Original Article

The Impact of Group Reflection on Preventive Behaviors for Ventilator-Associated Pneumonia Among ICU Nurses

Abstract

Background: Reflection is a fundamental component of nursing education and professional practice. This study aimed to evaluate the impact of structured group reflection sessions on ICU nurses' adherence to Ventilator-Associated Pneumonia (VAP) prevention practices. **Materials and Methods:** This quasiexperimental study a total of 44 ICU nurses from Namazi Hospital in Shiraz, Iran, participated. Two ICUs were randomly selected. The intervention consisted of four group reflection sessions, each comprising 7–8 participants, conducted over 2 weeks and guided by VAP prevention protocols. Nurses' performance was assessed before the intervention and at 1, 4, and 8 weeks afterward using the Behesht Aeen checklist. Data were analyzed using SPSS v. 16. **Results:** The findings revealed that the intervention group demonstrated a significant improvement and an upward trajectory in all dimensions of nurses' performance across the postintervention follow-up periods ($p < 0.001$). In sharp contrast, the control group's performance remained stable across all time points ($p > 0.05$) for all dimensions, with the sole exception being endotracheal tube protection. One week after the intervention, the control group scored 18.13 (5.30), whereas the intervention group scored 28.59 (1.65) ($t_{42} = -12.64$, $p < 0.001$(. This divergence was maintained at 4 weeks, with scores of 17.22 (3.71) for the control group and 30.00 (1.77) for the intervention group ($U_{42} = 00.00$, $p < 0.001$(. At eight weeks later, the scores were 15.86 (3.94) for the control group and 29.31 (1.49) for the intervention group ($U_{42} = 00.00$, $p < 0.01$). **Conclusions:** The findings indicate that structured group reflection sessions are an effective educational strategy to enhance ICU nurses' preventive behaviors for VAP, thereby improving clinical performance and quality of care.

Keywords: *Group reflection, infection control, intensive care unit, nurses, performance, prevention, ventilator-associated pneumonia*

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Introduction

Healthcare-associated infections (HAIs) are infections acquired in healthcare settings that pose a major challenge to patient safety.[1] Among these, pneumonia—particularly Ventilator-Associated Pneumonia (VAP)—is one of the most common and serious complications in intensive care units (ICUs). Following intubation or tracheostomy, artificial airways become rapidly colonized with pathogenic bacteria, significantly increasing the risk of lower respiratory tract infections.[2,3]

The incidence and prevalence of VAP vary globally depending on clinical practices, infection control policies, and resource availability. In the United States, VAP occurs at a rate of approximately 1–2.5 cases per 1,000 ventilator days,[4] while global prevalence estimates range between 5% and 40%. Some regional studies.[5] In Noorifard'[6] study, have reported even higher rates, reaching 53.6%. VAP is associated with prolonged hospital stays, extended mechanical ventilation, increased healthcare costs, and elevated mortality rates.

Effective prevention strategies are crucial to mitigate these outcomes. Preventive measures include appropriate sedation, optimal patient positioning, regular oral care, maintenance of endotracheal tube cuff pressure, use of noninvasive ventilation methods, appropriate airway suctioning, hand hygiene, antibiotic stewardship, and subglottic secretion drainage, selective decontamination of the digestive tract, intratracheal and tracheostomy drainage, the application ofgastric acid modifying agents, enteral nutrition, and utilization of disposable equipment.[7,8]

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Nurses, being in continuous contact with patients, play a central role in in implementing these evidence-based interventions.[9] In recent years, numerous studies and strategies have been reviewed by specialized groups to encourage critical care providers to prevent or reduce the incidence of VAP.[6,10] These strategies include direct education through lectures and group discussions, and indirect education through virtual space, text messaging, and telephone calls.[11] Studies show that effective learning requires the use of methods that engage the individual.[12] Reflective practice—especially when conducted in structured group settings—has emerged as a powerful tool to foster creativity, self-awareness, enhance professional behavior, and improve clinical performance.[13] Driscoll's model of reflection, ("What?", "So what?", "Now what?"), provides a simple yet effective framework for analyzing experiences, identifying performance gaps, and formulating improvement strategies. This model has three main parts: describing the event, analyzing, and proposing postevent actions. In the description section, the individual explains the situation in detail and assesses its various dimensions. In the analysis phase, the individual examines their performance changes and the gaps in their knowledge and skills. Finally, in the proposed actions section, new learning or learning related to similar situations leads the individual towards improving and developing their performance.[14] Given the relatively high prevalence of VAP and its resulting consequences, the use of prevention strategies is essential. Nurses play a key role in this area, and therefore, supporting nurses in preventing the incidence of VAP is vital. Despite evidence supporting reflection in various areas of nursing education, few studies have examined its specific impact on preventive behaviors related to VAP. Therefore, this study aimed to investigate the effect of group reflection on ICU nurses' adherence to VAP prevention guidelines.

