Mansoura Nursing Journal (MNJ) Vol. 12. No. 2 – 2025
Print ISSN: 2735 – 4121 Online ISSN : 2735 – 413X

Original Article

Effectiveness of Intensive Care Unit-Acquired Weakness Prevention Program on Nurses' Practice

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ABSTRACT

Background: Intensive care unit-acquired weakness (ICU-AW) poses a significant challenge in critical care, contributing to increased morbidity and reduced quality of life. Despite its impact, critical care nurses may lack adequate practice regarding ICU-AW prevention **Aim:** The present study aimed to evaluate the effectiveness of the intensive care unit-acquired weakness prevention program on nurses' practice. **Methods**: A quasi-experimental design of one group pre-posttest was utilized. **Subject:** A convenience sample of Eighty critical care nurses participated. **Setting:** Intensive care unit-Governmental Hospital in Jordan. **Study tools:** The data were collected using Critical Care Nurses' Practice Regarding ICU-Acquired Muscle Weakness. **Results:** A statistically significant differences was noted between nurses' total mean practice scores per, post and follow-up the implementation of the intensive care unit acquired weakness prevention program(8.8 & 55.0 & 72.5 respectively). **Conclusion:** The program effectively enhanced nurses' competencies in ICU-AW prevention, achieving sustained improvements in practice levels and emphasizing its importance in critical care settings. **Recommendations:** Implement regular training programs on ICU-AW prevention for all critical care nurses Furthermore, the integration of ICU-AW prevention strategies into nursing curricula is crucial to ensure sustained competency and Weakness. improved patient outcomes.

Keywords: Acquired Weakness, Intensive Care Unit, Nurses practice, Prevention Program

Introduction:

Acquired weakness in the Intensive Care Unit (AW-ICU) is a common complication affecting critically ill patients. It is estimated to impact around 13-20 million individuals globally who receive ICU care**.** Acquired weakness primarily affects the extremities and respiratory muscles, while the autonomic nervous system and cranial/facial muscles are largely spared from the syndrome. It is characterized by significant muscle weakness **(Chen & Huang, 2024).** Acquired weakness in the intensive care unit primarily affects the extremities and respiratory muscles, while the autonomic nervous system and cranial/facial muscles are largely spared from the syndrome. It is characterized by significant muscle weakness **(Solverson, Grant, & Doig, 2016).**

Receiving critical care is not without associated physical and psychological complications and adverse sequelae, physical complications linked with receiving ICU treatment range across several organ systems such as acute kidney injury, healthcare-associated infection, prolonged mechanical ventilation, pulmonary embolism, deep vein thrombosis, and cerebrovascular accidents **(Prin & Li, 2016)**. The ICU-AW is a recognized complication in critically ill patients, often associated with prolonged ICU stays, mechanical ventilation, and the use of various ICU medications, including sedatives and analgesics. Early enteral feeding via nasogastric tubes is also a common practice in the ICU setting **(Msc & Msc, 2021).**

Critical care nurses play a significant role in the care of patients with life-threatening illnesses, being the healthcare professionals who stay the most amount of time at the bedside. Outcomes of critically-ill patients have been found to be significantly associated with the skills, number and level of nursing care (**Xu, Zhang, Ding, Liu, & Zhang, 2021**). However, there is a paucity of evidence on the role of critical care nurses in the prevention, identification, and management of ICUAW, there is data suggesting low levels of nurse competence in dealing with this issue.

For instance, **Wu** and **colleagues (2021)** in a cross-sectional survey involving 2,371 nurses who were part of a sample of ICU staff asked regarding their experiences in identifying and managing ICUAW found that 43% of all respondents felt that their knowledge levels did not meet the level of their clinical practice, that only 19% of all respondents proactively assessed patients for

ICUAW, and that only 10% of all respondents received any form of training in ICUAW. The authors found that lack of knowledge and lack of guidelines and procedures in dealing with ICUAW were significant barriers in assessing ICUAW among critically ill patients **(Wu et al., 2021)**.

