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ORIGINAL RESEARCH

Determining the Effectiveness of a Clinical Nursing Teaching Intervention in Improving Teamwork Ability: A Quasi-Experimental Study

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Objective: This study aimed to explore the effectiveness of applying TeamSTEPPS ((Team Strategies & Tools to Enhance Performance & Patient Safety, TeamSTEPPS)) in clinical nursing education and evaluate its impact on improving teamwork skills among nursing trainees. TeamSTEPPS is a systematic framework developed to improve healthcare team performance and patient safety, focusing on core elements such as leadership, communication, situation monitoring, mutual support, and team structure.

Methods: A total of 120 nursing trainees, who interned at Affiliated Hospital of Jiangnan University from November 2020 to November 2022, participated in this study. The participants were randomly divided into two groups: an intervention group (n= 60) that received instruction based on the TeamSTEPPS framework, and a control group (n= 60) that followed the traditional nursing education model. The TeamSTEPPS curriculum consisted of five key modules: team structure, effective communication, leadership, situation monitoring, and mutual support. The intervention included weekly theoretical and practical training sessions over a six-month period, incorporating group discussions, simulation training, scenario-based teaching, and role-playing. The impact of the intervention was assessed through pre- and post-intervention evaluations using the Teamwork Attitudes Questionnaire (T-TAQ), which measured teamwork awareness, communication skills, leadership, and mutual support.

Results: Before the intervention, there were no significant differences between the two groups in terms of Team Structure, Leadership, Situation Monitoring, Mutual Support, and Communication skills ($P > 0.05$). After the intervention, the intervention group showed significant improvements in Team Structure, Leadership, Situation Monitoring, Mutual Support, and Communication skills, with scores significantly higher than those of the control group ($P < 0.05$).

Conclusion: The TeamSTEPPS-based teaching model significantly enhances nursing students' Team Structure, Leadership, Situation Monitoring, Mutual Support, and Communication skills, showing superior outcomes compared to the traditional education model. This evidence suggests that TeamSTEPPS is a valuable tool for nursing education and should be further promoted and applied in clinical training settings.

Keywords: TeamSTEPPS, clinical nursing, teaching model, teamwork, teaching research

Introduction

Patient safety is a serious topic in healthcare. According to the Institute of Medicine (IOM), at least 98,000 hospitalized patients die each year due to medical errors, 58% of which are preventable Communication failures and leadership errors are the main causes. In response to this, the Agency for Healthcare Research and Quality (AHRQ) and the US Department of Defense (DoD) collaborated to develop a team communication strategy and toolkit (Team Strategies & Tools to Enhance Performance & Patient Safety, TeamSTEPPS) to improve healthcare quality and patient safety. TeamSTEPPS is an evidence-based approach designed to enhance four key skills: leadership, situation monitoring, mutual support, and effective communication, with an emphasis on optimizing team structure. TeamSTEPPS is a systematic team collaboration strategy and tool designed to improve the performance of healthcare teams and ensure patient safety.[1,2]

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In recent years, the importance of teamwork in clinical nursing has gained increasing attention, especially in complex healthcare environments, where effective collaboration is crucial to improving care quality and reducing medical errors. The traditional nursing education model relies on the "apprentice" method, where experienced nurses mentor students. The selection of mentors is often based on seniority rather than competency, and the teaching method follows a one-on-one or shadowing approach. This model limits the interns' ability to work independently, as they mainly rely on their mentors and lack initiative in completing tasks. Consequently, the training process becomes mechanical, with students only knowing basic patient information without understanding their diseases or treatment plans. This leads to a narrow and mechanical approach to patient care. Under this model, nursing students often fail to understand the holistic needs of patients, such as their psychological state during treatment, resulting in a lack of comprehensive and systematic care.[3,4]

The TeamSTEPPS framework, through its five core elements—leadership, situation monitoring, mutual support, communication, and team structure—can effectively enhance team collaboration.[5] Studies have confirmed the significant impact of applying TeamSTEPPS theory in various healthcare teams, including pediatric intensive care units and surgical teams, where it has improved communication efficiency and reduced medical errors.[6] It has been found that applying the TeamSTEPPS theory in nursing education helps trainees better handle emergencies in real-world practice, increases sensitivity to patient safety, and promotes more effective interprofessional collaboration.[7]

Multiple international studies have shown that after implementing this theory, both team collaboration levels and patient care quality improved significantly.[8] For instance, a study on pediatric intensive care teams demonstrated that the use of TeamSTEPPS led to marked improvements in team responsiveness and communication quality, with a significant reduction in patient safety incidents.[9] Other research has pointed out that incorporating TeamSTEPPS into nursing education enhances trainees' communication, leadership, and task allocation skills, while also improving their ability to respond to emergencies. These studies suggest that TeamSTEPPS is not only an effective tool for teamwork training but also offers a new direction for improving clinical nursing education models.[10]

In China, the traditional nursing education system has not systematically emphasized the development of teamwork, particularly in complex and emergency situations. This study seeks to address this gap by exploring the application of TeamSTEPPS in clinical nursing education, a topic that has not been widely explored in the Chinese context. This research will assess the effectiveness of TeamSTEPPS in improving teamwork skills among nursing students, filling a significant gap in the current nursing education framework.