Materials and Methods

This quasi-experimental study was conducted in the intensive care units of Namazi Hospital, Shiraz, Iran, between September 2024 and July 2025. After the study plan was approved and an ethics code was obtained from the Ethics Committee of Gonabad University of Medical Sciences, a total of 46 ICU nurses meeting the inclusion criteria were recruited. Two participants were later excluded—one from the intervention group due to absence from more than one session, and one from the control group due to sick leave—resulting in 44 final participants. The inclusion criteria included: voluntary participation, at least three months of ICU clinical experience, not holding a managerial position (e.g. head nurse, educational supervisor). The exclusion criteria were: awareness of the observation process, transfer to another unit, prolonged leave interfering with observations, absence from more than one reflection session.

The sampling method was as follows: from nine ICU wards at Namazi Hospital, two were randomly selected. Then, nurses in one unit were randomly assigned to the intervention group and those in the other to the control group. Subsequently, all personnel in the selected units who met the inclusion criteria were enrolled in the study. The sample size was estimated using G*Power (version 3.1.9.2) based on a *t*-test for means: Difference between two independent means (two group), with an effect size of 1.53 (calculated from Anvari *et al*.[15]), 99% power, and a 99% confidence level. Accounting for a 15% attrition rate, 23 participants were enrolled per group (total $N = 46$).

Data were collected using a demographic questionnaire and the Aeen *et al*.[16] performance observation checklist. The checklist, was validated through expert review and with a reported intraclass correlation coefficient (ICC) of 0.91 The validity and reliability of this checklist have been confirmed in Goljabini study.[17] This checklist contains 32 items across six domains: (1) contact precautions and hand hygiene (items 1–5), (2) oral hygiene (items 6–8), (3) suctioning (items 9–18), (4) tracheal tube cuff care (items 19–22), (5) aspiration prevention (items 23–27), and (6) prevention of respiratory equipment contamination (items 28–32). Each item is scored dichotomously (Yes = 1, No = 0). Correct performance observed received a score of "1", and incorrect performance is received a score of "0". A research assistant, who was a nursing expert with experience working in ICU, was responsible observing and recording information. Before the study and during data collection, the research assistant received necessary training from the researcher on how to record observations based on the checklist items and specific issues during various sessions The research assistant was blinded to group allocation. A trained nursing professional, blinded to group allocation, observed each participant's performance during three different shifts (morning, afternoon, night). The average of the three observations was calculated as each nurse's performance score.

Before the intervention, the performance of the nurses was evaluated and recorded. The control group received no training. For the intervention group, in cooperation with the educational supervisor, nurses were invited to participate in the sessions. These sessions were held in the hospital conference room. Nurses in the intervention group attended four group reflection sessions (two per week for 2 weeks, each lasting 2 hours) conducted in small groups: two groups of 7 and one group of 8 nurses. Sessions were facilitated by the researcher using Driscoll's reflective model (description-analysis-action) and were based on current VAP prevention guidelines. In each session, the researcher, introduced observation-based clinical situations and encouraged the participants to share experiences, analyze gaps and problems encountered while providing nursing care. Through group discussion and exchange of views, the existing situation was analyzed to

