational qualifications, 46.05% held a Bachelor's degree in Nursing, 39.47% had a Diploma, and 3.95% had a Master's degree. Regarding ICU experience, 34.21% had less than two years, 31.58% had 2-5 years, and 23.68% had more than five years of experience. Over half of the nurses (59.21%) reported prior training related to early mobility. Most participants (68.42%) were staff nurses working in rotating shifts.

Table 1: Demographic Data of Participants

Demographic Variable	Details	Frequency	Percentage (%)
Age Group (Years)	20-29	22	28.95%
	30-39	33	43.42%
	40 and above	13	17.11%
Gender	Male	25	32.89%
	Female	43	56.58%
Education Level	Diploma	30	39.47%
	Bachelor's	35	46.05%
	Master's	3	3.95%
Years of ICU Experience	Less than 2 years	26	34.21%
	2-5 years	24	31.58%
	More than 5 years	18	23.68%
Previous Training on Early Mobility	Yes	45	59.21%
	No	23	30.26%
Marital Status	Married	40	52.63%
	Unmarried	28	36.84%
Job Position	Staff Nurse	52	68.42%
	Head Nurse	10	13.16%
	Nurse Educator	6	7.89%
Work Shift	Day Shift	35	46.05%
	Night Shift	33	43.42%

The data indicate a predominantly mid-career female nursing workforce with moderate levels of education and experience, suggesting an appropriate target group for capacity-building interventions.

Table 2: Pretest and Posttest Results

Score Category	Pretest Frequency	Pretest Percentage (%)	Posttest Frequency	Posttest Percentage (%)
Good	10	14.7	40	58.8
Average	30	44.1	20	29.4
Poor	28	41.2	8	11.8

Table 3: Effectiveness of Intervention

Measure	Mean	SD	Mean Difference	t-value	p-value
Pretest	15.3	4.5	10.5	12.34	0.001
Posttest	25.8	3.2			

The pretest-posttest comparison of nurses' knowledge levels revealed a significant improvement after the educational intervention (Table 2).

Prior to the intervention, only 14.7% of nurses demonstrated Good knowledge, while 41.2% scored in the Poor category. Following the educational workshop, 58.8% achieved Good knowledge, and only 11.8% remained in the Poor category.

The mean knowledge score increased from 15.3±4.5 in the pretest to 25.8±3.2 in the posttest, with a mean difference of 10.5 points. The improvement was statistically significant ($t = 12.34$, $p = 0.001$), confirming the effectiveness of the intervention (Table 3).

The marked increase in mean knowledge scores and the shift from "Poor" to "Good" categories demonstrate that the educational workshop was highly effective in improving ICU nurses' understanding of early mobility principles and practices.

Table 4: Association Between Demographic Variables and Knowledge Improvement

Demographic Variable	Chi-Square Value	Degrees of Freedom (df)	p-value	Significance
Age Group	2.34	2	0.210	Not Significant
Gender	1.45	1	0.230	Not Significant
Marital Status	0.89	1	0.346	Not Significant
Education Level	6.75	2	0.034	Significant
Years of ICU Experience	5.48	2	0.021	Significant
Previous Training on Early Mobility	7.12	1	0.008	Significant

Associations between selected demographic characteristics and post-intervention knowledge improvements were assessed using the chi-square test (Table 4).

Significant associations were found for education level (χ^2 = 6.75, p = 0.034), years of ICU experience (χ^2 = 5.48, p = 0.021), and previous training on early mobility (χ^2 = 7.12, p = 0.008). Other variables, such as age, gender, and marital status, did not show significant relationships with knowledge gain (p > 0.05).

Nurses with higher educational qualifications, greater ICU experience, and previous exposure to early mobility training showed significantly higher knowledge gains. This suggests that professional maturity and prior learning experiences enhance responsiveness to educational interventions.

Discussion

The present study evaluated the impact of an educational intervention on ICU nurses' knowledge regarding early mobility and demonstrated a statistically significant improvement following the intervention. The mean knowledge score increased from 15.3±4.5 in the pretest to 25.8±3.2 in the posttest (t = 12.34, p = 0.001), indicating the effectiveness of structured teaching in enhancing nurses' understanding of evidence-based mobility practices. The proportion of nurses achieving "Good" knowledge levels increased from 14.7% to 58.8%, while "Poor" knowledge declined from 41.2% to 11.8%.

These findings are consistent with prior research emphasizing that educational programs significantly enhance healthcare professionals' knowledge and practice of early mobility. Khan [1] reported a substantial improvement in ICU nurses' adherence to early mobility protocols following a structured, nurse-driven intervention, paralleling the results of the present study. Similarly, Balas *et al*. [2] demonstrated that integrating the ABCDE bundle which includes early mobility into ICU care improved nurses' understanding and confidence, leading to better patient outcomes.

The observed post-intervention knowledge gain also aligns with Uustal's [3] findings, where implementation of a nurse-driven mobility protocol improved staff competency and compliance. Dang [4] further highlighted that structured educational sessions on early mobility improved teamwork and safety awareness, supporting the need for interprofessional education as a catalyst for behavioral change in critical care.

