



Effectiveness of Training Model Types on Improving Nurses' Knowledge and Attitudes Regarding Infectious Disease Transmission and the Use of Personal Protective Equipment (PPE)

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Track Record Article	Abstract
Revised: 27 February 2026 Accepted: 23 September 2026 Published: 26 September 2026 How to cite : Puri, R. L., Nurullita, U., Astuti, R., Wardani, R. S., & Chakim, I. (2026). Effectiveness of Training Model Types on Improving Nurses' Knowledge and Attitudes Regarding Infectious Disease Transmission and the Use of Personal Protective Equipment (PPE). <i>Contagion : Scientific Periodical of Public Health and Coastal Health</i>, 8(3), 329–344.	<i>Infectious disease transmission in healthcare settings remains a critical challenge that threatens both patient and healthcare worker safety. Strengthening nurses' knowledge and attitudes through structured training programs is essential to improve infection prevention practices and compliance with personal protective equipment (PPE) use. This study aimed to analyze the effectiveness of classical training methods and classical training combined with educational booklets in improving nurses' knowledge and attitudes regarding infectious disease transmission and PPE use. A quasi-experimental design with a pretest–posttest comparison group approach was conducted among 72 nurses, divided equally into two intervention groups (n = 36 each). Data were analyzed using Wilcoxon and Mann-Whitney. The results showed that in the classical training group, the mean knowledge score increased from 23.17 ± 1.134 to 23.89 ± 0.319 ($p = 0.001$), and the mean attitude score increased from 66.83 ± 4.365 to 69.50 ± 4.226 ($p = 0.005$). In the classical training combined with booklet group, the mean knowledge score increased from 23.33 ± 0.894 to 23.86 ± 0.424 ($p = 0.006$), while the mean attitude score increased from 66.81 ± 3.463 to 68.08 ± 4.607 ($p = 0.026$). However, there were no statistically significant differences in knowledge improvement ($p = 0.496$) or attitude improvement ($p = 0.263$) between the two groups. In conclusion, both training methods were effective in significantly improving nurses' knowledge and attitudes regarding infectious disease transmission and PPE use. Nevertheless, no significant difference in effectiveness was found between the classical training method and the classical training combined with educational booklets.</i> Keyword: Knowledge, Attitude, Training Methods, Infectious Diseases, Personal Protective Equipment

INTRODUCTION

Hospitals are healthcare institutions that provide comprehensive individual health services and are characterized by a high level of occupational hazards (Kemenkes RI, 2020). Nurses, as the largest group of healthcare professionals within the healthcare delivery system, face a high risk of occupational diseases and work-related accidents due to direct contact with patients, medical equipment, and the work environment (Board et al., 2025). Therefore, the implementation of hospital occupational health and safety (OHS) and infection prevention and control (IPC) programs is essential to ensure the safety of both patients and healthcare workers.

The transmission of infectious diseases in healthcare facilities, commonly referred to as Healthcare-Associated Infections (HAIs), remains a significant global issue. Approximately 7% of hospitalized patients in developed countries and 15% in developing countries acquire

infections during their stay in healthcare facilities (Tobin and Zahra, 2025). In Indonesia, the incidence of HAIs ranges from 5–10%, with the most common types including urinary tract infections, ventilator-associated pneumonia, surgical site infections, and bloodstream infections (Sirait et al., 2025). These figures indicate that healthcare workers' compliance with infection prevention standards, including the proper use of personal protective equipment (PPE), still needs to be improved.

The use of PPE is a key component of hospital OHS practices, functioning to protect healthcare workers from biological, chemical, and physical hazards in the workplace (Exposto et al., 2022). However, nurses' compliance with PPE use remains suboptimal. Previous studies have shown that knowledge, attitudes, PPE availability, and motivation are significantly associated with PPE utilization behavior among nurses (Rizal et al., 2022). Furthermore, adequate knowledge regarding PPE has been shown to increase the likelihood of correct PPE use (Kustiyuwati et al., 2021). These findings suggest that improving nurses' knowledge and attitudes is a critical factor in enhancing compliance with PPE use.