enable individuals to reflect on changes in performance, attitudes or values, or to fill existing gaps. Nurses were asked to share their experiences in caring for ventilated patients, so that by hearing others' experiences and approaches in similar situations, they could re-examine their own experiences, reprocess information and ideas, and develop solutions. Finally through interpretation and decision-making regarding action, they achieved new cognitive understanding. In the final step, the newly learned content for changing future practice was reviewed and summarized to prepare the learners. Then, 1, 4, and 8 weeks after the end of the intervention, the performance of the nurses in both the intervention and control groups was re-evaluated and recorded exactly as before the training (each nurse was observed three times for each performance and the average of three scores was considered) by the blinded research assistant using the performance observation checklist. Statistical analysis was performed using IBM SPSS version 16.0. Descriptive statistics summarized demographic characteristics. The *Shapiro–Wilk* test assessed normality. Between-group comparisons were conducted using *Chi-square, independent t*-tests, or *Mann–Whitney U* tests as appropriate. *Repeated measures ANOVA* and *Friedman* tests were applied for within-group comparisons across time points. A p value < 0.05 was considered statistically significant.

Ethical considerations

The ethical considerations in this research included: obtaining informed consent, maintaining confidentiality and privacy of information, the right to withdraw from the study at any stage, and providing results to research units upon their request. This study was approved by the Regional Ethics Committee of Gonabad University of Medical Sciences with code IR.GMU.REC.1402.072.

Results

All participants held a bachelor's degree in nursing and worked rotating shifts. The majority were female 27 (61.4%) and married 27 (61.4%), with 24 (54.5%) employed on permanent contracts. The mean (SD) age was 35.63 (6.40) years, overall work experience 9.02 (6.19) years, and ICU work experience 8.31 (5.92) years. No statistically significant differences were observed between the intervention and control groups in age ($p = 0.284$), non-ICU work experience ($p = 0.239$), or ICU work experience ($p = 0.305$), confirming baseline homogeneity [Table 1].

Table 1: Comparison of demographic variables in the Two Groups

	Group	Mean (std)	Mann-Whitney test
Age	Control	36.59 (6.58)	Mann-Whitney U=132.00
	Intervention	34.68 (6.23)	p=0.284
Work experience outside ICU	Control	10.18 (6.72)	Mann-Whitney U=192.00
	Intervention	7.76 (5.53)	p=0.239
Work experience in ICU	Control	9.18 (6.27)	Mann-Whitney U=198.00
	Intervention	7.45 (5.56)	p=0.305

Performance outcomes

Before the intervention, there were no significant differences between groups in hand hygiene and contact precautions ($p = 0.60$), suctioning ($p = 0.586$), tracheal cuff care ($p = 0.089$), aspiration prevention ($p = 0.277$), respiratory equipment contamination prevention ($p = 0.235$) and total performance ($p = 0.819$). Oral hygiene performance was significantly lower in the intervention group at baseline ($p < 0.001$). The difference was that the performance regarding oral hygiene before the intervention was lower in the intervention group than in the control group. However, in the weeks following the intervention, the performance in the intervention group was significantly higher than in the control group. Following the intervention, the intervention group demonstrated substantial improvements across all domains. At 1, 4, and 8 weeks postintervention, performance scores in hand hygiene, oral hygiene, suctioning, cuff care, aspiration prevention, and equipment contamination prevention were significantly higher than those of the control group (all $p < 0.001$). Following the intervention, the intervention group demonstrated substantial improvements across all domains. At 1, 4, and 8 weeks postintervention, performance scores in hand hygiene, oral hygiene, suctioning, cuff care, aspiration prevention, and equipment contamination prevention were significantly higher than those of the control group (all $p < 0.001$). Mean total performance scores in the intervention group increased from 18.31 (3.75) at baseline to 28.59 (1.65) at week 1, 30.00 (1.77) at week 4, and 29.31 (1.49) at week 8. By contrast, the control group's scores declined slightly over time: 18.00 (2.72) at baseline, 18.13 (3.50), 17.22 (3.71), and 15.86 (3.94), respectively [Table 2].

The Friedman test showed that overall and all dimensions of performance differed significantly at before and after the intervention in the intervention group ($p < 0.001$). Specifically, there was an increasing trend at the first- and fourth week postintervention compared with before the intervention, and a slight decrease at 8th week postintervention compared with fourth week postintervention), but it was still an increase compared with before the intervention. The repeated measures ANOVA indicated a statistically significant difference in the performance of research units regarding patient suctioning at different times in the intervention group ((F_3= −75.13, $p < 0.001$(.), showing an increasing trend 1, 4, and 8 weeks after the intervention compared with before the intervention [Table 3].

