

Impact of education on nurses' perceptions of patient safety culture: A systematic review

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Abstract: Patient safety culture is crucial for providing safe, high-quality care. Educating nurses about patient safety is considered a significant intervention for improving their perceptions of patient safety culture. This systematic review aimed to identify the impact of educational interventions on nurses' perceptions of patient safety culture. The current review followed the PRISMA 2020 reporting guidelines for new systematic reviews. The search focused on studies published in English from January 2019 to April 2025 in six databases: CINAHL via EBSCOhost, MEDLINE via EBSCOhost, Scopus via Elsevier, ProQuest, the Cochrane Central Register of Controlled Trials, and Web of Science. Two reviewers independently screened the studies using the Rayyan platform and evaluated the quality of the included studies using the Medical Education Research Study Quality Instrument. Seven studies met the inclusion criteria. All included studies were of moderate quality. Six studies used quasi-experimental designs, and one was a randomized controlled trial. Overall, the findings indicate that educational interventions positively influence nurses' perceptions of patient safety culture. This review highlights the importance of educational interventions in strengthening patient safety culture. It emphasizes the need for well-structured and ongoing education to sustain improvements in patient safety culture.

Keywords: Education, Intervention, Patient safety culture, Safety culture, Training.

1. Introduction

Safety is a fundamental pillar of care quality; however, within every healthcare system, the level of safety in care delivery varies and is not always optimal [1]. The incidence of negative outcomes resulting from unsafe care is likely among the top 10 causes of mortality and disability worldwide [2]. In high-income countries, it is estimated that 1 in every 10 patients experiences harm during hospital care, with a variety of adverse events contributing to this issue; nearly 50% of these incidents are deemed preventable [2]. Worldwide, approximately 4 in 10 patients experience harm in primary and outpatient healthcare settings, with as much as 80% of this harm being preventable [2].

To consistently improve patient safety, health organizations must cultivate their safety cultures [3, 4]. The culture of patient safety reflects the degree to which an organization's environment fosters and encourages patient safety; it encompasses the shared values, beliefs, and norms among healthcare practitioners and staff, which, in turn, shape their actions and behaviors [5].

Training and education of healthcare workers have been implemented in developed nations and proposed as essential strategies to enhance patient safety culture [6]. Nurses are the backbone of healthcare facilities and the healthcare providers who have the most contact with and spend the most

time with patients. Nurses play a crucial role in promoting safety through formal policies, informal discourse, involvement, and encouragement of safe behaviors, supported by their professional and organizational training, thereby ensuring a patient safety culture [7]. Numerous studies have investigated the effectiveness of educational interventions on nurses' perceptions of patient safety culture [8–10]. However, no published systematic review specifically addresses nursing studies related to this issue. Therefore, the current review sought to address this gap.

2. Methodology

2.1. Study Design

To achieve the objective of this review, which was to identify the impact of educational interventions on nurses' perceptions of patient safety culture, a systematic review was conducted following the PRISMA 2020 reporting guidelines for new systematic reviews [11].

2.2. Inclusion and Exclusion Criteria

The inclusion criteria focused on interventional studies published in English that examined the impact of educational interventions on nursing staff's perception of patient safety culture. Eligible studies were published between January 2019 and April 2025 and employed randomized controlled trials or quasi-experimental designs, with or without a control group. The PICO model was used to define the target population, intervention type, comparison group, and study outcomes (Table 1).

However, the exclusion criteria pertained to review articles and studies focusing on the impact of educational interventions on patient safety culture among nursing students or all healthcare professionals. In addition, researchers' opinion papers, study protocols, reviews, and conference abstracts were excluded.

Table 1.
PICO strategy description.

Acronym	Definition	Description
P	Population	Nursing staff
I	Intervention	Education materials or program
C	Comparison	Standard education, no educational intervention, or comparison between two educational programs
O	Outcome	Impact or no impact on the perception of patient safety culture

2.3. Search Strategy

The current review encompasses an extensive search across six databases: 1) Cumulative Index to Nursing and Allied Health Literature (CINAHL) via EBSCOhost, 2) MEDLINE via EBSCOhost, 3) the Cochrane Central Register of Controlled Trials via EBSCOhost, 4) ProQuest, 5) Scopus via Elsevier, and 6) Web of Science. A one-step search strategy was employed to identify pertinent studies. Terms related to patient safety culture, safety culture, safety climate, education, programs, interventions, courses, workshops, and training were utilized. The researcher used the Boolean operators 'AND' and 'OR' across all databases to either expand or refine the combined keywords (Supplementary A). The screening process was performed independently by two reviewers using the Rayyan platform. The reviewers discussed discrepancies to reach a consensus.

2.4. Data Extraction and Synthesis

The data extraction process involved recording key elements, including the author, year, country, study aim, study design, participants, instrument, data collection time points, educational intervention, and findings (Supplementary B). Extraction was conducted by the first author and subsequently reviewed by the second and third authors.

Due to heterogeneity in study designs, educational programs, follow-up periods, and outcome reporting methods, conducting a meta-analysis was not feasible. Hence, the results were synthesized

through an integrated approach combining descriptive numerical analysis and narrative thematic synthesis.

Mean differences in the overall patient safety culture score and its dimensions, with p values, changes in the percentages and levels of positive responses, and difference-in-differences (DID) with 95% confidence intervals were reported. Outcomes not selected as primary outcomes for this review were excluded from both the results table and the synthesis.

2.5. *Quality Assessment*

The quality of the included studies was independently evaluated by two reviewers using the Medical Education Research Study Quality Instrument (MERSQI). The instrument was developed to evaluate the quality of experimental, quasi-experimental, and observational studies [12].

MERSQI scores are used by researchers, reviewers, and editors to predict editorial decisions and identify methodological strengths and weaknesses in submitted manuscripts [13]. Instrument validity is supported by expert consensus, authoritative literature, internal structure, and significant associations with quality ratings and citation rates [12]. Previous systematic reviews have used MERSQI to assess the quality of educational nursing studies [14, 15]. The instrument encompasses six domains: study design, sampling methods, types of data, validity of the evaluation instrument, data analysis techniques, and outcomes. The lowest score is 5, whereas the highest score is 18. Previous meta-analyses reported that a mean MERSQI score greater than 9 is acceptable [16, 17]. Accepted articles had a considerably higher mean overall MERSQI score than rejected manuscripts (10.7 ± 2.5 versus 9.0 ± 2.4) [13]. Percentages of total scores were calculated to categorize study quality as low, moderate, or high. Low corresponds to a score of 50% or less, moderate ranges from 51% to 75%, and high is defined as 76% to 100% [14]. The Statistical Package for the Social Sciences (SPSS), version 29, was used to calculate frequencies, percentages, means, and standard deviations.