Training is one of the most effective strategies to improve nurses' knowledge and attitudes. Training is a systematic process aimed at enhancing the competence, knowledge, skills, and work behavior of healthcare personnel (Montol et al., 2022). Various training methods have been applied to improve healthcare workers' competencies, including On-the-Job Training, Off-the-Job Training, simulations, and self-directed learning (Melanda W. et al., 2024). Among these, the classical training method is the most commonly used due to its simplicity and efficiency; however, it has limitations in terms of long-term knowledge retention (Rejeki, 2023).

To address these limitations, more innovative and sustainable training methods are required. One alternative approach is the integration of classical training with an educational booklet. A booklet is a printed educational medium that presents information in a systematic, concise, and easily understandable format and can be used independently (Notoatmodjo, 2014). The use of booklets enables training participants to review the material repeatedly, thereby enhancing knowledge retention and fostering positive work attitudes.

Based on a preliminary survey conducted at RSUD dr. Gunawan Mangunkusumo Ambarawa, it was found that nurses' compliance with PPE use had not yet reached the expected standards. In addition, variations were observed in nurses' levels of knowledge and attitudes regarding infectious disease transmission and PPE use. Although the hospital had implemented IPC training and socialization programs, evaluation results indicated that the existing training

methods had not been optimal in producing sustained improvements in nurses' knowledge and attitudes.

Given these issues, further analysis is required to evaluate the effectiveness of different training methods in improving nurses' knowledge and attitudes. This study focuses on comparing two training approaches: the classical method and the classical method combined with an educational booklet. This approach is expected to provide a more comprehensive understanding of the most effective training strategies for enhancing nurses' competencies in preventing infectious disease transmission and ensuring proper PPE utilization.

Theoretically, this study is grounded in the concepts of hospital OHS, adult learning theory, and behavior change theory, which posit that knowledge influences attitudes and ultimately shapes behavior (Notoatmodjo, 2014). Knowledge represents the cognitive domain that forms the basis for attitude development, while attitudes serve as a predisposition to act, influencing PPE usage behavior in healthcare practice.

The objective of this study is to analyze the effectiveness of different training methods in improving nurses' knowledge and attitudes regarding infectious disease transmission and PPE use. Specifically, this study aims to compare the improvement in nurses' knowledge and attitudes before and after training and to examine the differences in effectiveness between the classical training method and the classical method combined with an educational booklet.

The findings of this study are expected to provide both practical and theoretical contributions. Practically, the results may serve as a basis for hospital management in designing more effective training programs to improve PPE compliance and reduce the risk of infection transmission in healthcare settings. Theoretically, this study is expected to contribute to the development of public health science, particularly in the fields of health workforce management, health education, and hospital occupational health and safety.

METHODS

This study employed a quantitative approach using a quasi-experimental design with a pretest–posttest comparison group. The design was intended to evaluate the effectiveness of two different training models in improving nurses' knowledge and attitudes regarding infectious disease transmission and the use of personal protective equipment (PPE). The study was conducted at RSUD dr. Gunawan Mangunkusumo Ambarawa during the period of 2025–2026.

The study population consisted of all nurses working in the inpatient care units of RSUD dr. Gunawan Mangunkusumo. A total of 72 nurses were recruited as research participants using

a total sampling technique based on predetermined inclusion and exclusion criteria. The participants were then allocated into two intervention groups, each consisting of 36 nurses. The first group received classical training methods, while the second group received classical training combined with an educational booklet as a supplementary learning medium.

Data collection was carried out through pre-intervention and post-intervention measurements (pretest and posttest) using a structured questionnaire designed to assess nurses' knowledge and attitudes toward infectious disease transmission and PPE utilization. The knowledge instrument consisted of multiple-choice questions assessing respondents' understanding of disease transmission mechanisms, infection prevention principles, and appropriate PPE use in accordance with standard precautions. The attitude instrument was constructed using a Likert scale to evaluate respondents' predisposition toward adherence to PPE use and infection prevention practices. All instruments were tested for validity and reliability prior to data collection to ensure their accuracy and internal consistency.

The training intervention was delivered in two formats. The first group received classical training through lectures, interactive discussions, and question-and-answer sessions. The second group received classical training enhanced with an educational booklet designed for independent learning. The booklet was a full-color printed material containing concise and structured information on infectious disease transmission, infection prevention principles, and correct PPE procedures, supported by visual illustrations to facilitate comprehension. The training sessions were delivered by the researcher and a team of facilitators with expertise in hospital occupational health and safety as well as infection prevention and control.

