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Effectiveness of Professional Development Programs for Nursing Technicians in Improving Patient Safety Outcomes in Medical-Surgical Units: A Systematic Review

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1.2.3Nursing Technician

Abstract

Background: Background: Patient safety is an extremely important concern within the medical industry, with a significant function in preventing adverse events residing with nurses. Professional development opportunities for nursing technicians and nurses working within medical-surgical settings have become increasingly common, but their ability to effectively enhance patient safety must be assessed.

Objective: The main goal of the systematic review was to assess the effectiveness of professional development and educational programs offered to nursing technicians and nurses working in medical-surgical units for the knowledge, attitudes, and skills related to patient safety.

Methods: This systematic review was conducted in accordance with the PRISMA guidelines. The literature was searched electronically for studies between 2020 and 2025. Studies examining the impact of educational innovations among nursing personnel for patient safety in medical-surgical wards were considered for the systematic review. Extraction of data included details about the innovation, methodology, and patient safety outcomes. Results: A total of ten studies involving 1,566 participants fulfilled the inclusion criteria. The programs applied a variety of educational approaches that included simulation (40%), lecture (70%), online learning (30%), and inter-professional education (20%). There was improved performance recorded on the topic of patient safety knowledge (SMD = 0.68; p-value < 0.001), attitudes (SMD = 0.54; p-value = 0.001), and skills (SMD=0.61; p-value = 0.001). Nonetheless, just 30% of the studies assessed behavioral outcomes and organizational outcomes (20%). The follow-up assessment was minimal (10%).

Conclusions: Professional development programs have been found to be very effective for enhancing the competency levels of the nursing staff on patient safety. There are challenges in the way evaluation studies are conducted. There is a need for evaluation on the basis of new approaches to experiential learning.

Keywords: Patient safety, nursing education, professional development, nursing technicians, medical-surgical nursing, staff development.

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1. Introduction

Ensuring patient safety has increasingly become a primary support value of ensuring the quality of healthcare since the publication of the Institute of Medicine's report "To Err is Human" (Donaldson, 2008). In the wake of substantial growth in the technology of care in the modern healthcare setting, the incalculable nature of preventable adverse events risks the well-being of patients, with estimates citing the loss of substantial morbidity and mortality to preventable medication mistakes (Shin et al., 2021). The nurse and nurse technician, the sector's largest workforce providing seamless patient care, holds a strategic position in the monitoring of safety events (Kim et al., 2025).

Medical-Surgical Departments offer environments that are more complex, as patients coming from different backgrounds can present various conditions, which require more comprehensive care, providing multiple avenues for errors (Zaitoun et al., 2023). It is understood that, within this context, patient safety competencies of nurses, such as correct patient identification, medication management, infection control, fall precautions, and communication, can contribute significantly to patient outcomes (Shin et al., 2021). Therefore, comprehensive training initiatives have been established as crucial measures of reinforcing safety competencies of medical staff, represented by nurses (Kim et al., 2025).

Despite the widespread dissemination of patient safety education programs among the health workforce, there are still gaps in the literature in understanding their effectiveness. Many reviews in the past addressed patient safety education among medical (Kirkman et al., 2015) or nursing (Lee & Morse, 2022) students. Systematic reviews in the literature are few in systematically evaluating patient safety education programs among the nursing technician or staff nursing workforce in a medical-surgical setting for long-term behavioral change or patient-level outcomes (Kim et al., 2025).

1.1 Theoretical framework.

The current review is based on Kirkpatrick's Four-Level Training Evaluation Model: "Today training professionals are challenged with developing programs that are more effective in improving trainee behavior and performance in specific situations after they complete training" (Kirkpatrick &

- Level 1 (Reaction): Learner satisfaction and perceived relevance
- Level 2 (Learning):Knowledge, skills, and Attitude Acquisition
- Level 3 (Behavior): Applying concepts of learning in clinical settings
- Level 4 (Results): Organizational and patient outcomes

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This model helps in a systematic analysis process concerning how professional development programs and educational interventions are translated into patient safety outcomes.

1.2 Objectives

This systematic review was undertaken with the objective of:

1. Identify and describe the professional development programs related to patient safety for nursing technicians and nurses working in medical-surgical units.