3. Results

3.1. *Study Selection*

The database searches yielded a total of 333 articles. One hundred and fifty-six articles were removed because of duplication. Following the removal of duplicates, the titles and abstracts of the remaining papers underwent a thorough review, resulting in 148 being classified as ineligible according to the established inclusion criteria. Access issues prevented the retrieval of one article. Upon review of the full texts, 21 articles were found to be ineligible. The systematic review included seven studies. The selection process and the rationale for exclusions at each stage of this review are illustrated in the PRISMA flow diagram in Figure 1.

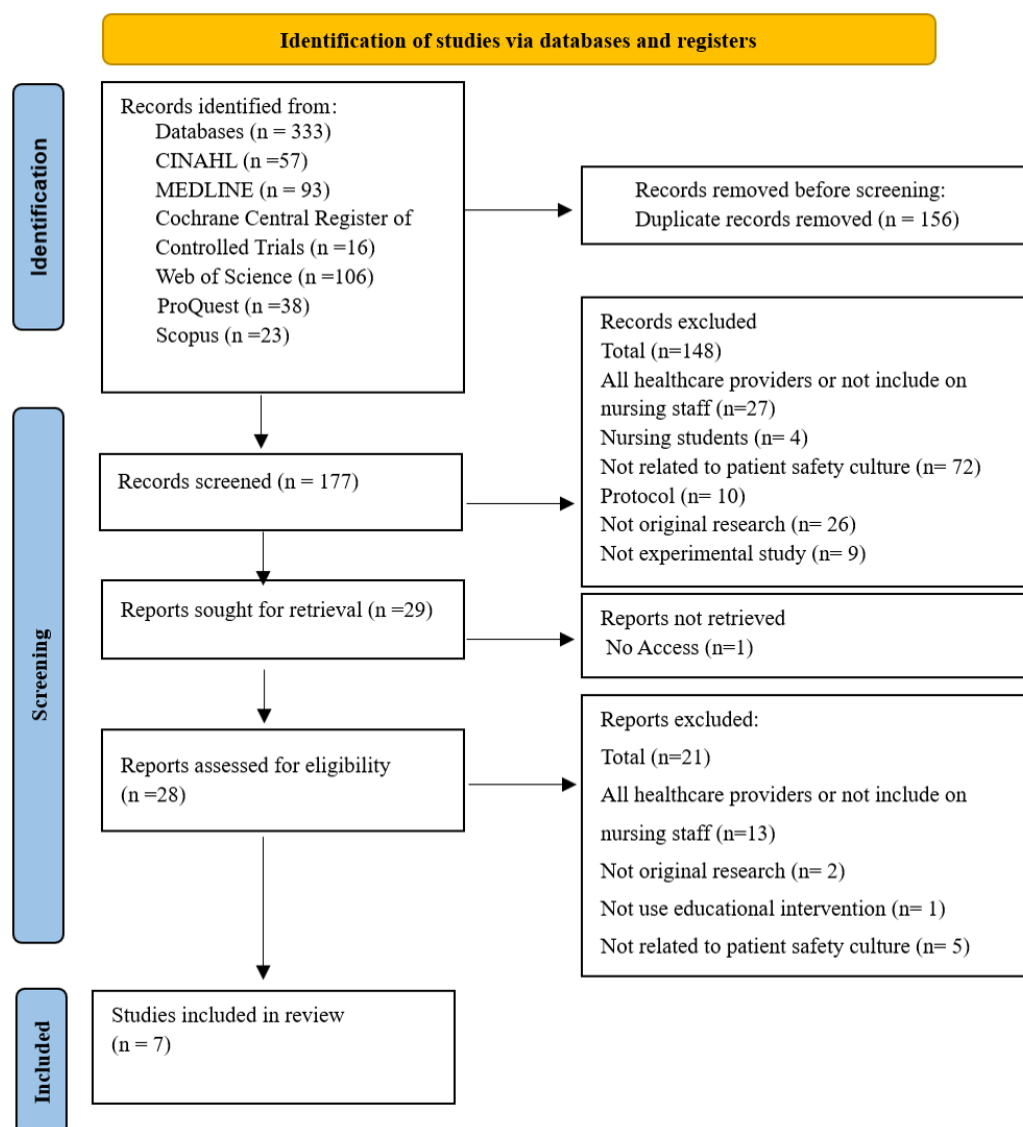


Figure 1.
PRISMA flow diagram.

3.2. Quality Assessment

The mean score across the seven studies included in this review was 11.64 (SD = 0.56), with scores ranging from 11 to 12.5. All included studies were of moderate quality. Not all the included studies reported the content and construct validity of the Hospital Survey on Patient Safety Culture (HSOPSC). This survey was released by the Agency for Healthcare Research and Quality, which approved its validity. In addition, the survey has been widely used by researchers since 2004, and its validity has been confirmed in numerous translations. Consequently, full scores were given for the instrument validity domain. A score of zero was given for the content and construct validity of a modified version of the Safety Attitudes Questionnaire used by Park, et al. [18], with no accompanying information regarding these items [18]. One study did not report the response rate or the number of participants before the program or at follow-up [9]. Therefore, the score was classified as not reported. Quality assessment scores are provided in Tables 2 and 3.

Table 2.

Quality appraisal based on the MERSQI for each study.

Author and year	Study design	Sampling		Type of data	Validity of evaluation instrument			Data analysis		Outcomes	Total score (%)	Quality level
		No. of institutions studied	Response rate		Internal Structure	Content	Relationship to other variables	Appropriate of Analysis	Complexity of analysis			
Abrishami, et al. [19]	2	0.5	1.5	1	1	1	1 [†]	1	2	1	12 (66.67%)	Moderate
Akoijam and Konjengbam [20]	2	1	1.5	1	1 [†]	1 [†]	1 [†]	1	2	1	12.5 (69.44%)	Moderate
Dickens, et al. [21]	1.5	1.5	0.5	1	1	1 [†]	1 [†]	1	2	1	11.5 (63.89%)	Moderate
Etemadifar, et al. [9]	2	0.5	0.5 [†]	1	1	1	1 [†]	1	2	1	11 (61.11%)	Moderate
Park, et al. [18]	3	0.5	1.5	1	1	0	0	1	2	1	11 (61.11%)	Moderate
Razzani, et al. [22]	1.5	0.5	1.5	1	1	1 [†]	1 [†]	1	2	1	11.5 (63.89%)	Moderate
Suryani, et al. [10]	2	0.5	1.5	1	1	1 [†]	1 [†]	1	2	1	12 (66.67%)	Moderate

Note: [†] Not reported the number of participants before the program and at the follow-up.[†] Previous studies reported the instrument's validity.**Table 3.**

Quality appraisal based on the MERSQI for all studies.