Educational programs have been shown to improve nurses' competency in preventing ICU-AW. Structured training provides nurses with the necessary skills to assess and manage ICU-AW effectively, enhancing patient care quality and reducing complications. Studies such as those by **Zhao, Qiu, Zhang, Pan, & Gao (2024)** emphasize that well-designed interventions targeting ICU staff significantly improve patient outcomes by mitigating the risks of ICU-AW. Despite this, gaps in training and inconsistent implementation continue to pose challenges.

2.1.Significance of the Study

The significance of this study lies in addressing a critical gap in the literature, as very few studies have explored nurses' practices in preventing ICU-acquired muscle weakness (ICUAW) among critically ill patients in Jordanian hospital settings. The results of the study can benefit bedside nurses by providing a program that can potentially increase the level of their knowledge and skills in the prevention, early identification, and management of ICU-acquired muscle weakness among critically ill adult patients under their care and create a conducive environment within intensive care that can help in preventing the rates of ICU-acquired muscle weakness.

Nurse educators will play an important role in the sustainable and consistent implementation of the educational program, and in auditing whether the program is being accessed by bedside nurses in the long term. This highlights a significant gap in the literature, underscoring the importance of this study in addressing this gap by providing valuable insights and empirical evidence on the role of nursing competencies in the prevention, detection, management, and evaluation of ICUAW.

Aim of the study:

The study aimed to evaluate the effectiveness of intensive care unit acquired weakness prevention program on nurses' practice.

Research Hypothesis: The research hypothesis:

H1. Implementing the program would enhance nurses' practice in preventing ICU-acquired muscle weakness.

Method

Research Design: A Quasi-experimental pre / post research design, one group was utilized in this study.

Research Setting: This study was conducted at the ICUs at governmental Hospital in Jordan, included 86 bed. The hospital selected based on availability of critical care units, geographical location and accessibility.

Sample size

Based on data from literature **(Li & Pan, 2020)**, considering level of significance of 5%, and power of study of 80%, the sample size can be calculated using the following formula:

$$n = \frac{\left(\frac{Z\alpha}{2} + Z\beta\right)^2 \times 2(SD)^2}{d^2}$$

where, SD = standard deviation obtained from previous study; $Z_{\alpha/2}$, for 5% this is 1.96; Z_{β}, for 80% this is 0.84 and d, for the expected difference. Therefore,

$$n = \frac{(1.96 + 0.84)^2 \times 2(6.0)^2}{(2.67)^2} = 79.2$$

A convenience sample of 80 nurses working in the study setting.

Research Subjects

Based on the above formula, the sample of 80 nurses working in the study setting. The nurses (available at the time and voluntarily agreed to the study, with an experience in the ICU more than one year in ICU).

Tools of Data Collection:

One tool was used to collect data pertinent to the current study:

Tool I: Critical Care Nurses' Practice Regarding ICU-Acquired Muscle Weakness. It aimed to assess nurse's practice regarding ICU-acquired muscle weakness. It involved two parts as follows:

Part I: Critical Care Nurses' Demographic Characteristics: This part involved the demographic characteristics of the participant nurses as gender, age, years of work experience in the ICU, type of ICU, educational level, and attending previous programs about ICU-acquired muscle weakness.

Part II: Critical Care Nurses' Practice Observation Checklist: This part was adapted by the researcher from (Wu et al., 2021). This part was used to assess nurses' practice of ICU-acquired

muscle weakness. Which includes (23 questions) assessing the patient for prevention of muscle weakness, atrophy, and enhanced muscle strength among critically ill patients, monitoring the patient's physical activities, symptoms and changes in patient's conditions, changes in muscle pain and stiffness, fluid intake and output, diet, vital signs, intravenous fluids, medication, perform range-of-motion exercises and early mobilization.

Scoring system: Each item scored based on done correctly = 1, and done incorrectly = 0. The scores ≥ 80% were considered satisfactory practice level, while the scores < 80% were considered unsatisfactory practice level. This percentage was decided by a panel of experts, who argued that the lowest acceptable practice level for nurses who care for critically ill patients is 80% **(Turan, Topaloglu,** and **Ozyemisci, 2020)**.