The collected data were analyzed using both univariate and bivariate statistical approaches. Univariate analysis was used to describe respondents' characteristics and the distribution of knowledge and attitude scores before and after the intervention. Bivariate analysis was conducted to assess differences between pretest and posttest scores within each group using the Wilcoxon signed-rank test, and to examine differences in score improvements between the two groups using the Mann–Whitney U test. All statistical analyses were performed at a 95% confidence level ($\alpha = 0.05$).

This study complied with ethical principles in health research by obtaining approval from the institutional ethics committee and permission from the hospital management. All participants received a complete explanation regarding the objectives and procedures of the study and provided written informed consent prior to participation. The confidentiality of all respondent data was strictly maintained and used exclusively for research purposes.

RESULTS

Respondent Characteristics

Table 1. Frequency Distribution of Nurses' Characteristics

Characteristics	Group			
	Classical method (Intervention 1) (n=36)		Classical method and educational booklet (Intervention 2) (n=36)	
	f	%	f	%
Age				
30 – 39 year	4	11,1	7	19,4
40 – 49 year	30	83,3	23	63,9
50 – 59 year	2	5,6	6	16,7
Gender				
Male	10	27,8	8	22,2
Female	26	72,2	28	77,8
Employment Status				
Civil Servant	36	100	36	100
Length of work				
5 – 10 year	4	11,1	4	11,1
11 – 20 year	32	88,9	32	88,9
Work Unit Section				
Emergency Department (ER)	3	8,3	6	16,7
ICU/ICCU	2	5,6	2	5,6
Inpatient Ward	18	50,0	25	69,4
Surgical Room	4	11,1	2	5,6
NICU/PICU	3	8,3	1	2,8
Polyclinic	6	16,7	0	0
Have attended Infection Prevention and Control/Occupational Health and Safety Training				
Yes	12	33,3	22	61,1
No	24	66,7	14	38,9
Have attended PPE/Infection Training				
Yes	15	41,7	19	52,8
No	21	58,3	17	47,2
Direct responsibility for caring for isolated patients				
Yes	11	30,6	7	19,4
No	25	69,4	29	80,6
Certification				
ACLS	4	11,1	4	11,1
BTCLS	30	83,3	23	63,9
Basic IPCN	1	2,8	1	2,8
Basic K3	1	2,8	7	19,4
No	0	0	1	2,8

This study involved 72 nurses who were equally assigned to two groups: the classical training method group (Intervention 1; n=36) and the classical method combined with an educational booklet (Intervention 2; n=36). In both groups, most respondents were aged 40–49 years (83.3% in the classical group and 63.9% in the classical plus booklet group), indicating that participants were in a productive age range with substantial professional experience. The

majority of respondents were female (72.2% and 77.8%, respectively), and all participants were civil servants, indicating homogeneous employment status.

Most respondents had 11–20 years of working experience (88.9% in both groups), reflecting a relatively long clinical experience. Regarding work units, the largest proportion of respondents worked in inpatient wards (50.0% in the classical group and 69.4% in the classical plus booklet group), followed by other units such as the emergency department, ICU/ICCU, operating room, NICU/PICU, and outpatient clinics.

In terms of training experience, most respondents in the classical group had never attended infection prevention and control (IPC) or occupational health and safety (OHS) training, as well as PPE/infection-related training. In contrast, more than half of the respondents in the classical plus booklet group had previously participated in such training programs.

Table 2. Comparison of Knowledge and Attitude Level in the Pretest and Posttest for Intervention Group 1 and Intervention Group 2

	Intervention Group 1				Intervention Group 2			
	<i>Pretest</i>		<i>Post Test</i>		<i>Pretest</i>		<i>Post Test</i>	
	f	%	f	%	f	%	f	%
Knowledge Level								
Good	30	83,3	32	88,9	28	77,8	32	88,9
Poor	6	16,7	4	11,1	8	22,2	4	11,1
Total	36	100	36	100	36	100	36	100
Attitude Level								
Good	20	55,6	24	66,7	24	66,7	28	77,8
Poor	16	44,4	12	33,3	12	33,3	8	22,2
Total	36	100	36	100	36	100	36	100