Domain/ Total Score	MERSQI Item	Item score	Studies No. (%)	Mean±SD SUB-Domain	Mean±SD Domain
Study Design (3)	Single-group cross-sectional or single-group posttest-only	1	0 (0%)		2.000±0.50
	Single-group pretest and posttest	1.5	2 (28.6%)		
	Nonrandomized, 2-group	2	4 (57.1%)		
	Randomized controlled trial	3	1 (14.3%)		
Sampling (3)	A-No. of institutions studied			0.71±0.390	1.928±0.45
	1	0.5	5 (71.4%)		
	2	1	1 (14.3%)		
	>2	1.5	1 (14.3%)		
	B- Response rate, %			1.21±0.49	
	Not applicable	-	-		
	< 50 or not reported	0.5	2 (28.6%)		
Type of data (3)	50-74	1	0 (0%)		
	≥ 75	1.5	5 (71.4%)		
	Assessment by study participant	1	7 (100%)		1.000±0.00
	Objective measurement	3	0 (0%)		
Validity of evaluation instrument (3)	A- Internal structure			1.00±0.00	2.714±0.76
	Not applicable	-	-		
	Not reported	0	0 (0%)		

	Reported	1	7 (100%)		
	B- Content			0.86±0.378	
	Not applicable	-	-		
	Not reported	0	1 (14.3%)		
	Reported	1	6 (85.7%)		
	C- Relationships to other variables			0.86±0.378	
	Not applicable	-	-		
	Not reported	0	1 (14.3%)		
	Reported	1	6 (85.7%)		
Data analysis (3)	A-Appropriateness of analysis			1.00±0.00	3.000±0.00
	Data analysis inappropriate for study design or type of data	0			
	Data analysis appropriate for study design and type of data	1	7 (100%)		
	B- Complexity of analysis			2.000±0.00	
	Descriptive analysis only	0	0 (0%)		
	Beyond descriptive analysis	2	7 (100%)		
Outcomes (3)	Satisfaction, attitudes, perceptions, opinions, general facts	1	7 (100%)		1.00±0.00
	Knowledge, skills	1.5	0 (0%)		
	Behaviors	2	0 (0%)		
	Patient/health care outcome	3	0 (0%)		
Total Score (18)					11.64±0.56

3.3. Study Characteristics

3.3.1. Study Setting and Nursing Characteristics

The search identified seven eligible studies. Three were conducted in Iran [9, 19, 22]. The remaining studies were conducted in Korea [18], Indonesia [10], India [20], and Australia [21].

Six studies focused on various nursing populations, including operating room nurses [18], nurse leaders in tertiary-level hospitals [20], nurses working in intensive care units [9], and nurses in inpatient departments of general public hospitals [10]. One study involved clinical and managerial nurses working in a general hospital setting [19]. Two studies were conducted in mental healthcare settings [21, 22]. One examined nurses working in clinical and managerial roles within inpatient mental health departments [21]. The other included nurses employed in psychiatric emergency units, male and female inpatient mental health units, and child inpatient mental health units [22].

3.4. Study Design

Regarding study design, six studies employed a quasi-experimental approach [9, 10, 19-22], whereas one study used a randomized controlled trial design [18].

Among the quasi-experimental studies, one adopted a longitudinal design [21], and one employed a single-group pretest–posttest design [22]. In the study by Dickens et al. [21], measurements collected before and after the intervention were treated as independent samples because of the low proportion of repeated data. Four studies included a control group [9, 10, 18, 20]. In these studies, control groups either received no educational intervention [9, 20] or were offered individual lectures [18] or pamphlets [10]. Finally, one study compared perceptions of patient safety culture between two different educational programs using two distinct participant groups [19].

3.5. Homogeneity of General Characteristics Between the Two Groups

Homogeneity between the two groups was assessed based on general characteristics, including age, gender, marital status, education level, employment status, working hours, years of experience, type of

work, job position, working unit, number of patients, direct interaction with patients, experience with patient safety education, and participation in the training group. Most included studies reported no statistically significant differences between the two groups across these characteristics [10, 18–21]. However, Etemadifar, et al. [9] did not report data regarding the homogeneity of the two groups.

3.6. Study Instrument

The Hospital Survey on Patient Safety Culture (HSOPSC) has been used in most studies to determine nurses' perceptions of patient safety culture [9, 10, 19, 20, 22]. Two studies used the Safety Attitudes Questionnaire (SAQ) [18, 21].

3.7. Follow-Up Frequency and Duration

The frequency and duration of follow-ups varied across studies. Four studies employed a single follow-up time point [9, 18, 19, 21], while three studies used two follow-up time points [10, 20, 22]. Follow-up duration ranged from immediate post-intervention assessment to one year. Specifically, Park, et al. [18], Razzani, et al. [22], and Akoijam and Konjengbam [20] assessed outcomes immediately after the intervention. One-month follow-up assessments were conducted by Etemadifar, et al. [9], Suryani, et al. [10], Abrishami, et al. [19], and Razzani, et al. [22]. Outcomes were assessed at three months in Suryani, et al. [10] and Akoijam and Konjengbam [20], while Dickens, et al. [21] reported a one-year follow-up.

3.8. Educational Intervention

3.8.1. Topics of Education

Several educational program topics were examined across the included studies. These included safety practices focused on infection control and operating room management [18]; nursing ethical principles [22]; nurse empowerment emphasizing patient safety, teamwork strategies, and speaking up in situations that threaten patient safety [10]; nursing leadership and workplace culture [21]; and a patient safety program based on the WHO Multi-Professional Patient Safety Curriculum Guide and the National Patient Safety Implementation Framework [20]. Additional interventions included training in Failure Mode and Effects Analysis (FMEA) techniques [19] and Situation, Background, Assessment, Recommendation (SBAR) communication strategies [9, 19].