Tool Validity

The tool was tested and checked for content related validity by five experts from ICU in previous mentioned setting and three academic staff members from the Mansoura University, Faculty of Nursing, evaluated and verified the tools' content-related validity and extensive revisions were made. Every participant was asked to review the instrument for topic coverage, clarity, phrasing, length, structure, and overall appearance. Modifications of tools were done according to panel judgment.

Tool Reliability

The reliability of the tool using the means of Pearson's correlation coefficient test and founded to be 0.902 which indicated a reliable tool.

Pilot Study

To make sure the research was internally consistent, a pilot study was carried out test the clarity, feasibility, and applicability of the data collection tools. Based on the suggestion that a reasonable sample size for a pilot study should be 10% of the study population, eight nurses of the sample for the study were chosen and excluded from the main study samples.

Data Collection Process

The data were collected in seven months between January and July 2024. The researcher interviewed critical care nurses' (within the ICU setting) and explained to them the nature of the study.

Stage One: Preparation

Ethical approval was obtained from the Research Ethics Committee (REC) of the Faculty of Nursing – Mansoura University. The PI introduced himself to the eligible participant nurses and tried to build a trust relationship with them to gain their cooperation and interest. The researcher explained to them the complete details of the study and motivated them to participate in the research. Furthermore, a written consent approval was obtained from each participant prior to his/her inclusion into study. Nurses' demographic characteristics were collected by the PI using part I of tool through interviewing each participant nurse individually for 15 minutes and using part II of tool to evaluate the effectiveness of the interventional program, the researcher constructed an observational check list format regarding the ICU-acquired muscle weakness in order to reach the aims of the study.

Stage Two: Planning

Clarification of the nature and purpose of the study was made to critical care nurses. Each nurse was interviewed individually before applying the educational program. An educational program for dissemination of information about ICU-acquired muscle weakness and prepared after reviewing the related literature. Time and duration of the session about 15-30 minutes for each session, for 3 months. The theoretical and practical educational program was advanced according to the actual nurses' requirement (pre-test).

Stage Three: Implementation Stage

The ICU-acquired muscle weakness prevention program included 10 sessions (3 theoretical and 7 practical) over 3 months, with an additional orientation session. Sessions, lasting 15-30 minutes each. Nurses were divided into small groups (8 members) based on shift attendance, and sessions were scheduled between morning and afternoon shifts to accommodate their workload and attention span. The PI introduced the program's objectives, content, and schedule, emphasizing the importance of consistent attendance and active participation.

Before each session, the PI gathered feedback from nurses on previous sessions. Each session concluded with a summary of key points, and nurses received a hard copy of the ICU-AW prevention guide during the first session for reference. Various teaching methods were employed, including group activities, lectures and re-demonstration, supported by tools like PowerPoint presentations and videos. The PI

expressed gratitude to the nurses for their participation at the program's conclusion.

Three theoretical sessions: The first session focused on defining ICU-acquired muscle weakness, requirements, indicators, complications, and signs. The second session focused on diagnosis, prevention, management and patients rehabilitation. The third session focused on nursing care for patients with acquired weakness. Each meeting was involved in displaying simple practicing videos for training about ICU-acquired muscle weakness. Each nurse was given the Arabic educational booklet (ICU-acquired muscle weakness) to engage her awareness, and encourage support for her education and training. The content of the theoretical part was given to all the studied nurses at the end of the last meeting.

The practical sessions included seven sessions. The first session focused on practical training to assess a patient's condition with acquired weakness, included initial, clinical assessment and a physical assessment of acquired weakness from the intensive care unit. The second session focused on practical training on active range of motion (AROM) and passive range of motion (PROM). The third session was practical training on rehabilitation for ICUAW patients, and was explained and applied in a simplified manner. The fourth session focused on practical training on nursing care for ICUAW cases, including patient's assessment, monitor the patient's diet, administer iv fluids and medications and laboratory and diagnostic tests.

The fifth session focused on practical training and assessment using the MRC score, use of assessment models. The sixth session included practical training to prepare the patient for discharge from the intensive care unit. Finally, the seventh session included a comprehensive review and open discussion that included training for strengthening muscle tone, monitoring physical activity, vital signs, managing fluid intake and output, diet, medications, range-of-motion exercises, and early mobilization of critically ill patients.

