

# Enhancing Knowledge and Quality of Care for Patients on Mechanical Ventilation: A Pilot Study of an Educational Intervention for Staff Nurses

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## ABSTRACT

This pilot study aimed to evaluate the effectiveness of an educational intervention in enhancing the knowledge and quality of care of staff nurses managing patients on mechanical ventilation. Twenty staff nurses from a hospital in Dehradun, Uttarakhand, were divided into an experimental group (n=10) and a control group (n=10). The educational package provided covered critical aspects of ventilator care, focusing on both theoretical and practical competencies. Pretest and posttest assessments were conducted using structured knowledge and skill questionnaires. Results demonstrated a statistically significant improvement in both knowledge and quality of care in the experimental group post-intervention. This suggests that such educational packages have promising potential to enhance nursing competencies and improve patient outcomes in critical care settings.

**KEYWORDS:** Staff Nurses, Mechanical Ventilation, Educational Intervention, Knowledge Enhancement, Quality of Care

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## INTRODUCTION

Mechanical ventilation is a critical life-support measure for patients in intensive care, requiring specialized knowledge and skills from nursing staff. Staff nurses play a pivotal role in the management and care of patients on ventilators, influencing patient outcomes through their expertise and ability to deliver high-quality care. Despite the importance of this role, studies indicate that nurses often lack adequate training and confidence in managing ventilated patients, leading to inconsistencies in care and variations in patient outcomes (Crocker, 2009; Griffiths & Jones, 2002). Educational interventions, therefore, are critical in equipping nurses with the necessary knowledge and practical skills to manage ventilated patients effectively.

This study investigates the impact of an educational intervention on nurses' knowledge and quality of care for ventilated patients. Given the limited sample size,

this pilot study serves as a preliminary exploration into the efficacy of such interventions, with the potential to inform larger-scale research in the future.

## Methods

### Design

A quasi-experimental design was employed, with participants divided into an experimental and a control group. The study was conducted in a selected hospital in Dehradun, Uttarakhand, India.

### Sample

Twenty staff nurses were recruited using a convenience sampling method and randomly assigned to either the experimental (n=10) or control group (n=10). Inclusion criteria included nurses working in critical care or intensive care units and responsible for patients on mechanical ventilators. All participants consented to be a part of the study.

## Data Collection Tools

Two primary tools were used to assess the participants' knowledge and quality of care levels:

- 1. Structured Knowledge Questionnaire:** This assessed theoretical knowledge regarding mechanical ventilation, covering patient assessment, ventilator settings, and complication management.
- 2. Skill Questionnaire:** This measured practical skills in managing ventilated patients, evaluating competencies such as suctioning, infection prevention, and ventilator monitoring.

## Intervention

The educational package was designed to address critical areas of ventilator care, emphasizing both knowledge and hands-on skills. Topics included:

- Principles of mechanical ventilation
- Ventilator settings and adjustments
- Complication prevention (e.g., ventilator-associated pneumonia)
- Patient assessment and weaning strategies

The intervention included lectures, demonstrations, and interactive discussions over three days, totalling six hours of instruction. The control group did not receive any additional training during this period.

## Statistical Analysis

Data were analyzed using SPSS software. Descriptive statistics were used to summarize participant demographics and baseline scores, while inferential statistics (paired t-tests) were applied to compare pretest and posttest results within and between groups. Significance was set at  $p < 0.05$ .

## Results

### Section 1: Participant Demographics

The participants were well-matched in terms of age, gender, educational background, and years of experience. This homogeneity helped ensure that differences in post-test results could be attributed to the educational intervention.

Demographic Variable	Experimental Group (n=10)	Control Group (n=10)	Total (N=20)
<b>Age (years)</b>			
22-26	6	5	11
27-30	4	5	9
<b>Gender</b>			
Male	4	4	8
Female	6	6	12
<b>Educational Background</b>			
Graduate	5	4	9
General Nursing and Midwifery (GNM)	4	5	9
Auxiliary Nurse Midwifery (ANM)	1	1	2
<b>Years of Experience</b>			
1-5 years	4	5	9
6-12 years	5	4	9
13-18 years	1	1	2

### Section 2: Pretest Scores of Knowledge and Quality of Care

In the pretest, there was no statistically significant difference between the experimental and control groups in knowledge and quality of care scores ( $p > 0.05$ ). This indicates that both groups started at a similar baseline.