Materials and Methods

Research Objects

The study selected 120 nursing students who participated in clinical internships at Affiliated Hospital of Jiangnan University from November 2020 to November 2022 as the research subjects. Randomization was performed using a computer-generated random number table to ensure unbiased allocation. The participants were then divided into two groups: an intervention group (n= 60) that received instruction based on the TeamSTEPPS framework, and a control group (n= 60) that followed the traditional nursing education model. Both groups underwent a six-month clinical internship, with the intervention group adopting the TeamSTEPPS teaching model and the control group following the traditional teaching model. The average age of the nursing students in the intervention group was 24.5±2.3 years old, and the proportion of women was 82%; the average age of the students in the control group was 24.7±2.6 years old, and the proportion of women was 80%. There was no significant difference in the baseline data of the two groups of students, including age and gender ($P>0.05$), and the baselines were balanced. This study was approved by the Affiliated Hospital of Jiangnan University ethics committee. All research subjects gave informed consent to participate in this study, and no one terminated midway. The inclusion criteria were: (1) over 18 years old and with a nursing background; (2) participating in clinical internships and having basic nursing knowledge; (3) no language or cognitive impairment; (4) voluntarily participating in the study and signing an informed consent form.

Exclusion criteria are: (1) Those who suffer from serious psychological or mental illness; (2) Those who withdraw from internship due to other reasons during the study period.

Research Methods

The traditional clinical teaching model followed by the control group involved a standard rotation through departments. Each student was assigned a mentor from the nursing staff, who provided one-on-one guidance and supervision. Weekly lectures, nursing rounds, and practical demonstrations were incorporated. The students observed and assisted in patient care, with a focus on basic clinical skills and tasks. This model emphasized observation and practice under supervision, without a structured focus on teamwork development.

TeamSTEPPS course training content: The TeamSIEPPS course training content is based on the theoretical framework and introduces students to a series of strategies and tools from the five modules of team structure, effective communication, leadership, situational monitoring and mutual support, see Table 1.

The research team was composed of one deputy director of the nursing department in charge of nursing education, one head nurse, one leader of the nursing teaching and research group, one chief nursing instructor, two specialized emergency nurses, and one associate chief physician.

Based on the TeamSTEPPS framework, the teaching methods for the intervention group focused on training students in communication, task allocation, situation monitoring, mutual support, and leadership skills. The intervention lasted for six months and employed a variety of teaching methods, including group discussions, simulation training, scenario-based teaching, and role-playing. Theoretical training was conducted once a week, along with a practical training session. The theoretical training covered basic principles of teamwork and core elements of the TeamSTEPPS framework, such as effective communication skills (using the SBAR model), situation monitoring (using the STEP model), and leadership. Practical training involved simulations of task allocation, team communication, and emergency response in a work-like environment to enhance the students' hands-on abilities.

Every two weeks, group discussions were held, where students shared real-world challenges from their work, and analyzed them within the TeamSTEPPS theoretical framework. Monthly, simulation drills and teamwork tasks were conducted, simulating emergencies or high-pressure situations to practice real-time team coordination. Role-playing sessions were organized, with students assigned different roles to experience firsthand the full process of team leadership, communication, and task execution. Throughout the intervention, teamwork skills were regularly evaluated, and mentors provided personalized feedback to help students identify and improve their weaknesses, aiming to comprehensively enhance their teamwork and emergency response capabilities.

Observation Indicators and Evaluation Criteria

The TeamSTEPPS® Teamwork Attitudes Questionnaire (T-TAQ) consists of 30 items across five dimensions: Team Structure, Leadership, Situation Monitoring, Mutual Support, and Communication. Each dimension includes 6 items. The questionnaire uses a 5-point Likert scale to rate each item, where participants respond on a scale from 1 (strongly disagree) to 5 (strongly agree). Therefore, the score for each individual item ranges from 1 to 5. Each dimension has a score range of 6 to 30 points, with 6 items per dimension (6 items × 5 points maximum = 30 points per dimension). The