***Stage Four*: Evaluation Phase**

After applying the ICU-acquired muscle weakness prevention educational program, the PI evaluated the effect of the education program on nurses' practice using Part II of tool: Critical Care Nurses' Practice Observation Checklist. Compare the obtained nurses' data reviewed before, and immediately after implementation of the educational program and after three months of implementation of the educational program. Then a comparison among the follow-up tests was done.

Ethical Considerations

Ethical approval was obtained from the Research Ethical Committee at Mansoura University(NO. 305), and permission was granted by the Jordanian Ministry of Health. Informed consent was collected from nurses after explaining the study's aim, benefits, and risks, assuring them the right to withdraw anytime without consequence. Nurses' confidentiality was maintained, and observed practices were not part of performance evaluations, with privacy and confidentiality ensured throughout the study. Participants had the freedom to withdraw at any time without responsibility.

Statistical Analysis

All statistical analyses were conducted using SPSS for Windows version 23.0 (SPSS, Chicago, IL). Continuous data, which followed a normal distribution, were presented as mean ± standard deviation (SD). Categorical data were expressed as frequencies and percentages. The Chi-square test (or Fisher's exact test when appropriate) was employed to compare different categories of data. A correlation coefficient test was used to assess the relationship between two continuous variables **(Ranganathan, 2021).**

Results

Table 1. Distribution of the Socio – Demographic Characteristics of the Nurses. The table shows that 38.8% of the nurses were more than 40 year, the average age among nurses was 32 year. It was showed that male nurses represented more half (57.5%) of the participants. 75.0 % of the participant nurses had a bachelor's degree in nursing and 28.7% between 1 – 5 years of work experience in the ICU and 38.8% among them work in ICU medical. Furthermore, more than three-quarters (87.5) of the participants not attend any Attendance of training Programs Workshops or Conferences about ICU-AW.

Table 2. Comparison of the Critical Care Nurses' Practice Observation Checklist. The table shows that there are statistically significant differences between care nurses' practice before the Program / after the Program/follow-up throughout "test1" and test2 In terms of the program being implemented correctly by nurses concerning all domains of the critical care nurses' practice observation of the study since p-value less than 0.001 and 0.05, We notice that the nurses are implementing the program correctly after applying for the program and increases when following it, so

there are differences between them, While there are no statistically significance differences for one practice which is "Carefully document the patient's vital signs" between care nurses since p-value greater than 0.05 because they implement this practice.

Table 3. Comparison of the Critical care nurses' practice observation checklist total level. The table shows that a high statistically significance differences pre and post program –as p= <0.001**

Table 4. Association Between the Socio – Demographic Characteristics of the Nurses and Practice Observation Checklist at Before – Program: illustrates that there are no statistically significant differences between the socio – demographic characteristics of the nurses and practice observation checklist at before – program about unsatisfactory practice and satisfactory practice of the nurses according to (age, gender, Educational level, Type of ICU you Work in, Years of Work Experience in the ICU, attendance of Training Programs, Workshops or Conferences about ICU-AW) since p-value greater than 0.05.

Table 5. Association Between the Socio – Demographic Characteristics of the Nurses and Practice Observation Checklist at After Program: shows significant differences between nurses' socio-demographic characteristics and their practice levels after the program, particularly regarding education level, years of ICU experience, and attendance in ICU-AW training programs, workshops, or conferences ($p<0.001$ and $p<0.05$). Nurses with a bachelor's degree had the highest satisfactory practice rate (63.6%), followed by those with a master's degree (31.8%) and doctorate holders. Additionally, 25% of nurses with over 15 years of experience reported satisfactory practices. No significant differences were found based on age, gender, or ICU type ($p>0.05$).

Figure 1. Comparison of the Critical Care Nurses' Practice Observation Checklist Total Level: illustrates that nurses' satisfactory practice increased from 8.8% to 72.5% between care nurses' practice before program / after program/ follow – up.