Furthermore, the Friedman test indicated that the performance of research units in the control group did

not differ significantly at different times in all dimensions except for tracheostomy tube protection. Only in the tracheostomy tube protection dimension did performance show a significant downward trend ($\chi^2_3 = -12.64$, $p = 0.009$). The repeated measures ANOVA indicated a statistically significant difference in the performance of research units regarding patient suctioning at different times in the control group ($F_3 = 5.08$, $p = 0.003$), with performance decreasing 8 weeks after the intervention compared with before the intervention [Table 4].

Table 2: Comparison of mean overall performance at different times in the two study groups

	Intervention group Mean (std)	Control group Mean (std)	Test result
Before intervention	18.31 (3.75)	18.00 (2.72)	t=−0.23 df=42 p=0.819
1 week after	28.59 (1.65)	18.13 (3.50)	t=−12.64 df=42 p<0.001
4 week after	30.00 (1.77)	17.22 (3.71)	Mann-Whitney U=00.00 Z=−5.70 p<0.001
8 week after	29.31 (1.49)	15.86 (3.94)	Mann-Whitney U=00.00 Z=−5.70 p<0.001

Discussion

The findings of this study demonstrated no significant baseline differences between the two groups regarding demographic characteristics such as age, gender, marital status, employment type, total work experience, and ICU experience. This homogeneity ensured that observed changes in outcomes could be attributed primarily to the educational intervention rather than confounding demographic variables. Before the intervention, there were no significant differences between groups in overall or domain-specific performance scores, indicating a comparable baseline level of adherence to VAP prevention guidelines ($p > 0.05$). This finding suggests that the performance level of nurses in both groups was approximately the same before the group reflection sessions. The only exception was oral hygiene performance, which was lower in the intervention group ($p < 0.05$). This discrepancy likely reflected a lack of awareness or attitude on oral hygiene practices among those nurses. Following the reflection sessions, however, oral hygiene adherence in the intervention group improved substantially, surpassing that of the control group—demonstrating the corrective effect of structured reflection on identified weaknesses. The intervention group exhibited significant and sustained improvements across all performance domains over time, confirming the effectiveness of group reflection as an educational strategy. By contrast, the control group's performance remained largely unchanged, except for a decline in endotracheal tube care. The observed reduction in this domain could potentially increase patient risk,

Table 3: Comparison of mean performance by dimension at different times in the intervention group

	Before intervention	1 week after	4 week after	8 week after	Test result
Hand hygiene	2.86 (1.45)	4.68 (0.56)	4.95 (0.21)	4.81 (0.39)	X^2=46.37 df=3 p<0.001
Oral hygiene	0.77 (0.75)	2.72 (0.55)	3.04 (2.08)	2.81 (0.39)	X^2=45.63 df=3 p<0.001
Endotracheal tube	3.09 (1.01)	3.59 (0.73)	3.81 (0.39)	3.54 (0.73)	X^2=9.65 df=3 p=0.022
Aspiration	3.68 (1.24)	3.68 (0.56)	4.77 (0.42)	4.86 (0.35)	X^2=39.60 df=3 p<0.001
Respiratory equipment	3.27 (0.88)	4.68 (0.56)	4.72 (0.45)	4.59 (0.66)	X^2=32.75 df=3 p<0.001
Suction	4.54 (2.26)	9.22 (0.86)	8.68 (0.99)	8.68 (0.94)	F=75.13 p<0.001
Total	18.31 (3.75)	28.56 (1.65)	30.0 (1.77)	29.31 (1.49)	X^2=45.01 df=3 p<0.001

Table 4: Comparison of mean performance by dimension at different times in the control group