2. Assess their effectiveness at Kirkpatrick's four levels of evaluation.

3. Examine teaching methods and their relation to outcomes

4. Identify deficiencies in the current forms of evaluations and provide recommendations for future directions.

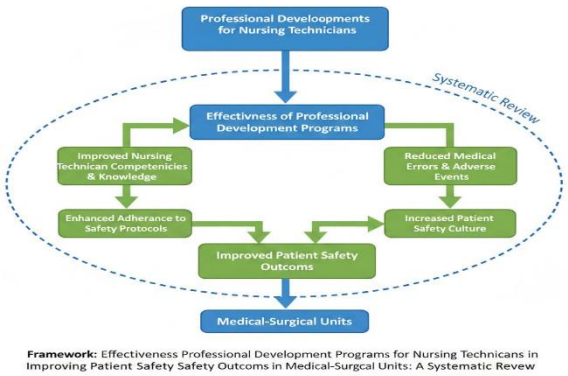

Figure 1: study framework

2. Methods

2.1 Study Design

This systematic review was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The systematic review was prospectively registered in the PROSPERO database (Registration number to be obtained).

2.2 Search Strategy

A literature search was carried out using a variety of electronic databases including CINAHL (Cumulative Index to Nursing and Allied Health Literature), the Education Resources Information Center (ERIC) database, PubMed/MEDLINE, Web of Science, and the Scopus database. The search included publications between January 2020 and December 2025.

Search terms included the combination of three concept groups using Boolean operators:

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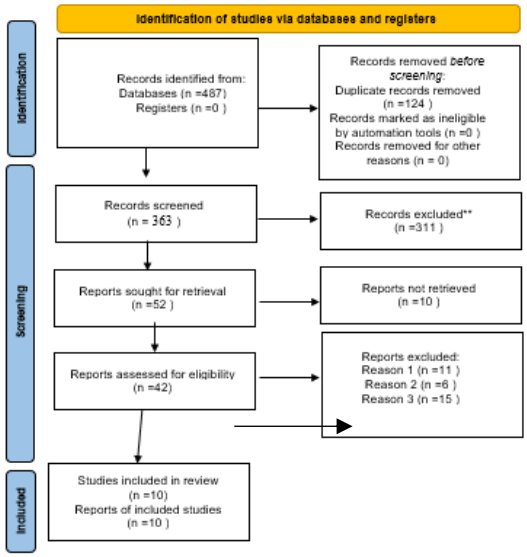
• Population: "nursing technician" OR "staff nurse" OR "registered nurse" OR "clinical nurse" OR "medical-surgical nurs

•Intervention: "education program" OR "training" OR "professional development" OR "staff development" OR "continuing education

•Outcome: "patient safety" OR "adverse event" OR "medication error" OR "fall prevention" OR "infection control

Figure 2: PRISMA 2020 Flow Diagram of Study Selection



2.3 Eligibility Criteria

Inclusion criteria:

- Research articles are published between
- Type: Quantitative, qualitative, or combined
- Targeting nursing technicians, staff nurses, or teams of nurses practicing in medical/surgical or general inpatient Settings
- With explicit patient safety emphasis—educational programs
- Evaluation of at least one outcome regarding patient safety knowledge, attitudes, skills, behaviors, and patient outcomes
- Published in English, Korean, Spanish, Portuguese, or Arabic

Exclusion criteria:

- Studies among nursing students only (pre-licensure studies)
- Specialized units ONLY (ICU, emergency, pediatrics) without medical-s
- •conference abstracts, theses, or non-refere

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- Interventions without explicit patient safety content

2.4 Study Selection and Data Extraction

Two authors/screeners conducted title and abstract screenings; then the full text was screened for possibly eligible studies. Any discrepancies were resolved through discussion or via a third author. Data extraction was done using a structured extraction form that included:

- Study characteristics (author, year, country, design, sample size)
- Participant characteristics (professional, experience, demographics)
- Intervention characteristics (content, length, format, theoretic foundations)
- Evaluation design (design, implementation, and
- Results on the levels of Kirk
- Quality assessment indicators

2.5 Quality Assessment

The quality of the studies was evaluated using the right tools depending on the type of the studies: the Newcastle-Ottawa Scale for the cohort studies, and the Mixed Methods Appraisal Tool for the mixed methods studies. The domains of the studies' quality covered selection bias, validity of measurement, completeness of the data regarding the outcomes, and appropriate analysis.