Table 1. Distribution of the Socio – Demographic Characteristics of the Nurses

	n (80)	%
Age (Years)		
- 22 – 30	24	30.0
- 31 – 40	25	31.3
- > 40	31	**38.8**
Mean ±SD	32.6 ±5.9	
Gender		
- Male	46	**57.5**
- Female	34	42.5
Educational level		
- Bachelor's Degree in Nursing	60	**75.0**
- Master's Degree in Nursing	18	22.5
- PhD Degree in Nursing	2	2.5
Type of ICU you Work in		
- Surgical	18	22.5
- Medical	31	**38.8**
- Cardiac	15	18.8
- Emergency	16	20.0
Years of Work Experience in the ICU		
- 1 – 5	23	**28.7**
- 6 – 10	19	23.8
- 11 – 15	17	21.3
- > 15	21	26.3
Mean ±SD	10.6 ±3.9	
Attendance of Training Programs, Workshops or Conferences About ICU-AW		
- No	70	**87.5**
- Yes	10	12.5

SD (Standard deviation).

Table 3. Comparison of the Critical Care Nurses' Practice Observation Checklist Total Level

	Before Program		After Program		Follow – Up		Significance T 1	Significance T 2
	n	%	n	%	n	%		
Practice level							X^2=39.403, p<0.001**	X^2=67.394, p<0.001**
- Unsatisfactory practice	73	91.3	36	45.0	22	27.5		
- Satisfactory practice	7	8.8	44	55.0	58	72.5		

highly statistically significant $p \leq 0.001$

Table 4. Association Between the Socio – Demographic Characteristics of the Nurses and Practice Observation Checklist at Before – Program

	Unsatisfactory practice (n=73)		Satisfactory practice (n=7)		Chi – square / fisher's exact test	
	n	%	n	%	X^2	p
Age (Years)						
- 2 – 30	23	31.5	1	14.3		
- 31 – 40	21	28.8	4	57.1		
- > 40	29	39.7	2	28.6	2.482	0.289
Gender						
- Male	41	56.2	5	71.4		
- Female	32	43.8	2	28.6	0.609	0.435
Educational level						
- Bachelor's Degree in Nursing	54	73.9	6	85.7		
- Master's Degree in Nursing	17	23.3	1	14.3		
- PhD Degree in Nursing	2	2.7	0	0.0	0.539	0.763
Type of ICU you Work in						
- Surgical	15	20.5	3	42.9		
- Medical	30	41.1	1	14.3		
- Cardiac	14	19.2	1	14.3		
- Emergency	14	19.2	2	28.6	2.961	0.398
Years of Work Experience in the ICU						
- 1 – 5	22	30.1	1	14.3		
- 6 – 10	18	24.7	1	14.3		
- 11 – 15	13	17.8	4	57.1		
- > 15	20	27.4	1	14.3	5.917	0.116
Attendance of Training Programs, Workshops or Conferences About ICU-AW						
- No	64	87.7	6	85.7		
- Yes	9	12.3	1	14.3	0.022	0.881

Table 5. Association Between the Socio – Demographic Characteristics of the Nurses and Practice Observation Checklist at After Program.

	Unsatisfactory practice (n=36)		Satisfactory practice (n=44)		Chi – square / fisher's exact test	
	n	%	n	%	X2	*p*
Age (Years)						
- 22 – 30	13	36.1	11	25.0		
- 31 – 40	13	36.1	12	27.3		
- > 40	10	27.8	21	47.7	3.343	0.187
Gender						
- Male	24	66.7	22	50.0		
- Female	12	33.3	22	50.0	2.251	0.134
Educational level						
- Bachelor's Degree in Nursing	32	88.9	28	63.6		
- Master's Degree in Nursing	4	11.1	14	31.8		
- PhD Degree in Nursing	0	0.0	2	4.5	7.093	0.028*
Type of ICU you Work in						
- Surgical	10	27.8	8	18.2		
- Medical	17	47.2	14	31.8		
- Cardiac	4	11.1	11	25.0		
- Emergency	5	13.9	11	25.0	5.282	0.152
Years of Work Experience in the ICU						
- 1 – 5	19	52.8	4	9.1		
- 6 – 10	10	27.8	9	20.5		
- 11 – 15	6	16.7	11	25.0		
- > 15	1	2.8	20	45.5	27.976	<0.001**
Attendance of Training Programs, Workshops or Conferences About ICU-AW						
- No	36	100.0	34	77.3		
- Yes	0	0.0	10	22.7	9.351	0.002*