Table 1 Introduction to TeamSTEPPS Course Training Content

Module	Specific Content
Team Structure	Definition of team and team structure, importance of team members working with patients and families, components of multi-team system, video and discussion on team structure, effective communication, current situation, background, assessment and recommendations (situation-background-assessment-recommendation, SBAR),(call-out), (check-back), (handoff)
Leadership	Types of team leaders, definition of an effective team leader, the role of the team leader in conflict resolution, (briefs), (huddle), (debrief)
Situation Monitoring	Build a shared mental model, patient status-team member-environment-target alignment tool (status of the patient-team-environment-progress toward the goal, STEP)
Mutual Support	Feedback, advocacy and persistence, two-time reminder system, immediate shutdown (concern-uncomfort-safety, CUS), Description-Expression-Suggestion-Result (describe-express-suggest-consequences, DESC)
Communication	Introduction to the SBAR model (Situation, Background, Assessment, Recommendation), role-play for practicing communication, emphasizing clear handoffs, call-outs, check-backs, and ensuring understanding in team interactions.

maximum possible score for the total questionnaire is 150 points (30 items × 5 points maximum). However, the T-TAQ includes 4 negatively worded items, 3 of which are in the Mutual Support dimension and 1 in the Communication dimension. For these negative items, scoring is reversed to ensure that lower scores reflect more negative attitudes toward teamwork. Specifically, if a participant rates a negatively worded item highly (eg, 5 = strongly agree), this score is reversed (converted to 1) for the purpose of calculating the final score. The reversed scores ensure that negative responses are appropriately reflected and that all dimensions are assessed consistently with the overall TeamSTEPPS model. For each dimension, the total score is calculated by summing the scores for the individual items, including the reversed items for negatively worded questions. The final score for each dimension ranges from 6 to 30 points, and the total score ranges from 30 to 150 points, with lower scores indicating less favorable attitudes toward teamwork and higher scores indicating stronger teamwork attitudes.

The Chinese version of the T-TAQ was cross-culturally translated and adapted following Diep's[11] translation model. Initially, the original English version of the T-TAQ was translated into Mandarin by a professional bilingual translator. The translated version was reviewed, and minor semantic and conceptual adjustments were made. A back-translation to English was conducted by another bilingual translator, followed by a comparison between the original and back-translated versions to ensure consistency. A pilot test of the Chinese T-TAQ was conducted with 15 healthcare professionals to ensure the clarity and appropriateness of the translation. Based on their feedback, further language modifications were made to ensure the questionnaire's relevance and clarity in the Chinese context.[12]

Statistical Analysis

Data were analyzed using SPSS 22.0 statistical software. Descriptive statistics were performed, with continuous data expressed as mean ± standard deviation (Mean ± SD). An independent sample *t*-test was used for data analysis, and statistical significance was set at $P < 0.05$ for this study.

To compare before and after intervention results, a paired *t*-test was used for normally distributed data, while the non-parametric Wilcoxon signed-rank test was employed for non-normally distributed data or small sample sizes. These tests were performed to assess any significant improvements in students' knowledge and attitudes toward teamwork after the intervention.

Results

Team Structure

As shown in Table 2, before the intervention, there was no significant difference in Team Structure scores between the two groups ($P > 0.05$). After the intervention, the Team Structure score of the intervention group was significantly higher than that of the control group, and the difference was statistically significant ($P < 0.05$).

Leadership

As shown in Table 3, before the intervention, there was no significant difference in Leadership scores between the two groups ($P > 0.05$). After the intervention, the Leadership score of the intervention group was significantly higher than that of the control group, and the difference was statistically significant ($P < 0.05$).

Table 2 Impact of Different Teaching Models on Team Structure

Groups	Before Intervention	After Intervention
Intervention group (n=60)	21.37 ± 5.27	27.93± 7.01
Control group (n=60)	21.45 ± 5.21	24.18 ±6.41
t	0.084	0.984
p	0.933	0.001

Table 3 Impact of Different Teaching Models on Leadership

Groups	Before Intervention	After Intervention
Intervention group (n=60)	15.24± 4.63	22.75 ± 6.89
Control group (n=60)	15.49 ± 4.61	18.53 ± 6.92
t	0.626	3.347
p	0.339	0.001

Situation Monitoring

As shown in Table 4, before the intervention, there was no significant difference in Situation Monitoring scores between the two groups ($P > 0.05$). After the intervention, the Situation Monitoring score of the intervention group was significantly higher than that of the control group, and the difference was statistically significant ($P < 0.05$).

Mutual Support

As shown in Table 5, before the intervention, there was no significant difference in Mutual Support scores between the two groups ($P > 0.05$). After the intervention, the Mutual Support score of the intervention group was significantly higher than that of the control group, and the difference was statistically significant ($P < 0.05$).

Communication

As shown in Table 6, before the intervention, there was no significant difference in Communication scores between the two groups ($P > 0.05$). After the intervention, the Communication score of the intervention group was significantly higher than that of the control group, and the difference was statistically significant ($P < 0.05$).