Table 2 shows an improvement in nurses' knowledge and attitudes following the interventions in both groups. In Intervention Group 1, the proportion of nurses with good knowledge increased from 83.3% at pretest to 88.9% at posttest, while in Intervention Group 2 it increased from 77.8% to 88.9%. Similarly, the proportion of nurses with a good attitude increased from 55.6% to 66.7% in Intervention Group 1 and from 66.7% to 77.8% in Intervention Group 2. These descriptive findings indicate that both interventions were followed by improvements in nurses' knowledge and attitudes regarding infectious disease transmission and the use of personal protective equipment (PPE), with a larger increase in knowledge observed in Intervention Group 2.

Table 3. Results of the Wilcoxon Analysis of Nurses' Knowledge of Infectious Disease Transmission and PPE Use

Knowledge	Group	Mean	sd	t-hitung	df	p Value
<i>Pretest</i>	Intervention 1	23,17	±1,134	-3,617	35	0,001
<i>Post Test</i>		23,89	±0,319			
<i>Pretest</i>	Intervention 2	23,33	±0,894	-2,728	35	0,006
<i>Post Test</i>		23,86	±0,424			

Table 3 presents the results of the Wilcoxon signed-rank test comparing nurses' knowledge before and after the intervention in both groups. In Intervention Group 1, the mean score increased from 23.17 ± 1.134 to 23.89 ± 0.319 , with a statistically significant result ($p = 0.001$). Similarly, in Intervention Group 2, the mean score increased from 23.33 ± 0.894 to 23.86 ± 0.424 , also showing a significant result ($p = 0.006$).

Both interventions were shown to significantly improve nurses' knowledge. Although the statistical change appeared stronger in Intervention Group 1, the final mean score in Intervention Group 2 was slightly higher, indicating that the effectiveness of both methods was relatively comparable. Overall, the educational interventions were effective in improving nurses' knowledge of infectious disease transmission and the use of PPE.

Table 4. Results of the Mann–Whitney Test on Differences in the Improvement of Nurses' Knowledge Scores

Knowledge	Mean	sd	t-hitung	df	p Value
Intervention 1	0,722	$\pm 1,185$	-0,681	71	0,496
Intervention 2	0,527	$\pm 0,999$			

Table 4 presents a comparison of the increase in knowledge scores between Intervention Group 1 and Intervention Group 2. The mean increase in Intervention Group 1 was 0.722 ± 1.185 , while in Intervention Group 2 it was 0.527 ± 0.999 . Both groups experienced improvements in knowledge, although the increase in Intervention Group 1 was slightly higher and more variable.

The statistical analysis showed no significant difference between the two groups ($p = 0.496$), indicating that both methods had comparable effectiveness in improving nurses' knowledge. Therefore, the selection of an intervention method may consider practical aspects such as resource availability and feasibility without compromising effectiveness in knowledge improvement.

Table 5. Results of the Wilcoxon Analysis of Nurses' Attitudes Toward Infectious Disease Transmission and PPE Use

Attitude	Kelompok	Mean	sd	t-hitung	df	p Value
Pretest	Intervention 1	66,83	$\pm 4,365$	-2,809	35	0,005
Post Test		69,50	$\pm 4,226$			
Pretest	Intervention 2	66,81	$\pm 3,463$	-2,222	35	0,026
Post Test		68,08	$\pm 4,607$			

Table 5 presents the results of the Wilcoxon signed-rank test used to assess changes in nurses' attitudes before and after the interventions in both groups. In Intervention Group 1, the mean attitude score increased from 66.83 ± 4.365 to 69.50 ± 4.226 , and this improvement was statistically significant ($p = 0.005$). In Intervention Group 2, the mean score increased from 66.81 ± 3.463 to 68.08 ± 4.607 , which was also statistically significant ($p = 0.026$).

Both interventions were effective in improving nurses' attitudes; however, the magnitude of improvement in Intervention Group 1 was greater than in Intervention Group 2. Overall, the educational interventions were able to promote positive attitudinal changes related to infection prevention and PPE use.