highly statistically significant $p \leq 0.001$

Statistically significant $p \leq 0.001$

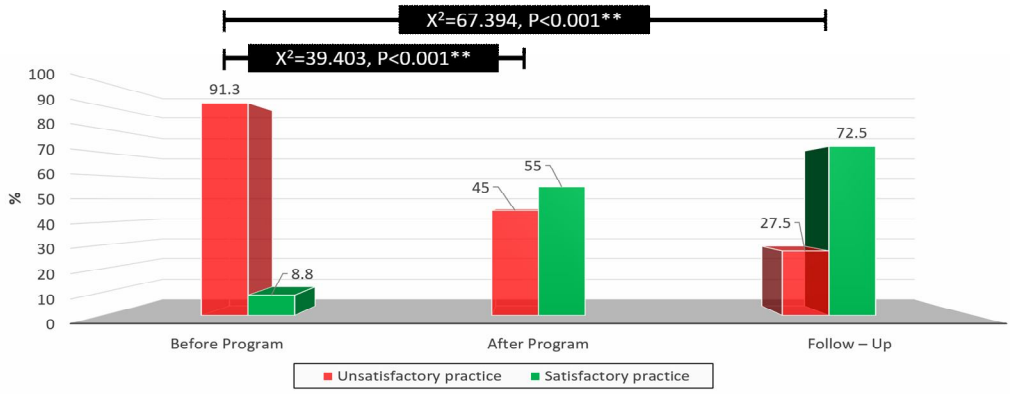

Figure 1. Comparison of the Critical Care Nurses' Practice Observation Checklist Total Level

highly statistically significant $p \leq 0.001$

Discussion

In the present study the distribution of nurses' age revealed that the mean age of thirty two point sex years, these findings align closely with prior studies that emphasize the prevalence of younger healthcare workers in intensive care units (ICUs). For instance, **Elsayed** and **Elbana (2023)** reported a mean age of 28.07 years among ICU nurses, suggesting that the profession tends to attract individuals early in their careers due to the demanding nature of the work. Conversely, the results deviate slightly from **Kamarudin, Sudin,** and **Zakaria (2021)** who found a higher proportion of older nurses (mean age 38 years) in specialized ICUs, Researcher opinion say the age distribution is consistent with the operational requirements of ICUs, where a younger workforce is advantageous. However, strategies to retain these professionals, such as mentorship programs involving senior nurses, could balance the experience gap and improve long-term workforce stability.

The gender distribution in the study showed that male nurses made up the majority of participants, which aligns with the view of **Rabie, Rossouw,** and **Machobane (2021)** that male nurses are often seen as caring, empathetic, and better at management. This finding contrasts with global trends where nursing is typically a female-dominated profession, as supported by **Elsayed & Elbana (2023)** and **Teresa, Rodríguez, Araujo, & Feria (2022)**. The predominance of male nurses in this study aligns with reports from regions where ICU roles are perceived as more physically demanding and technical roles that tend to attract male professionals. The researcher believes this shift reflects a growing trend of men entering the nursing profession, which was once predominantly female.

Regarding work types with nurses, the majority of participation worked in medical ICUs, followed by surgical ICUs, emergency ICUs, and cardiac ICUs. The predominance of nurses in medical ICUs reflects the increasing demand for critical care in managing chronic and complex medical conditions. Similar trends were reported by **Naidech (2019)** who observed a higher concentration of staff in medical ICUs due to the growing burden of non-communicable diseases and aging populations.