3.9. Education Duration and Number of Sessions

Educational interventions ranged from a single session to multisession programs delivered over several weeks or months. Park, et al. [18] implemented two 60-minute sessions (totaling 120 minutes). Razzani, et al. [22] conducted four weekly sessions lasting 45–60 minutes over one month, while Akoijam and Konjengbam [20] delivered six 45-minute sessions over two days. Suryani, et al. [10] described a three-month education program consisting of five training days, each lasting four hours. Session duration in Dickens, et al. [21] varied, ranging from a single session of 1.5–2 hours to three sessions lasting either four hours or three hours each. In two studies, details regarding session duration [19] or session frequency [9] were incompletely reported.

3.10. Form of Instructions, Teaching Methods, and Teaching Aids

Four studies utilized in-person instruction: Etemadifar, et al. [9], Park, et al. [18], Razzani, et al. [22], and Dickens, et al. [21]. Etemadifar, et al. [9] integrated in-person instruction with virtual training. The remaining three studies did not provide information regarding the form of instruction [10, 19, 20].

Most studies combined lectures with group discussions [9, 10, 19, 20, 22], while others employed methods such as individual, person-to-person lectures with simulation-based practice [18], lectures with a debriefing session [21], scenario presentations [10], and question-and-answer sessions alongside role-playing [9].

Post-education, the studies distributed pamphlets [10, 22] and posters Etemadifar, et al. [9] and Suryani, et al. [10]. Abrishami, et al. [19] presented safety culture training booklets based on FMEA and SBAR to all nurses after completing the research. The distribution of any materials following an educational program was not reported in three studies [18, 20, 21].

3.11. The Impact of Educational Programs on the Perception of Patient Safety Culture

3.11.1. Overall Perception of Patient Safety Culture

Across six of the seven included studies, the interventions resulted in notable improvements in participants' perceptions of patient safety culture [9, 10, 18–20, 22]. Three studies reported statistically significant improvements in overall patient safety culture scores in the intervention groups compared with the control groups Etemadifar, et al. [9], Suryani, et al. [10], and Park, et al. [18]. Park, et al. [18] reported higher mean overall scores in the intervention group (4.31 vs. 3.96; $F = 6.70$, $p = 0.013$). Similarly, Suryani, et al. [10] observed a significant increase in overall patient safety culture one month after the intervention (DID coefficient = 2.15; 95% CI: 1.14–5.37; $p < 0.01$), with further improvements evident at three months (DID coefficient = 3.68; 95% CI: 1.17–6.53; $p < 0.01$). Etemadifar, et al. [9] likewise reported significantly higher overall patient safety culture scores in the intervention group than in the control group (59.5 vs. 39.2; $p = 0.004$). In contrast, the longitudinal study reported no significant change in safety attitudes following the intervention [21].

3.12. Composites of Patient Safety Culture

Educational interventions were associated with statistically significant improvements across several patient safety culture composites. Statistically significant improvements were observed in organizational learning and continuous quality improvement, teamwork within work units, transparency of communication channels, handoff processes, and information exchange. Statistically significant improvements were reported in four studies ($p < 0.001$ or $p < 0.05$) [9, 10, 19, 22]. Additional significant improvements were noted in feedback and communication regarding incidents, reporting patient safety events, and staffing, with effects reported at $p < 0.001$ or $p < 0.01$ [9, 19, 22]. Improvements in support from supervisors, managers, or clinical leaders were reported in three studies, with statistically significant effects at $p < 0.001$ or $p < 0.05$ [10, 19, 22].

In contrast, some patient safety culture composites demonstrated statistically significant declines or limited improvement. Akoijam and Konjengbam [20] reported significant declines, with small effect sizes (<0.2), in responses to error and hospital management support for patient safety. Similarly, Etemadifar, et al. [9] observed a statistically significant decline in hospital management support for patient safety, while error responses remained weak following the intervention. Staffing and reporting of patient safety events also remained weak immediately and three months post-intervention [20]. Additionally, Suryani, et al. [10] identified persistent deficiencies in staffing and non-punitive responses to errors.

3.13. The Differences in Patient Safety Culture Between the FMEA And SBAR Programs

The FMEA program demonstrated a greater overall impact on total patient safety culture scores compared with the SBAR program (mean score: 72.13 vs. 68.67; $p < 0.05$). In addition, the FMEA intervention resulted in significantly greater improvements across multiple patient safety culture composites, including organizational learning (12.54 vs. 11.41; $p < 0.001$), openness in communication (12.85 vs. 11.90; $p < 0.001$), feedback, and communication regarding errors (13.45 vs. 12.59; $p < 0.001$), non-punitive response to error (12.56 vs. 11.05; $p < 0.001$), staffing (19.03 vs. 18.33; $p = 0.02$), and teamwork across units (13.92 vs. 13.18; $p = 0.004$). Conversely, the SBAR program demonstrated significantly greater improvement in the composite measure of handoffs and transitions than the FMEA group (mean scores: 23.36 vs. 21.00; $p < 0.001$) [19].

4. Discussion

The current systematic review aimed to examine the impact of educational interventions on nurses' perceptions of patient safety culture. This review identified seven studies conducted over the past five years that assessed educational programs designed to enhance perceptions of patient safety culture among nurse leaders, bedside nurses, and clinical and managerial nurses collectively. Randomized controlled trials (RCTs) are widely regarded as the gold standard because they provide the most reliable evidence regarding the effectiveness of treatments or interventions. However, all studies included in this review used quasi-experimental designs, except for one study that used an RCT.

Five studies used the Hospital Survey on Patient Safety Culture, and two studies used the Safety Attitudes Questionnaire. These instruments are the most widely used and validated surveys for studying safety culture, as highlighted in a recent review [23]. All studies employed quantitative designs using surveys with closed-ended questions. Meanwhile, there is a recommendation to use validated safety culture surveys that include open-ended questions, accompanied by qualitative methods such as interviews or focus groups, to comprehensively explore complex issues, identify priority dimensions, and identify areas for improvement [23].

Most included studies used in-person teaching approaches and combined lectures with group discussions. A crucial aspect of in-person learning is the social and communicative interaction that occurs between learners and teachers, as well as among learners themselves [24]. Group discussions foster an interactive learning environment that allows participants to share knowledge, deepen their understanding, and enhance their attention, motivation, and satisfaction with the teaching process [25, 26].