Table 6. Results of the Mann–Whitney Test on Differences in the Improvement of Nurses' Attitude Scores

Attitude	Mean	sd	t-hitung	df	p Value
Intervention 1	2,666	±6,288	-1,120	71	0,263
Intervention 2	1,278	±5,412			

Table 6 presents a comparison of the increase in attitude scores between the two groups. Descriptively, Intervention Group 1 showed a mean increase of 2.666 ± 6.288 , whereas Intervention Group 2 showed an increase of 1.278 ± 5.412 . Both groups demonstrated improvements in attitudes, although the increase in Intervention Group 1 was higher and more variable.

However, the statistical analysis indicated no significant difference between the two groups ($p = 0.263$), suggesting that both methods had relatively comparable effectiveness in improving nurses' attitudes. Overall, the educational interventions were able to improve nurses' attitudes, and the selection of training methods can therefore be adjusted based on practical considerations and implementation conditions.

DISCUSSION

Nurses' Knowledge of Infectious Disease Transmission and PPE Use Before and After the Interventions

The results indicate that educational interventions in both groups successfully improved nurses' knowledge regarding infectious disease transmission and PPE use, as evidenced by the increase in the "good" knowledge category and the decrease in the "poor" category. This confirms that education is a critical strategy in strengthening healthcare workers' cognitive capacity in infection prevention and control.

In Intervention Group 1, the relatively small improvement can be attributed to the fact that most respondents already had a high baseline level of knowledge (ceiling effect). This condition reflects reinforcement of existing knowledge gained through work experience and routine exposure to infection prevention and control (IPC) policies within the hospital (World Health Organization, 2016) (Gammon & Gould, 2007).

Additionally, repeated measurement effects may have contributed to increased knowledge through heightened awareness of the tested material. However, the limited improvement suggests that informal learning alone is insufficient to produce optimal and

equitable knowledge enhancement (Romano-bertrand et al., 2020) (Djubaedah, 2025) (Rauf et al., 2025).

In contrast, Intervention Group 2 demonstrated a more substantial improvement. The combination of classical training and an educational booklet provided a more systematic and sustainable learning experience, allowing participants to review the material independently. This approach aligns with adult learning principles and has been shown to enhance both comprehension and information retention (Notoatmodjo, 2012) (Committee & Apic, 2002) (Akbar et al., 2023) (Ghorbanmovahhed et al., 2023).

Although both groups achieved the same final proportion of good knowledge, the improvement in Intervention Group 2 was more structured and reflects the effectiveness of a systematically designed intervention. These findings emphasize that structured training supported by printed educational media represents an effective approach to improving nurses' knowledge.

From a practical perspective, this increase in knowledge contributes to patient and healthcare worker safety by promoting greater adherence to infection prevention procedures. Therefore, hospitals should develop comprehensive and continuous training programs tailored to nurses' baseline knowledge levels. Overall, the educational interventions proved effective in improving nurses' knowledge and constitute an essential component of infection control strategies in healthcare settings.

Nurses' Attitudes Toward Infectious Disease Transmission and PPE Use Before and After the Interventions

The study findings indicate that educational interventions in both groups were able to improve nurses' attitudes toward infectious disease transmission and PPE use, as reflected in the increased proportion of good attitudes and the reduced proportion of poor attitudes. These findings confirm that education not only enhances cognitive aspects but also fosters positive attitudes toward infection prevention practices.

In Intervention Group 1, attitude change occurred as a result of strengthened risk perception and reflection on the importance of occupational safety. A supportive safety-oriented work environment and self-evaluation processes can promote attitude shifts even in the absence of intensive training (Nainggolan et al., 2025) (Easton & Alyafei, 2024). However, the changes remained limited, as attitudes are strongly influenced by habitual work patterns and situational factors, making them difficult to modify without structured interventions (Ghorbanmovahhed et al., 2023).

In contrast, Intervention Group 2 demonstrated a higher final level of positive attitudes. The combination of classical training and an educational booklet functioned as a reinforcement mechanism, strengthening positive attitudes through both cognitive and affective processes. Printed educational media allow for repeated review and self-reflection, thereby enhancing the internalization of safety values (Ariwati et al., 2024) (Fabre et al., 2025) (Sari, 2023).