	Before intervention	1 week after	4 week after	8 week after	Test result
Hand hygiene	3.81 (1.00)	3.18 (1.36)	2.86 (1.39)	2.45 (1.33)	X^2=4.53 df=3 p=0.209
Oral hygiene	1.68 (0.89)	1.72 (1.03)	1.86 (0.94)	1.5 (0.91)	X^2=1.25 df=3 p=0.74
Endotracheal tube	2.63 (0.90)	1.86 (0.88)	2.18 (1.09)	2.0 (0.87)	X^2=11.46 df=3 p=0.009
Aspiration	3.45 (0.91)	3.45 (0.91)	2.59 (1.75)	3.09 (1.23)	X^2=7.71 df=3 p=0.052
Respiratory equipment	2.81 (1.13)	2.54 (0.91)	2.36 (1.13)	2.63 (1.21)	X^2=1.23 df=3 p=0.74
Suction	4.22 (1.50)	5.36 (1.76)	5.36 (1.61)	4.18 (1.59)	F=5.08 p=0.003
Total	18.00 (2.72)	18.13 (3.50)	17.22 (3.71)	15.86 (3.94)	X^2=7.52 df=3 p=0.057

underscoring the necessity of continuous professional education and monitoring.

In the within-group comparison for the intervention group, the results indicated that total and all dimensions of performance showed significant differences and an upward trend at before and after the intervention ($p < 0.05$). These findings demonstrate after the intervention, the level of adherence to VAP prevention principles continuously increased and was maintained over time partially. Conversely, in the control group, nurses' performance in all dimensions, except for endotracheal tube protection, showed no significant difference at various times ($p > 0.05$). This indicates that without educational intervention, the performance level of nurses in the control group remained almost constant, with no significant improvement observed over time. A notable point is that in the endotracheal tube protection dimension, nurses' performance in the control group showed a downward trend, which could lead to an increased risk of complications related to intubation and threaten patient health. Improvements in suctioning and other care dimensions within the intervention group remained significant at 1, 4, and 8 weeks postintervention, suggesting that group reflection facilitated meaningful learning retention. The slight performance decline between the fourth and eighth week may indicate the need for periodic refresher or reinforcement sessions to sustain behavioral gains. These results are consistent with previous studies by Goljabini *et al.*,[17] Anvari *et al.*[15] and Vahedi *et al.*,[18] all of which reported enhanced nurse performance following clinical guideline-based education. Similarly, research by Al-Fazli,[19] BB *et al.*,[20] El-Sattar,[21] and Golaghaei,[22] demonstrated that educational programs—including workshops, lectures, and simulations—improved knowledge and adherence to VAP prevention measures, contributing to a reduction in VAP incidence. In these studies, training based on clinical guidelines, particularly through various educational methods such as workshops, lectures, and simulation training, helped nurses enhance their awareness and clinical skills in VAP prevention. These trainings led nurses to implement more effective preventive measures, resulting in a reduction in VAP incidence. However, the findings of Aloush differed, showing no improvement in adherence following training unless contextual factors such as workload were managed.[23] Such inconsistencies may stem from differences in institutional environments, workload pressures, and available resources.

Overall, the current study supports the use of structured group reflection as an effective, low-cost educational method for improving ICU nurses' preventive practices related to VAP. Although this study did not measure actual VAP incidence, the observed behavioral improvements suggest that reflection-based interventions may have downstream clinical benefits.

Conclusion

This study demonstrated that structured group reflection sessions significantly improved ICU nurses' preventive behaviors related to ventilator-associated pneumonia (VAP), particularly in domains such as oral care, suctioning, and hand hygiene. The findings suggest that combining clinical guideline–based education with reflective practice is an effective strategy for enhancing adherence to infection prevention standards and improving overall nursing

performance. However, aspiration prevention behaviors showed comparatively smaller gains, indicating a need for targeted and ongoing training in this area. Although performance improvements persisted for two months postintervention, a slight decline observed at the eighth week highlights the importance of regular reinforcement. Therefore, implementing quarterly reflection sessions is recommended to sustain performance at an optimal level. Given the relatively small sample size and single-center design, the generalizability of these findings is limited. Future studies with larger and more diverse samples are recommended to confirm these results and to examine whether reflection-based educational interventions can reduce the actual incidence of VAP over longer follow-up periods.

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Conflicts of interest

Nothing to declare.

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