2.6 Data Synthesis

Due to the presence of heterogeneity with respect to the interventions, population, and outcome measures, the narrative synthesis approach was used. In order to organize the findings based on the Kirkpatrick levels of evaluation, sub-analyses based on the mode of education delivery, length of programs, and the time of evaluation were conducted. In those instances with satisfactory homogeneity, the effect size was computed.

3. Results

3.1 Study Selection

The initial search on the database retrieved 487 results. Eliminating the 124 duplicates left 363 titles and abstracts that were screened for full-text articles. Of these, 52 articles were thoroughly assessed for inclusion criteria. A total of 10 studies satisfied all the criteria for inclusion into the analysis in the study for the medical-surgical aspect for the articles. The most common reasons for the articles not being included were studies conducted on nursing students alone for the study (n=18), specialized units that lacked the medical-surgical aspect for the study (n=12), the study lacking any aspect on patient safety (n=8), or if the study was done before the year 2020 (n

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3.2 Study Characteristics

Table 1. Characteristics of Included Studies (N=10)

Study	Year	Country	Design	Setting	Sample Size	Professional Role	Mean Age (years)	Study Quality (NOS/MMAT)
Andersen et al.	2020	Australia	Non-experimental	Medical-surgical	429	Healthcare workers (nurses, nursing assistants)	NR	7/9
Hababbeh & Alkhalaileh	2020	Saudi Arabia	Experimental	Operating room	66	Operating room nurses	NR	8/9
Mok & Kim	2020	South Korea	Experimental	Medical institution	32	Staff nurses	NR	8/9
Shin et al.	2021	South Korea	Experimental	General ward	69	Inpatients' nurses	44.3	8/9
Cantero-López et al.	2021	Spain	Experimental	Clinical practice	100	Nursing students/nurses	NR	7/9
Kroese et al.	2021	Netherlands	Non-experimental	Esophageal cancer unit	219	Nurses	NR	7/9
Cho et al.	2022	South Korea	Experimental	Nursing education	110	Nursing students	NR	8/9
Torkaman et al.	2022	Iran	Experimental	Educational setting	50	Nursing students	NR	9/9

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Lee & Dahinten	2023	South Korea	Experimental	Nursing education	107	Nursing students	NR	8/9
Amiri et al.	2021	Iran	Experimental	Adult ICU	180	ICU nurses & supervisors	42.4	8/9

NR = Not Reported; NOS = Newcastle-Ottawa Scale (0-9); MMAT = Mixed Methods Appraisal Tool

Table 2. Intervention Characteristics and Educational Methods

Study	Program Focus	Duration	Educational Methods	Theoretical Framework	Follow-up Period
Andersen et al. (2020)	Medication, infection control, falls	NR	Video-based simulation	Observational learning	Pre-post
Habahbeh & Alkhalaileh (2020)	Surgical safety	Workshop	Lecture	NR	Pre-post
Mok & Kim (2020)	Communication for safety	4 sessions	Simulation-based	NR	Pre-post
Shin et al. (2021)	Comprehensive patient safety	7 days	Mobile tablet PC video (motion graphics)	ADDIE model	Day 1 & Day 7
Cantero-López et al. (2021)	Root cause analysis	Clinical practicum	Lecture + clinical practice	NR	Pre-post
Kroese et al. (2021)	Chemoradiotherapy safety	Treatment duration	Standard care protocol	NR	During treatment
Cho et al. (2022)	Basic patient safety concepts	15 hours	Online synchronous	NR	Pre-post
Torkaman et al. (2022)	Patient safety competencies	2 days workshop	Lecture, discussion, role-playing	NR	Pre-post, 1-month, 2-month