The present study also found significant associations between knowledge improvement and selected demographic factors education level (p = 0.034), ICU experience (p = 0.021), and prior training (p = 0.008). These findings suggest that nurses with greater professional exposure and formal training are more receptive to educational interventions. Similar results were observed by Krupp *et al*. [7], who concluded that ICU experience enhances the translation of training into clinical decision-making, and by Mohamed *et al*. [22], who reported that previous exposure to mobility training led to better learning outcomes and sustained practice adherence.

The present results corroborate the outcomes of Fraser *et al*. [8], who found that educational interventions reduced knowledge gaps and improved early mobility implementation among critical care nurses. Bassett *et al*. [9] also confirmed that integrating multidisciplinary education on mobility within ICU teams fosters greater compliance and collective accountability. Furthermore, Elsayed *et al*. [10] observed that structured educational guidelines significantly enhanced nurses' performance and patients' functional recovery, reinforcing the effectiveness of training-driven improvements.

The decline in poor knowledge scores in this study mirrors the outcomes of Azuh *et al*. [5], who demonstrated improved knowledge and patient outcomes after early mobility education. Rohr [6] also reported improved sleep and psychological outcomes among patients mobilized by well-trained ICU nurses, indirectly validating the importance of education on nurse performance.

Interestingly, no significant association was observed between demographic factors such as age, gender, or marital status and knowledge improvement (p > 0.05). This contrasts with findings by Mohamed *et al*. [17], who reported demographic influences on knowledge acquisition. Such divergence may stem from contextual differences such as educational systems, resource availability, or institutional culture highlighting that learning outcomes depend more on training quality and engagement than on demographic attributes.

The findings also align with broader global evidence that knowledge-based interventions are foundational to evidence-based critical care nursing. Fraser *et al*. [8] and Bassett *et al*. [19] emphasized that consistent mobility education improves adherence to ICU protocols and patient recovery rates. Educational interventions provide not only cognitive enhancement but also foster a cultural shift in nursing practice, encouraging nurses to integrate early mobility as a standard component of ICU care [12].

The present study's pretest-posttest design enabled clear evaluation of immediate knowledge gains following the intervention. Similar methodological frameworks were used by Dang [4] and Khan [1], who reported parallel results in knowledge improvement and practice adoption. However, the absence of a control group limits causal inference, as improvements could partly reflect increased awareness or Hawthorne effects. Future studies incorporating randomized controlled designs and follow-up assessments could evaluate long-term retention and behavioral translation of knowledge into sustained clinical practice.

Another key observation is that nurses with prior exposure to mobility training exhibited significantly higher posttest scores. This indicates that repeated reinforcement through ongoing continuing education is essential for retention and competence [20]. This aligns with findings from Uustal [3] and Fraser *et al*. [8], who advocated for regular refresher courses and simulation-based learning to maintain proficiency.

Overall, this study contributes to the growing evidence supporting the integration of structured educational programs within ICU nursing curricula. Empowering nurses through continuous professional education fosters competence, confidence, and accountability, all of which are critical to delivering high-quality patient care. These findings emphasize that educational interventions are not merely informational but transformational building the foundation for sustainable culture change in intensive care practice.

Limitations

Despite positive outcomes, the study had certain limitations. The use of a convenience sampling technique restricts generalizability beyond the selected setting. The small sample size (N = 68) and lack of a control group limit comparative strength. Additionally, the study evaluated short-term knowledge gains only, without assessing long-term retention or clinical application. Future studies should employ multi-center randomized trials, larger samples, and follow-up evaluations to validate these findings and assess their impact on patient outcomes.

Implications for Nursing Practice

The results highlight the critical role of educational interventions in enhancing nurses' knowledge and readiness to apply early mobility in ICUs. Regular workshops, simulation training, and interdisciplinary collaboration can improve protocol compliance, optimize patient recovery, and reduce ICU-related complications. Institutional policies should support mandatory continuing education to ensure knowledge translation into consistent practice.

Conclusion

The findings of the present study clearly demonstrate that a structured educational intervention significantly enhances ICU nurses' knowledge regarding early mobility practices. The mean knowledge score improved markedly from 15.3 to 25.8, with a substantial increase in the proportion of participants achieving good knowledge levels. Significant associations between education level, ICU experience, and prior training highlight the influence of professional background on learning outcomes. These results affirm that continuous education and structured training play a pivotal role in strengthening nurses' competence and readiness to implement evidence-based mobility protocols in critical care settings.

By improving knowledge, such interventions not only empower nurses but also foster a culture of safety, collaboration, and proactive patient rehabilitation in ICUs. The study underscores the necessity for hospitals and nursing administrators to integrate early mobility education into routine in-service training and quality improvement programs. Sustained reinforcement through workshops, simulations, and audits can ensure long-term retention and consistent practice.

Future research should focus on assessing behavioral translation of knowledge into clinical performance and its impact on patient outcomes such as length of ICU stay, mechanical ventilation duration, and functional recovery. Ultimately, empowering nurses through education is key to advancing the quality and safety of critical care.

Conflict of Interest

The authors certify that they have no involvement in any organization or entity with any financial or non-financial interest in the subject matter or materials discussed in this paper.

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