Table 4 Impact of Different Teaching Models on Situation Monitoring

Groups	Before Intervention	After Intervention
Intervention group (n=60)	20.71± 6.82	27.63 ± 8.27
Control group (n=60)	20.37 ± 7.01	23.75 ± 6.91
t	0.269	2.789
p	0.788	0.006

Table 5 Impact of Different Teaching Models on Mutual Support

Groups	Before Intervention	After Intervention
Intervention group (n=60)	16.33±5.71	25.82 ± 7.92
Control group (n=60)	16.38±5.92	19.24± 7.37
t	0.047	1.813
p	0.923	0.001

Table 6 Impact of Different Teaching Models on Communication

Groups	Before Intervention	After Intervention
Intervention group (n=60)	18.38± 5.22	23.41 ± 7.04
Control group (n=60)	18.52 ± 5.91	20.77 ± 6.49
t	0.161	0.937
p	0.753	0.001

Discussion

The results of this study demonstrate that the TeamSTEPPS teaching model significantly improves nursing students' teamwork, communication, and leadership skills, with these improvements being particularly evident in the intervention group after the intervention. Compared to the control group, the intervention group exhibited a greater increase in teamwork skills, indicating that the structured training methods of the TeamSTEPPS model effectively enhance students' collaboration and teamwork awareness in clinical settings. This finding aligns with the conclusions of Aldawood et al, who found that structured team communication tools can significantly improve teamwork skills.[13] Additionally, Shi et al's research supports this study by showing that TeamSTEPPS effectively reduces medical errors.[14]

Communication skills, a key factor in teamwork, saw a marked improvement in this study. The intervention group's increase in communication scores was significantly greater than that of the control group, suggesting that TeamSTEPPS, through simulation training and scenario-based teaching, helps students communicate more smoothly with colleagues and patients in clinical settings. This is consistent with the findings of Scolari et al, who highlighted the benefits of the standardized communication tool SBAR in clinical practice.[15] Simulation training not only enhances communication efficiency among team members but also improves the ability to respond to emergencies, ensuring better patient safety through effective communication mechanisms.

Leadership improvement was another important finding in this study. The intervention group showed significantly greater progress in leadership skills compared to the control group, particularly in task allocation and emergency response.[16] Hansen et al noted that systematic leadership training improves decision-making efficiency and emergency response in medical teams. Enhanced leadership plays a crucial role in teamwork and also boosts students' confidence in navigating complex nursing environments.[17]

The results of this study further validate the value of applying the TeamSTEPPS framework in clinical nursing education. Through scenario-based teaching and simulation training, students not only improved their professional skills but also demonstrated stronger teamwork and leadership abilities in practice.[18,19] These findings are consistent with those of Krivanek et al, who concluded that TeamSTEPPS can significantly improve communication and collaboration among team members and reduce conflict.[20,21] Burns et al also confirmed that online simulations and training can effectively improve teamwork and patient safety.[22]

The TeamSTEPPS teaching model provides an effective tool for clinical nursing education. Through comprehensive teamwork training, it not only enhances students' communication and leadership skills but also lays a solid foundation for their future clinical work. Future research could further explore the effectiveness of this model in different clinical departments to optimize the teaching model and improve nursing quality.[23,24]

Despite the positive outcomes observed in this study, there are several limitations to consider. First, the study was conducted in a single institution with a relatively small sample size, which may limit the generalizability of the results to broader populations or other clinical settings. Additionally, the study relied on self-reported measures of teamwork, communication, and leadership skills, which could be subject to bias. Future studies with larger, more diverse samples and objective measures (eg, peer evaluations, clinical performance assessments) could provide more robust insights into the effectiveness of the TeamSTEPPS model. Furthermore, while the study showed improvements in the intervention group, the long-term impact of TeamSTEPPS on students' clinical performance and patient outcomes remains to be investigated. Future research could explore the sustainability of these improvements over time and in real-world clinical environments.

Conclusion

This study demonstrates that the TeamSTEPPS teaching model significantly improves nursing students' Team Structure, Leadership, Situation Monitoring, Mutual Support, and Communication skills. The intervention group showed substantial improvements in all five areas after the intervention, with scores significantly higher than those of the control group. These findings underscore the effectiveness of the TeamSTEPPS model in enhancing essential teamwork and communication competencies in clinical nursing education. The systematic training and scenario-based simulations used in this study not only

strengthened students' professional skills but also fostered a deeper understanding of collaborative care. These results validate the TeamSTEPPS model as a valuable tool for optimizing nursing education and improving the overall quality of nursing care. Future research could further explore the model's impact across different clinical settings and evaluate its long-term effects on clinical practice and patient outcomes.

Disclosure

The authors report no conflicts of interest in this work.

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