Most comparative studies assessed the homogeneity of general characteristics between groups and reported no significant differences. Such assessments ensure that observed outcomes are attributable to the educational intervention rather than preexisting group differences.

The majority of the studies in this review indicated a positive shift in the overall perception of patient safety culture and most of its dimensions following the implementation of educational interventions. Furthermore, several studies indicated that the intervention group experienced notable improvements in perceptions of safety culture compared with the control group. These results validate the impact of educational programs on enhancing patient safety culture. This finding aligns with those of a previous systematic review and meta-analysis examining educational studies involving all healthcare providers from January 1999 to February 2021 [27].

The variability in reporting methods and statistical analyses may limit the ability to identify which type of educational intervention has the greatest impact on patient safety culture. Previous meta-analyses have reinforced that incorporating educational content recommended by the WHO for creating a patient safety training program could significantly improve patient safety culture [27]. The WHO, the Canadian Patient Safety Institute [28], and the Institute for Healthcare Improvement [29] emphasize the importance of human and system factors, the culture of patient safety, teamwork, communication, risk management, quality improvement, patient and family engagement, and recognizing and disclosing adverse events. Human factors experts suggest that understanding human factors in healthcare can improve job performance and reduce errors by studying providers' interactions with their environments [30]. A systems approach in healthcare focuses on understanding the complexity of the system and improving care transparency, rather than blaming individuals for mistakes [30]. Patient safety necessitates an understanding of teamwork and communication techniques, adverse event types, the use of quality improvement methodologies, and risk management processes [30]. Patients and caregivers can collaborate effectively in the healthcare system, particularly in the areas of harm prevention and deriving lessons from adverse events [30].

Nonetheless, it was only a longitudinal study, and it did not identify any change in perceptions following the program. This study attributed the lack of positive outcomes to several factors, including interactions among the program content (two programs were delivered), participant characteristics (bedside nurses and managers), the adequacy of intervention delivery (variations in attendance rates),

and the mandatory nature of participation. Additionally, this investigation gathered follow-up data after one year. This may reveal the significance of ongoing education in ensuring a patient safety culture. Similarly, a previous review revealed that the positive impact of educational programs may diminish after one year, indicating the need for refresher training in patient safety [27].

The FMEA education program demonstrated enhanced organizational learning, communication openness, feedback mechanisms, a nonpunitive approach to errors, effective staffing, and strong teamwork across units, whereas the SBAR education program showed improvements in handoffs and transitions. These findings may be connected to the design of the tools and their primary functions. FMEA is a method that highlights the importance of transparent communication among teams with diverse expertise to pinpoint potential errors, allowing proactive corrections in processes to prevent issues [29]. It is helpful for evaluating the effects of a suggested modification to a current process [29]. This may encourage staff to share existing errors and near-miss incidents, and interdepartmental collaboration could be implemented to improve patient safety. SBAR is a systematic communication tool designed to facilitate the sharing of information regarding the status of a patient, team member, or any other pertinent issue that requires attention from the team [31]. Medical associations and prominent healthcare organizations advocate the SBAR method as the standard communication tool for handoffs among healthcare providers [32-34]. The SBAR program has the potential to enhance adherence to this value and facilitate use of this framework, thereby improving the handoff and transition process.

4.1. Implications For Practice and Future Research

This review addresses the positive impact of educational programs on nurses' perceptions of patient safety culture. Face-to-face educational approaches that combine lectures with group discussions, followed by the provision of printed educational materials, emerged as a key strength across the reviewed studies.

Although most dimensions of patient safety culture showed improvement, numerous studies reported persistent shortcomings in hospital management support for patient safety, non-punitive responses to errors, and staffing levels. These findings suggest that educational initiatives alone may be insufficient unless they are complemented by strategies that strengthen leadership commitment to patient safety. Such strategies include engaging in regular patient safety huddles and leadership walk rounds, ensuring adequate resources, promoting a systems-based approach to patient safety, and developing clear policies that encourage error reporting without fear of punishment.

Findings from the longitudinal study highlight that variability in educational content, participant characteristics, and short-term interventions with limited long-term follow-up may hinder sustained improvements in safety culture. This underscores the importance of well-structured, continuous educational programs to maintain and reinforce safe practices over time.

Finally, the review of electronic databases revealed a limited number of randomized controlled trials, along with heterogeneity in intervention types, follow-up durations, and outcome reporting. Consequently, more rigorous randomized trials using standardized interventions, follow-up periods, and methods for reporting outcomes are needed to strengthen the evidence base and better inform future practice.

4.2. Strengths And Limitations of the Review

To our knowledge, this is the first systematic review to examine the impact of educational interventions on nurses' perceptions of patient safety culture. The strengths of this review include searches across six major databases; the involvement of two independent reviewers in the screening and quality appraisal processes; review of data extraction by two experts; and a comprehensive synthesis of the findings. However, some limitations should be acknowledged. The restriction to English-language publications and the exclusion of unpublished or grey literature may have limited the capture of relevant and robust evidence and increased the risk of publication bias.

5. Conclusion

This review highlights the meaningful role of educational interventions in enhancing patient safety culture, as well as the need for well-structured and continuous education to maintain improvements over time. Aspects including hospital support, staffing adequacy, and a non-punitive response require the integration of educational efforts with strategies that strengthen leadership commitment to patient safety.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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References