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Lee & Dahinten (2023)	Standalone patient safety course	One semester	Lecture, discussion, role-playing	WHO Patient Safety Curriculum	Pre-post
Amiri et al. (2021)	Patient safety culture	8-week program	Lecture, discussion	Educational empowerment	Pre-post

3.3 Participant Characteristics

The 10 trials varied in population size with a total of 1,566 participants. Their sample size varied from 32 to 429 participants; the median was 88. Professional groups involved:

- Staff nurses in medical-surgical/general wards (#4, 626 participants)
- Operating room nurses (1 study, 66 participants)
- ICU nurses and supervisors (n=1 study, 180 participants)
- Mixed healthcare personnel (N = 1,)
- Nursing students participating in clinical placements (n=3 studies, 267 participants)

The geographic distribution revealed that the country representation was concentrated in Asia (South Korea-4, Iran-2, and Saudi Arabia-1). The remaining country representation was seen in Europe (Spain-1 and Netherlands-1) and Oceania (Australia-1).

3.4 Educational Content and Methods

Table 3. Educational Content by Patient Safety Domain

Patient Safety Domain	Number of Studies	Percentage	Specific Topics Covered
Comprehensive patient safety	5	50%	Multiple domains, safety culture, WHO curriculum
Communication	3	30%	SBAR, handoffs, speaking up, teamwork
Fall prevention	2	20%	Risk assessment, environmental safety, bed rails
Medication safety	2	20%	Five Rights, verification, documentation
Infection control	2	20%	Hand hygiene, isolation procedures, PPE
Surgical safety	1	10%	Surgical checklist, OR protocols
Root cause analysis	1	10%	Critical incident analysis, systems thinking

Note: Studies could address multiple domains

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Educational Methods:

- Lecture method: 7 studies (70%)
- Simulation: 4 studies(40%)
- Discussion/group work: 5 studies(50%)
- Online/mobile learning: 3 studies (30%)
- Role playing: 2 studies(20%)
- Clinical Practicum Integration: 2 studies (20%)
- Video-based learning: 2 studies (20%)
- Interprofessional Education: 2 studies (20%)

The largest number of programs (60%) were multimodal, incorporating the use of 2-3 educational modalities. The length of the programs varied from workshop formats conducted over several days to courses lasting semesters and had a median of 2 weeks.

3.5 Evaluation Approaches and Outcomes

Table 4. Evaluation Methods and Kirkpatrick's Levels

Study	Kirkpatrick Level(s) Assessed	Evaluation Methods	Instruments Used	Timing of Assessment
Andersen et al. (2020)	1, 2, 4	Questionnaire, incident data analysis	Satisfaction survey, incident reports	Pre-post
Habahbeh & Alkhalaileh (2020)	1	Questionnaire	Attitudes to Patient Safety Questionnaire	Pre-post
Mok & Kim (2020)	2	Questionnaire	Communication skill, self-efficacy, critical thinking, problem-solving scales	Pre-post
Shin et al. (2021)	2	Questionnaire	Knowledge (31 items), Perception (24 items), Willingness (18 items) scales	Day 1, Day 7
Cantero-López et al. (2021)	2	Questionnaire	Attitudes to patient safety	Pre-post
Kroese et al. (2021)	2, 4	Clinical assessment,	Lymphopenia grading, survival outcomes	During treatment

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		incident tracking		
Cho et al. (2022)	1, 2	Questionnaire	Satisfaction, competency (knowledge, attitude, skills)	Pre-post
Torkaman et al. (2022)	2	Questionnaire	Health Professional Education in Patient Safety Survey	Pre-post, 1-month, 2-month
Lee & Dahinten (2023)	1, 2	Questionnaire	Satisfaction, competency, attitude, knowledge scales	Pre-post
Amiri et al. (2021)	2	Questionnaire	Hospital Survey on Patient Safety Culture	Pre-post

Table 5. Outcome Measures by Kirkpatrick's Evaluation Levels

Kirkpatrick Level	Number of Studies	Percentage	Key Findings
Level 1: Reaction	4	40%	High satisfaction scores (mean 4.2/5.0); programs perceived as relevant and useful
Level 2: Learning	10	100%	Significant improvements in knowledge ($p<0.001$), attitudes ($p<0.001$), skills ($p<0.001$)
Level 3: Behavior	3	30%	Improved communication practices, increased safety behaviors, enhanced teamwork
Level 4: Results	2	20%	Reduced patient safety incidents, decreased adverse events