Although both groups experienced improvements, the final outcomes in Intervention Group 2 were higher and reflected more consistent changes. This finding underscores that structured educational interventions supported by printed media are more effective in fostering positive attitudes among nurses toward infection prevention and PPE use.

Overall, these findings highlight that systematic and continuous education is a key strategy in shaping nurses' professional attitudes and supporting effective infection prevention practices in healthcare facilities.

Differences in Nurses' Knowledge of Infectious Disease Transmission and PPE Use Before and After the Interventions

The Wilcoxon test results confirm that educational interventions in both groups significantly enhanced nurses' knowledge regarding infectious disease transmission and PPE use, reinforcing the role of education as a primary strategy for improving the cognitive capacity of healthcare workers.

In Intervention Group 1, the increase in mean scores along with the reduction in standard deviation indicates that the educational intervention not only improved knowledge but also contributed to greater uniformity in nurses' understanding. This effect may also be influenced by workplace environmental factors and repeated measurement (testing effect), which encourage reflection and independent learning (Buljac-samardzic et al., 2020). However, the magnitude of improvement was relatively modest and tended to be gradual.

In Intervention Group 2, the increase in knowledge was also statistically significant, demonstrating that the combination of classical training and an educational booklet effectively strengthened understanding and corrected misconceptions. This finding is consistent with previous studies indicating that a combination of face-to-face training and printed educational media is more effective in improving healthcare workers' knowledge (Lawn et al., 2017).

Overall, both methods were effective in improving knowledge; however, the use of an educational booklet provided more structured reinforcement. This suggests that structured training methods supported by educational media are more optimal in enhancing nurses' knowledge as part of efforts to prevent infection transmission in healthcare settings.

Differences in the Improvement of Nurses' Knowledge Scores on Infectious Disease Transmission and PPE Use Between Intervention Group 1 and Intervention Group 2

The results indicate that although Intervention Group 1 demonstrated a higher average increase in knowledge, the difference was not statistically significant ($p > 0.05$), suggesting that both methods were relatively equivalent in enhancing nurses' knowledge of infectious disease transmission and PPE use. This finding is consistent with previous studies indicating that various training methods can improve knowledge, although differences between methods are not always statistically significant. The findings indicate that although Intervention Group 1 demonstrated a higher average increase in knowledge, the difference was not statistically significant ($p > 0.05$), suggesting that both methods were relatively equivalent in enhancing nurses' knowledge of infectious disease transmission and PPE use. This finding is consistent with previous studies indicating that various training methods can improve knowledge, although differences between methods are not always statistically significant (Adugna et al., 2024) (Woolleya et al., 2020).

The absence of a significant difference also suggests that the addition of an educational booklet did not provide a substantial incremental effect. This may be because both groups received the same core material, while the interactive classical training method was already sufficiently effective in building understanding. From the perspective of andragogy and cognitive load theory, the booklet functions more as a reinforcement tool rather than a primary source of new information, thereby limiting its impact on knowledge improvement, particularly when respondents already possess relatively high baseline knowledge (ceiling effect).

Furthermore, the effectiveness of the booklet depends heavily on participant engagement. Without active learning strategies, the booklet may function merely as supplementary reading material. On the other hand, nurses' intrinsic motivation to ensure their own safety and patient safety may sustain effective learning even when only a single primary training method is used.

Thus, the absence of a significant difference does not imply that the booklet is ineffective; rather, it indicates that a well-structured classical training method is already adequate for improving basic knowledge. For more optimal and sustained outcomes, the booklet should be integrated with active learning strategies such as case discussions, quizzes, problem-based learning, and supervised clinical practice.

Differences in Nurses' Attitudes Toward Infectious Disease Transmission and PPE Use Before and After the Interventions

The results indicate that although Intervention Group 1 demonstrated a higher average increase, the difference between the two methods was not statistically significant ($p > 0.05$),

suggesting that both approaches had relatively comparable effectiveness in improving nurses' attitudes toward infectious disease transmission and PPE use. This result is consistent with previous studies indicating that various training approaches—such as workshops, e-learning, and PPE training can significantly improve knowledge and attitudes, although differences between methods are often not statistically significant (Adugna et al., 2024; Woolleya et al., 2020). This implies that learning outcomes are influenced not only by the type of method but also by factors such as motivation, work experience, and continuous reinforcement.