- [1] C. Wagner, S. Kristensen, P. Sousa, and D. Panteli, *Patient safety culture as a quality strategy*. In: Busse R, Klazinga N, Panteli D, Quentin W, editors. *Improving healthcare quality in Europe: Characteristics, effectiveness and implementation of different strategies*. Copenhagen, Denmark: European Observatory on Health Systems and Policies, 2019.
- [2] World Health Organization, "10 facts on patient safety," 2019. <https://www.who.int/news-room/photo-story/detail/10-facts-on-patient-safety>. [Accessed Jun. 2025]
- [3] C. T. Reis, S. G. Paiva, and P. Sousa, "The patient safety culture: A systematic review by characteristics of hospital survey on patient safety culture dimensions," *International Journal for Quality in Health Care*, vol. 30, no. 9, pp. 660-677, 2018. <https://doi.org/10.1093/intqhc/mzy080>
- [4] L. M. Zabin, R. S. A. Zaitoun, E. M. Sweity, and L. de Tantillo, "The relationship between job stress and patient safety culture among nurses: A systematic review," *BMC Nursing*, vol. 22, no. 1, p. 39, 2023. <https://doi.org/10.1186/s12912-023-01198-9>
- [5] Agency for Healthcare Research and Quality, "What is patient safety culture? U.S. Department of Health and Human Services," 2022. <https://www.ahrq.gov/sops/about/patient-safety-culture.html>. [Accessed Aug. 5, 2025]
- [6] M. Buljac-Samardzic, K. D. Doekhie, and J. D. Van Wijngaarden, "Interventions to improve team effectiveness within health care: A systematic review of the past decade," *Human Resources for Health*, vol. 18, no. 1, p. 2, 2020. <https://doi.org/10.1186/s12960-019-0411-3>
- [7] P. S. Groves, R. J. Meisenbach, and J. Scott-Cawiezell, "Keeping patients safe in healthcare organizations: A structuration theory of safety culture," *Journal of Advanced Nursing*, vol. 67, no. 8, pp. 1846-1855, 2011. <https://doi.org/10.1111/j.1365-2648.2011.05619.x>
- [8] R. F. AbuAlRub and E. H. Abu Alhijaa, "Patient safety culture," *Nurs Forum*, vol. 49, pp. 139-150, 2014. <https://doi.org/10.1111/nuf.12067>
- [9] S. Etemadifar, Z. Sedighi, M. Sedehi, and R. Masoudi, "The effect of situation, background, assessment, recommendation-based safety program on patient safety culture in intensive care unit nurses," *Journal of Education and Health Promotion*, vol. 10, p. 422, 2021. https://doi.org/10.4103/jehp.jehp_1273_20
- [10] L. Suryani, S. Letchmi, and F. B. M. Said, "The impact of nurse empowerment program on patient safety culture in general public hospital in Indonesia," *Journal of Patient Safety and Risk Management*, vol. 29, no. 4, pp. 202-209, 2024. <https://doi.org/10.1177/25160435241244664>
- [11] M. J. Page *et al.*, "PRISMA 2020 explanation and elaboration: Updated guidance and exemplars for reporting systematic reviews," *bmj*, vol. 372, p. n160, 2021. <https://doi.org/10.1136/bmj.n160>
- [12] D. A. Reed, D. A. Cook, T. J. Beckman, R. B. Levine, D. E. Kern, and S. M. Wright, "Association between funding and quality of published medical education research," *Jama*, vol. 298, no. 9, pp. 1002-1009, 2007. <https://doi.org/10.1001/jama.298.9.1002>
- [13] D. A. Reed, T. J. Beckman, S. M. Wright, R. B. Levine, D. E. Kern, and D. A. Cook, "Predictive validity evidence for medical education research study quality instrument scores: Quality of submissions to JGIM's Medical Education Special Issue," *Journal of General Internal Medicine*, vol. 23, no. 7, pp. 903-907, 2008. <https://doi.org/10.1007/s11606-008-0664-3>
- [14] R. P. Cant, T. Levett-Jones, and A. James, "Do simulation studies measure up? A simulation study quality review," *Clinical Simulation in Nursing*, vol. 21, pp. 23-39, 2018. <https://doi.org/10.1016/j.ecns.2018.06.002>

- [15] T. Levett-Jones, R. Cant, and S. Lapkin, "A systematic review of the effectiveness of empathy education for undergraduate nursing students," *Nurse Education Today*, vol. 75, pp. 80-94, 2019. <https://doi.org/10.1016/j.nedt.2019.01.006>
- [16] Y. Gui, Z. Cai, Y. Yang, L. Kong, X. Fan, and R. H. Tai, "Effectiveness of digital educational game and game design in STEM learning: A meta-analytic review," *International Journal of STEM Education*, vol. 10, no. 1, p. 36, 2023. <https://doi.org/10.1186/s40594-023-00424-9>
- [17] S. Jaros and G. Beck Dallaghan, "Medical education research study quality instrument: An objective instrument susceptible to subjectivity," *Medical Education Online*, vol. 29, no. 1, p. 2308359, 2024. <https://doi.org/10.1080/10872981.2024.2308359>
- [18] O. Park, M. Jeon, M. Kim, B. Kim, and H. Jeong, "The effects of a simulation-based patient safety education program on compliance with patient safety, perception of patient safety culture, and educational satisfaction of operating room nurses," *Healthcare*, vol. 11, no. 21, p. 2824, 2023. <https://doi.org/10.3390/healthcare11212824>
- [19] R. Abrishami, K. Golestani, M. F. Ranjbar, M. H. G. Abarghouie, and A. Ghadami, "A survey on the effects of patient safety training programs based on SBAR and FMEA techniques on the level of self-efficacy and observance of patient safety culture in Iran hospital, Shiraz in 2022-2023," *Journal of Education and Health Promotion*, vol. 13, p. 66, 2024. https://doi.org/10.4103/jehp.jehp_194_23
- [20] P. Akoijam and S. Konjengbam, "The impact of an educational program on knowledge and perception of patient safety culture among nurses in the two medical colleges of Manipur: A quasi-experimental study," *Indian Journal of Public Health*, vol. 67, no. 2, pp. 265-270, 2023. https://doi.org/10.4103/ijph.ijph_1416_22
- [21] G. L. Dickens *et al.*, "Longitudinal evaluation of a programme for safety culture change in a mental health service," *Journal of Nursing Management*, vol. 29, no. 4, pp. 690-698, 2021. <https://doi.org/10.1111/jonm.13205>
- [22] B. Razzani, F. Atashzadeh-Shoorideh, T. Jamshidi, M. Barkhordari-Sharifabad, Z. Lotfi, and V. Skerrett, "The effect of education around ethical principles on nurses' perception to patient safety culture in an Iranian mental health inpatient unit: A pilot study," *BMC nursing*, vol. 19, no. 1, p. 10, 2020. <https://doi.org/10.1186/s12912-020-0402-7>
- [23] L. A. Ellis *et al.*, "Issues and complexities in safety culture assessment in healthcare," *Frontiers in Public Health*, vol. 11, p. 1217542, 2023. <https://doi.org/10.3389/fpubh.2023.1217542>
- [24] A. Y. Ni, "Comparing the effectiveness of classroom and online learning: Teaching research methods," *Journal of Public Affairs Education*, vol. 19, no. 2, pp. 199-215, 2013. <https://doi.org/10.1080/15236803.2013.12001730>
- [25] A. Burke, "Group work: How to use groups effectively," *Journal of Effective Teaching*, vol. 11, no. 2, pp. 87-95, 2011.
- [26] Y. S. Snell and S. Linda, "Interactive lecturing: Strategies for increasing participation in large group presentations," *Medical Teacher*, vol. 21, no. 1, pp. 37-42, 1999. <https://doi.org/10.1080/01421599980011>
- [27] F. Agbar, S. Zhang, Y. Wu, and M. Mustafa, "Effect of patient safety education interventions on patient safety culture of health care professionals: Systematic review and meta-analysis," *Nurse Education in Practice*, vol. 67, p. 103565, 2023. <https://doi.org/10.1016/j.nepr.2023.103565>
- [28] Canadian Patient Safety Institute, *The safety competencies: Enhancing patient safety across the health professions*, 2nd ed. Ottawa, Canada: Canadian Patient Safety Institute, 2020.
- [29] Institute for Healthcare Improvement, "Quality improvement essentials toolkit," 2017. <https://www.ihl.org/resources/tools/quality-improvement-essentials-toolkit>. [Accessed Jul. 2025]
- [30] World Health Organization, *Patient safety curriculum guide: Multi-professional edition*. Geneva, Switzerland: WHO, 2011.
- [31] Agency for Healthcare Research and Quality, "Tool: SBAR," 2019. <https://www.ahrq.gov/teamsteps-program/curriculum/communication/tools/sbar.html>. [Accessed Jun. 2025]
- [32] S. Shahid and S. Thomas, "Situation, background, assessment, recommendation (SBAR) communication tool for handoff in health care—a narrative review," *Safety in Health*, vol. 4, no. 1, p. 7, 2018. <https://doi.org/10.1186/s40886-018-0073-1>
- [33] V. Von Dossow and B. Zwissler, "Recommendations of the German Association of Anesthesiology and Intensive Care Medicine (DGAI) on structured patient handover in the perioperative setting: The SBAR concept," *Der Anaesthesist*, vol. 65, no. Suppl 1, pp. 1-4, 2016. <https://doi.org/10.1007/s00101-016-0237-5>
- [34] World Health Organization, "Patient safety solutions," 2007. <https://www.who.int/teams/integrated-health-services/patient-safety/research/patient-safety-solutions>. [Accessed Jul. 2025]

