

## EFFECTIVENESS OF AN E-MODULE FOR NURSING SKILLS DEVELOPMENT ON USING MECHANICAL VENTILATORS AMONG ADULT PATIENTS ADMITTED TO THE INTENSIVE CARE UNITS

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### Background

In the realm of intensive care nursing, the demand for proficient skills in continuing education using e-modules is paramount.

### Methodology

A quasi-experimental study was conducted using purposive sampling based on specific inclusion and exclusion criteria. The study involved 97 intensive care unit nurses, with 58 experimental and 39 control. The enrolled participants took the same pre- and post-tests divided in to a multiple-choice questions and competency skills checklist with a designated passing score. T-test was used to determine the effectiveness of the e-module.

### Findings

A detailed independent t-test analysis revealed significant differences with higher post-test scores in the experimental group ( $p < 0.05$ ). The pre-test results indicated that all participants failed the multiple-choice exam component ( $p \geq 0.05$ ), while 100% successfully passed the skills demonstration checklist ( $p \leq 0.05$ ). In the post-test evaluation, all participants successfully passed, with a calculated probability of 1.0 (100%) success rate for overall performance across both assessments. The paired t-test revealed a non-significant difference in pre-test scores between the control ( $M = 62.3$ ,  $SD = 4.5$ ) and experimental groups ( $M = 62.7$ ,  $SD = 4.8$ ),  $t(95) = 0.42$ ,  $p = 0.68$ , but a significant improvement in post-test scores for the experimental group ( $M = 85.2$ ,  $SD = 3.9$ ) compared to the control group ( $M = 65.1$ ,  $SD = 4.3$ ),  $t(95) = 19.87$ ,  $p < 0.001$ . The Pearson correlation showed a weak, non-significant relationship ( $r = 0.12$ ,  $p > 0.05$ ) between the multiple-choice exam and competency checklist pre-experiment, but a strong, significant positive correlation ( $r = 0.85$ ,  $p < 0.001$ ) post-experiment.

### Conclusion

An e-module was an effective tool for nursing skills development on using mechanical ventilators among adult patients admitted to the intensive care unit. A varying baseline competency in theoretical knowledge versus practical skills was concluded.

**Key words:** Mechanical ventilators, intensive care unit, nursing skills, e-module, Saudi

### Introduction

Mechanical ventilator use remains a cornerstone of critical care within intensive care units (ICUs), necessitating specialized nursing competencies to ensure effective patient management (Silva et al., 2022). As digital platforms gain prominence in nursing education, e-modules have shown

potential for facilitating both theoretical understanding and skill development (Zimmerman et al., 2021). This research assesses how an e-module can enhance ICU nurses' proficiency in managing mechanical ventilators, addressing both knowledge-based and practical dimensions (Peine et al., 2021).

Patricia Benner's Novice to Expert model (1984) underpins this study, offering a framework for understanding how nurses evolve from beginners to experts through structured learning experiences. The theory defines five progressive stages—novice, advanced beginner, competent, proficient, and expert—each reflecting deepening clinical insight, efficiency, and intuitive practice (Mortimore et al., 2021).

The e-module in this context acts as a transitional tool, designed to support nurses in progressing through these stages by building both conceptual and hands-on ventilator skills (Georgiou et al., 2023). The post-test improvements observed in the intervention group affirm Benner's premise that structured, experience-based learning fosters competency growth (Quinn, 2020). Ultimately, the e-module contributes to closing the gap between theory and clinical application, accelerating professional development in critical care environments.

### **Methodology**

This quasi-experimental study employed purposive sampling to recruit 97 ICU nurses, allocating 58 to the experimental group and 39 to the control group. Both groups completed pre- and post-intervention assessments comprising a multiple-choice test and a skills checklist. The instruments were validated during a pilot study involving 20 nurses (excluded from the main study), yielding a Cronbach's alpha of 0.89, indicating high reliability. An item analysis of the test was also conducted to ensure quality.

Participants in the experimental group used a structured e-module, accessible via <https://oqdiyahiaahmad.wordpress.com/activities/>, over a 30-day period, while the control group participated in a three-day in-person training. After the intervention period, data were analyzed using paired t-tests to evaluate the impact of the e-module in comparison to traditional in-service training.

### **Findings**

The independent t-test indicated a significant enhancement in the experimental group's post-test performance ( $p < 0.05$ ), supporting the effectiveness of the e-module in building both theoretical and practical competencies. Initial assessments revealed universal failure on the multiple-choice test ( $p \geq 0.05$ ), though participants passed the skills checklist ( $p \leq 0.05$ ). Following the intervention, 100% of the experimental group passed the post-test.

Pre-intervention comparisons showed no significant difference between the control ( $M = 62.3$ ,  $SD = 4.5$ ) and experimental ( $M = 62.7$ ,  $SD = 4.8$ ) groups,  $t(95) = 0.42$ ,  $p = 0.68$ . Post-intervention, the experimental group significantly outperformed the control group ( $M = 85.2$ ,  $SD = 3.9$  vs.  $M = 65.1$ ,  $SD = 4.3$ ),  $t(95) = 19.87$ ,  $p < 0.001$ . Pearson correlation analysis demonstrated a weak, non-significant link between theory and practice in the pre-test phase ( $r = 0.12$ ,  $p > 0.05$ ), but a strong, statistically significant relationship post-test ( $r = 0.85$ ,  $p < 0.001$ ), indicating convergence of knowledge and skills after the e-module.

## Discussion

These results highlight the capacity of e-modules to integrate theoretical instruction with practical application in ICU nursing settings (Dongelmans et al., 2020). Pre-intervention findings reflected a disconnect between cognitive knowledge and hands-on competency, but the post-intervention improvements—especially among those exposed to the e-module—demonstrate how digital learning platforms can enhance troubleshooting and device operation skills (Hawsawi et al., 2021). These outcomes corroborate existing research advocating for e-learning in health professions to improve skill acquisition and long-term retention (Lowenthal & Lomellini, 2023). The strengthened correlation between knowledge and practice after the e-module further supports its role in advancing nurse competency in ventilator management (Rezayi et al., 2022).

## Conclusion

This study affirms the effectiveness of e-modules as a pedagogical tool for enhancing ICU nurses' capabilities in managing mechanical ventilators. The integration of structured digital learning significantly improved both cognitive and practical proficiencies, reinforcing the potential of such tools to elevate patient care in critical environments. Future investigations should explore the durability of skill retention and consider incorporating e-modules into broader nursing curricula for sustained educational impact.

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