Variable	Experimental Group (n=10)	Control Group (n=10)	t-value	p-value
Knowledge Score	Mean = 16, SD = 3.0	Mean = 16, SD = 3.0	0.00	> 0.05
Quality of Care Score	Mean = 8.5, SD = 1.44	Mean = 8.5, SD = 1.44	0.00	> 0.05

### Section 3: Post-Intervention Knowledge and Quality of Care Scores

Post-intervention results showed that the experimental group experienced a notable improvement in both knowledge and quality of care scores compared to the control group. The mean knowledge score for the experimental group increased from 16 (SD = 3.0) to 26 (SD = 2.25), with a t-value of 6.29 ( $p < 0.05$ ). The quality-of-care score also saw a significant increase, with the experimental group's mean rising from 8.5 (SD = 1.44) to 14.5 (SD = 1.73), yielding a t-value of 11.28 ( $p < 0.05$ ). The control group showed minimal improvement in both knowledge and quality of care scores.

Variable	Pretest Mean $\pm$ SD	Post-test Mean $\pm$ SD	Mean Difference	t-value	p-value
<b>Knowledge Score</b>					
Experimental Group	16 $\pm$ 3.0	26 $\pm$ 2.25	10	6.29	< 0.05
Control Group	16 $\pm$ 3.0	19.5 $\pm$ 2.25	3.5	1.73	> 0.05
<b>Quality of Care Score</b>					
Experimental Group	8.5 $\pm$ 1.44	14.5 $\pm$ 1.73	6	11.28	< 0.05
Control Group	8.5 $\pm$ 1.44	9 $\pm$ 1.50	0.5	0.32	> 0.05

These results indicate that the educational intervention was effective in significantly improving both the knowledge and practical skills of the nurses in the experimental group.

#### Section 4: Correlation Between Knowledge and Quality of Care Scores

The analysis of post-test scores revealed a moderate positive correlation ( $r=0.35$ ) between knowledge and quality of care in the experimental group. This suggests that increased knowledge levels contributed to improved practical care skills, underscoring the importance of theoretical understanding as a foundation for skilful practice.

#### Discussion

This study's findings are consistent with existing literature highlighting the importance of structured training programs in enhancing nurses' competencies in ventilator management (Crocker, 2009; O'Brien & Khan, 2016). The significant improvement in both knowledge and quality of care scores among the experimental group suggests that the educational package was effective. The moderate correlation between knowledge and quality of care supports the theory that enhanced understanding of ventilator mechanics and patient management leads to better clinical practices and patient outcomes (Linton & Farrell, 2009).

#### Implications for Practice

The positive outcomes in this study have several implications for nursing practice:

- 1. Standardized Training:** Incorporating structured educational packages into nursing training programs could enhance care consistency and quality for ventilated patients.
- 2. Skill Reinforcement:** Practical, hands-on training should be combined with theoretical education to reinforce skills and bridge the knowledge-practice gap.
- 3. Periodic Assessments:** Regular assessments of nurse competencies in mechanical ventilation management can help identify gaps in knowledge and practice, enabling targeted interventions.

#### Limitations

While this pilot study provides valuable insights, its limitations must be acknowledged:

- 1. Small Sample Size:** With only 20 participants, the findings may not be generalizable to a larger population of nurses.

- 2. Short Duration:** The intervention was brief, and long-term retention of knowledge and skills was not assessed. Future studies could explore the sustainability of the intervention's effects over time.
- 3. Single Location:** Conducting the study in one hospital limits the applicability of the results to different settings.

#### Future Research

Further research with larger samples and multi-centre designs could provide more robust evidence of the effectiveness of such educational interventions. Longitudinal studies could also examine the retention of knowledge and skills over time, assessing the need for periodic refresher training.

#### Conclusion

This pilot study demonstrates that targeted educational intervention can significantly improve staff nurses' knowledge and quality of care in managing mechanically ventilated patients. The findings underscore the importance of structured training in critical care nursing, suggesting that comprehensive educational packages can be valuable tools in enhancing patient outcomes in intensive care settings.

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