Supplementary A

Table A1.

Database search strategies and results.

Database	Search Strategy	Results
MEDLINE, CINAHL, Cochrane Central Register of Controlled Trials (via EBSCOhost)	TI (Patient safety culture OR safety culture OR safety climate) AND TI (Education OR program OR intervention OR course OR workshop OR training)	CINAHL (57) MEDLINE (93) Cochrane Central Register of Controlled Trials (16)
ProQuest	title("Patient safety culture" OR "safety culture" OR "safety climate") AND title("Education" OR "program" OR "intervention" OR "course" OR "workshop" OR "training")	38
Scopus (via Elsevier)	(TITLE("Patient safety culture" OR "safety culture" OR "safety climate") AND TITLE("Education" OR "program" OR "intervention" OR "course" OR "workshop" OR "training")) AND PUBYEAR > 2018 AND PUBYEAR < 2026 AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (SUBJAREA, "NURS"))	23
Web of Science	Patient safety culture OR safety culture OR safety climate (Title) AND Education OR program OR intervention OR course OR workshop OR training (Title) AND English (Languages) Timespan: 2019-01-01 to 2025-04-30	106

Supplementary B

Table B1.

Data distraction of the included studies.

No	Author (Year)	Study country	Aim of the study	Study design	Study participant	Tool / Data Collection time points	Educational Intervention	Findings
1	Abrishami, et al. [19]	Iran	To determine the effects of patient safety programs based on Situation, Background, Assessment, Recommendation (SBAR) and Failure Mode and Effects Analysis (FMEA) techniques on self-efficacy and patient safety culture	Quasi-experimental study	78 nurses in Hospital The participants were divided into groups of SBAR (39 participants) and FMEA (39 participants).	Tool: Hospital Survey on Patient Safety Culture (HSOPS). Data Collection time points: Before and after one month.	Type of Education: Training program based on the SBAR method or the FMEA. Intervention Duration: Two days a week. Teaching methods and aids: Lecture and group discussion. Safety culture training booklets based on the two methods were presented to all the nurses after the research was completed.	No significant difference in terms of age, gender, participation in the training group, or academic degree between the two groups. Both SBAR and FMEA significantly improved total safety culture scores ($P < 0.05$). All dimension scores significantly increased in both groups ($P < 0.001$). FMEA > SBAR: Organizational learning (12.54 vs.11.41, $P < 0.001$) Openness in communication (12.85 vs.11.90, $P < 0.001$) Feedback and communication regarding errors (13.45 vs.12.59, $P < 0.001$) A nonpunitive response to error (12.56 vs.11.05, $P < 0.001$) Staffing (19.03 vs.18.33, $P = 0.02$) Teamwork across units (13.92 vs.13.18, $P = 0.004$) SBAR > FMEA: Handoffs and transitions (23.36 vs.21, $P < 0.05$).
2	Akoijam and	India	To assess the	A quasi-	64 nurses	Tool:	Type of Education:	No differences in terms of

	Konjengbam [20]		effectiveness of an educational intervention program on patient safety knowledge and perception of patient safety culture among nurses	experimental study	Nurses who were in positions of leadership in two tertiary-level hospitals Experimental group (n= 32) Control group (n= 32)	Hospital Survey on Patient Safety Culture (HSOPS). Data Collection time points: Before, immediately, and 3 months after the intervention.	Multi-Professional Patient Safety Curriculum Guide: Part B", which had 11 patient safety topics, was used. A session on the National Patient Safety Implementation Framework (NPSIF) was also conducted. Intervention duration and number of sessions: 2-day educational intervention Six sessions were held, which were of 45 min each. Teaching methods: Lecture and group discussion.	position in hospital, years of work in current hospital, years of work in current unit, working hours per week, or direct interaction with patients For the intervention group, the total safety score for the patient safety culture increased significantly from the pretest to the posttest ($P < 0.05$) and follow-up ($P < 0.001$). Significant decreases with small effect sizes (<0.2): Response to error (55.7→44.1) Hospital management support for patient safety (57.7→50.5) Slight increases at three months (weak all time points): Staffing and work pace (30.6%→36.6%) Reporting of patient safety events (31.7%→38.3%)
3	Dickens, et al. [21]	Australia	To evaluate the impact of the culture-change program for nurses on culture change, and safety-related behavior and knowledge improvements	A longitudinal pre-test and post-test design	241 nurses from mental health services at three hospitals Registered nursing staff employed in direct clinical, educational or managerial/ senior managerial roles Pre-test group	Tool: Safety Attitudes Questionnaire Data Collection time points: Before and After one Year	Type of Education: 1-Nurse leader culture program (Targeted nurse leaders). 2-Workplace culture program (Targeted at all ward nursing staff). Course form: In person Intervention duration and number of sessions: Nurse leader culture	No statistically significant differences between the samples on the reported characteristics (Job role, Employment status, Education, Hospital, Years qualified, Years in Mental health hospital). No measurable changes on safety attitudes after the program.