Conversely, the relatively lower representation in cardiac ICUs could indicate a preference for specialization among senior nurses or regional disparities in cardiac care facilities. This pattern aligns with findings by **Brown, Edwards, McIntyre,** and **Faulkner (2022)** who noted that cardiac ICU staffing often requires extensive specialized training, limiting the workforce size. Researcher's Perspective, the results emphasize the need for targeted training programs tailored to ICU types. Expanding cardiac and emergency ICU workforce capabilities could enhance preparedness for acute conditions, while maintaining strong coverage in medical ICUs for chronic disease management.

In the present study a significant majority of nurses had not attended any training programs, workshops, or conferences related to ICU-AW(ICU-AW). The low attendance rate reflects a gap in continuous professional development among the nurses. Previous studies, such as those by **Yoshioka, Honda,** and **Iwasaki (2020)** have highlighted that limited participation in training directly correlates with lower awareness and management skills for ICU-AW. In their research, nurses with access to regular workshops demonstrated significantly better outcomes inpatient rehabilitation and prevention of ICU-AW.

Regarding Comparison of Critical Care Nurses' Practice Observation Checklist indicates significant improvements in complex tasks, such as ICU-AW assessment, this finding aligns with **Kitto & Grant (2020)**, who found structured training significantly enhanced ICU clinical skills. However, documenting vital signs showed no significant improvement, suggesting routine tasks may require targeted reinforcement, as noted by **Johnson & Rice (2019)**. Studies by **Redfern, Gordon,** and **Cadilhac (2019)** contradict this by suggesting routine skills also improve with general training programs, indicating that the program might need adjustments for such tasks. Researcher's Perspective: While training enhanced critical skills, separate reinforcement for routine documentation is advised to achieve holistic skill development in ICU tasks.

The present study showed no statistically significant associations between socio-demographic variables (age, gender, educational level, type of ICU, years of experience, and attendance at training) and nurses' practice levels before the program. This suggests that unsatisfactory practices were widespread regardless of nurses' backgrounds or qualifications.

The present study demonstrates significant associations between nurses' educational levels, years of experience, and attendance at training programs with their practice levels after the program, notably, nurses with higher educational qualifications and longer experience demonstrated better outcomes. Attendance at training programs had a profound impact, with all nurses who attended training demonstrating satisfactory practices compared to none before the intervention. This reinforces the necessity of integrating regular workshops into institutional policies to enhance ICU care. Studies by **Shibuya et al. (2024)** support this finding, showing that participation in targeted training significantly boosts practice quality in critical care settings. Conversely, a study by **Pham et al. (2021)** noted that training alone might not address systemic barriers such as workload and institutional culture, emphasizing a need for multifaceted approaches

However, **Jeong et al. (2024)** suggest that while these factors enhance practice, more focus is needed on integrating evidence-based practice across varying levels of experience and education to ensure equity in nursing outcomes, my opinion, I believe that while experienced nurses may show improved outcomes due to their knowledge and training, novice nurses require additional support through targeted interventions to bridge gaps in practice and ensure the highest standards are maintained across the board.

At follow-up, nurses with more than fifteen years of experience exhibited the highest proportion of satisfactory practices. This finding underscores the critical combination of extensive practical experience and structured education in fostering sustained improvements in ICU care. Research by **Elhabashy, Moriyama, Mahmoud,** and **Eysa (2024)** highlights how experienced nurses often integrate training content effectively into their practices due to their accumulated clinical insights and decision-making skills. Similarly, findings from the **Oh & Cho (2019)** emphasize that while experienced nurses generally perform better in evidence-based nursing, structured interventions are necessary to maintain consistent practice quality across all experience level.

Conclusion

The program effectively enhanced nurses' competencies in ICU-AW prevention, achieving sustained improvements in practice levels and emphasizing its importance in critical care settings. In conclusion, this study underscores the value of ongoing education and institutional support in sustaining improved nursing practices.

Recommendations

1. Integrating ICU-acquired weakness (ICUAW) prevention strategies into daily nursing practice to enhance patient care and reduce complications.
2. Incorporating ICUAW prevention measures into nursing curricula to ensure that future nurses are well-equipped with the necessary skills and knowledge.
3. Participating in continuous professional development programs, workshops, and refresher courses on ICUAW prevention to stay updated with best practices and emerging interventions.

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