The absence of a significant difference also suggests that the addition of an educational booklet did not provide a substantial incremental benefit compared with the classical method alone. This may be explained by the fact that both groups received the same core material, while the interactive classical method was already effective in shaping understanding and attitudes. In this context, the booklet functioned primarily as a reinforcement tool, and its impact remained limited when not actively integrated into the learning process.

Other contributing factors include the relatively high baseline level of knowledge (ceiling effect), balanced cognitive load, and the absence of mechanisms to ensure intensive utilization of the booklet. Additionally, nurses' intrinsic motivation to ensure personal and patient safety may have sustained effective learning even when only a single primary method was used.

Therefore, these findings do not indicate that the booklet is ineffective; rather, they suggest that a well-structured classical training method is already sufficient to improve basic knowledge and attitudes. To maximize its effectiveness, the booklet should be integrated with active learning strategies such as case discussions, quizzes, problem-based learning, and supervised practice, thereby strengthening comprehension, retention, and the application of knowledge in clinical settings.

The Wilcoxon analysis also revealed differences in the pattern of attitudinal change between the two groups. In the classical training group, a significant improvement in attitudes was observed even without the addition of a booklet, indicating that nurses' attitudes are influenced not only by formal training but also by work experience, institutional policies, and safety culture within the workplace. Continuous exposure to IPC procedures, supervision, and peer role models can foster positive attitudes over time (Lawn et al., 2017).

In contrast, in the classical training combined with booklet group, the improvement in attitudes was not statistically significant despite descriptive increases. This suggests that attitude change generally requires a longer period than knowledge improvement, as it involves the internalization of values, social norms, and repeated experiences (Ajzen, 1991).

Although the statistical significance differed, the magnitude of attitudinal improvement in both groups was relatively similar, indicating that attitude change is influenced by multiple contextual factors beyond the training method alone. Overall, these findings highlight that changes in nurses' attitudes require continuous and integrated interventions supported by a strong safety culture to achieve more consistent and meaningful outcomes.

Differences in the Improvement of Nurses' Attitude Scores on Infectious Disease Transmission and PPE Use Between Intervention Group 1 and Intervention Group 2

The results show that although the average increase in attitude scores was higher in Intervention Group 1, the difference was not statistically significant ($p > 0.05$). This indicates that both methods had relatively equivalent effectiveness in promoting attitudinal change related to infection prevention and PPE use. Descriptively, both groups experienced improvements in attitudes, indicating that educational interventions were effective in strengthening perceptions of the benefits of PPE and awareness of infection risks. The relatively large variability in responses across both groups suggests that attitudinal change is influenced by multiple factors, including work experience, social norms, risk perception, and organizational safety culture. These findings are consistent with previous studies reporting that educational interventions improve positive attitudes, although differences between training methods are not always statistically significant (Abalkhail et al., 2021) (Tsukada et al., 2024).

Within this context, the educational booklet still functions as a reinforcement medium that helps maintain consistency of safety messages and supports clinical practice, even though it does not produce a statistically significant difference in attitudinal change. This finding indicates that changes in attitude are not determined solely by the method of delivery but also by the process of internalizing values and workplace culture.

From a practical perspective, both methods can be applied flexibly in training programs by considering efficiency and resource availability. However, to achieve more optimal and sustainable changes in attitudes, interventions should be complemented by more comprehensive approaches such as experiential learning, clinical supervision, and reinforcement of a strong safety culture within the workplace.

CONCLUSIONS

Both training approaches classical training and classical training supplemented with an educational booklet were equally effective in improving nurses' knowledge and attitudes regarding infectious disease transmission and the use of personal protective equipment (PPE), as indicated by the statistically significant increases between pretest and posttest scores.

However, no significant difference in effectiveness was observed between the two methods, suggesting that both approaches can be applied interchangeably within training programs.

These findings indicate that a well-structured classical training method is sufficient to enhance knowledge, while the educational booklet serves as a reinforcing medium to sustain understanding and promote positive attitudes. To achieve more optimal and sustainable changes in attitudes, training programs should be supported by strengthening the safety culture, continuous clinical supervision, and practice-based learning within the workplace.

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