					(n = 137) Post-test group (n = 104)		<i>program:</i> Debriefing session lasting 1.5–2 hr. Leadership development program comprising five 4-hr sessions. <i>Workplace culture program:</i> Three x 3-hr sessions	*Pre- and post-intervention iterations were treated as independent samples due to a low proportion of repeat data.
4	Etemadifar, et al. [9]	Iran	To investigate the effect of an SBAR-based training program on patient safety culture in the ICU.	A quasi-experimental study	60 nurses working in the ICU. Experimental group (n=30) The control group (n=30)	Tool: Hospital Survey on Patient Safety Culture (HSOPS). Data Collection time points: Before and after one month.	The type of education: The situation, background, assessment, and recommendation-based training program. Number of sessions: Five sessions Form of instruction, teaching methods, and Teaching aids: Physical and virtual training Lecture and group discussion, question-and-answer, and role-playing. SBAR training poster.	The mean post-intervention score of patient safety culture in the intervention group significantly increased from 118.1 to 139.3, with $t = 2.34$ and $P < 0.001$. The mean score in the intervention group is significantly higher than the control group in the total score of patient safety culture (48.6 vs. 30.85, $p < 0.001$). The mean scores in the intervention group are significantly higher than the control group in the domains of: Organizational learning (62.1 vs. 21, $p = 0.03$), Intradepartmental teamwork (43.1 vs. 31.7, $p = 0.03$), Openness of communication channels (52.9 vs. 17.8, $p < 0.001$), Communication and giving feedback on errors (64.4 vs. 27.8, $p < 0.001$), Staffing (33.6 vs. 20.8, $p = 0.012$), Teamwork across hospital units (48.3 vs. 20, $p < 0.001$), and Hospital handoffs and transitions (52.4 vs. 26.2, $p <$

								0.001) were significantly higher in the intervention group than in the control group ($P < 0.001$). Hospital management support for patient safety declined from a moderate level to weak level after intervention. Nonpunitive response to error and staffing have remained at weak levels both before and after the intervention.
5	Park, et al. [18]	Korea	To determine the effectiveness of a simulation-based patient safety education program for operating room nurses on their compliance with patient Safety, perception of patient safety culture	An equivalent-control-group pretest-posttest research design (RCT)	45 operating room nurses 22 in the experimental group 23 in the control group.	Tool: Safety Attitudes Questionnaire (SAQ) Data Collection time points: Before and immediately after the program	Type of Education: Simulation-based Safety education program with two sessions: The first education session focused on patient safety and infection control The second focused on patient safety and operating room management The duration of each education session: Two sessions. Each session was 60 min, for a total of 120 min. Form of instructions and teaching methods: The person-to-person individual lectures and simulation-based practice program were provided to the experimental group. Person-to-person individual lectures were	No differences in age, operating room work career, work hours, sex, final education career, work type, position, department in the operating room, number of patients who underwent operations, experience with patient safety education, or experience with simulation education were identified between the two groups. The perception of patient safety culture in the experimental group was significantly higher than the control group after the simulation program with (4.31 vs. 3.96) with $F=6.70$ and $p = 0.013$.

							provided to the control group.	
6	Razzani, et al. [22]	Iran	To investigate the effect of education around ethical principles on nurses' perception of patient safety in a psychiatric unit	Pre- and post-test study without control group	33 nurses in a mental health hospital Psychiatric emergencies, male inpatient mental health units, female inpatient mental health units, and child mental health units	Tool: Hospital Survey on Patient Safety Culture (HSOPS). Data Collection time points: Before, immediately after the program, and after 1 month	Type of Education: The educational content on nursing ethical principles was delivered to nurses. Intervention duration and number of sessions: Four educational sessions of 45–60 min duration were held once per week for 1 month. Form of instructions, teaching methods, and Teaching aids: Face-to-face sessions Group discussion Pamphlets containing the covered content were distributed.	Mean scores of the overall score of the patient safety culture increased from 116.85 to 143.58 immediately after the intervention and then increased to 152.12 after one month. Significant increases were observed in the percentage of positive responses for overall patient safety culture (55.64%→68.37%→72.91%). Mean scores of all dimensions increased significantly after the intervention with $p < 0.001$.
7	Suryani, et al. [10]	Indonesia	To assess the effect of the nurse empowerment program on the patient safety culture.	A quasi-experimental design	220 nurse who work in inpatients department of general public hospital Experimental group (n= 110) Control group (n= 110)	Tool: Hospital Survey on Patient Safety Culture (HSOPS). Data Collection time points: Before, one month, and 3 months after intervention.	The type of education: Nurse empowerment program include education on: Patient safety and patient safety culture Team Strategies and tools to Enhance Performance and Patient Safety (TeamSTEPPS) Competencies for speaking out in a situation of threat to patient safety Intervention Duration: For three months with a five-day education training (4 h for each day).	No significant difference in terms of age, gender, education level, marital status, working position, working unit, and working experience between intervention and control group. In the intervention group, patient safety culture scores significantly increased (3.11→4.89; $t=5.78$, $p=.001$). Following the intervention significant improvements in: Communication openness Handoffs and transitions Unit collaboration Learning and continuous

							Form of instructions, teaching methods, and Teaching aids: Lecture, group discussion and scenario presentation, followed by hanging up posters and handing out informative pamphlets to the intervention group. The control group received an information using pamphlet.	improvement, Manager expectations and actions promoting patient safety Patient safety culture was found to be <u>lacking</u> in staffing and non-punitive response to errors. The nurse empowerment program <u>improved</u> outcomes relative to the control: After one-month, patient safety culture <u>increased</u> (DID=2.15; 95% CI 1.14–5.37; p<0.01). After three months, greater <u>improvement</u> relative to control was observed (DID=3.68; 95% CI 1.17–6.53; p<0.01).
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