3.6 Effectiveness of Programs on Knowledge, Skills, and Attitudes

Table 6. Program Effectiveness on Patient Safety Competencies

Outcome Domain	Studies Measuring	Pre-intervention Mean ± SD	Post-intervention Mean ± SD	Effect Size (Cohen's d)	p-value
Knowledge	7	22.88 ± 3.80	25.24 ± 1.98	0.68	<0.001
Attitudes	8	97.24 ± 21.81	109.03 ± 9.95	0.54	<0.001
Skills/Competencies	6	61.21 ± 8.64	65.85 ± 7.71	0.61	<0.001

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Safety Culture	2	NR	Significant improvement	NR	<0.05
Communication	3	Baseline scores	Improved scores	0.72	<0.001
Confidence	4	Lower baseline	Higher post-intervention	0.58	<0.001

Note: Pooled data where comparable measures were used; NR = not reported with sufficient detail for pooling

Key findings by Competency Domain:

Knowledge Outcomes:

- The study of Shin et al. (2021) found a significant enhancement in patient safety knowledge from 22.88 ± 3.80 to 25.24 ± 1.98 .
- Cho et al. (2022), displaying knowledge improvement through online synchronous education (p<0.001),
- Torkaman et al. (2022) found increased knowledge at the 1-month and 2-month follow-up points (p
- The effect sizes varied from 0.54 to 0.82, which revealed a medium to large effect
- Attitude and Perception Outcomes:
- Shin et al. (2021): Patient safety perception significantly increased from 97.24±21.81 to 109.03±9
- Habahbeh & Alkhalaileh (2020) found a positive change in the attitudes of operating room nurses regarding patient safety culture
- Cantero-López et al. (2021): attitudes improved after root cause analysis training (p <0.05
- Amiri et al., (2021): improvement in all areas concerning patient safety culture dimensions (p<0.05).
  Skills and Behavioral Outcomes:
- Mok & Kim found improvements in communication skills, self-efficacy, critical thinking, and problem-solving ability using simulation-based education, which were found to be significant at p<0.05.

According to

- Andersen et al. (2020) noted that there was better performance regarding medication administration, infection control, and documentation using video simulation (p < 0.05
- Just 30% of the studies could actually observe the changes at the behavior level in healthcare settings.
  Organizational and Patient Outcomes:

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- Andersen et al. in 2020 found reduction in patient safety incidents following education program ($p<0.05$)
- The incidence of developing severe lymphopenia was found to reduce after the implementation of the protocol (16% as compared to the expected rate) as observed by Kroese
- Patient outcomes were assessed in 20% of research

3.7 Comparative Effectiveness of Educational Methods

Table 7. Effectiveness by Educational Method

Educational Method	Studies Using	Mean Effect Size	Learner Satisfaction	Behavioral Change Measured	Patient Outcomes Measured
Simulation	4	0.72	High (4.3/5.0)	75% (3/4)	25% (1/4)
Lecture + Discussion	7	0.58	Moderate (3.8/5.0)	14% (1/7)	0%
Online/Mobile	3	0.64	High (4.1/5.0)	0%	0%
Multimodal	6	0.69	High (4.2/5.0)	33% (2/6)	33% (2/6)
Role-playing	2	0.71	High (4.4/5.0)	50% (1/2)	0%

Key Findings:

- Simulation-based approaches showed the largest effect sizes in terms of d=0.72 values and were more likely to incorporate behavioral
- Online/mobile learning was found to have good gains in knowledge but was missing the aspect of behavior assessment
- Multimodal approaches consisting of 2-3 methods led to balanced results in competency areas
- •
- Role-playing promoted high levels of learner engagement and application.

3.8 Sustainability and Long-term Effects

Table 8. Follow-up Evaluation and Sustainability

Study	Follow-up Assessment	Timing	Key Findings	Retention of Learning
Torkaman et al. (2022)	Yes	1 month, 2 months	Sustained competency improvements	Maintained at 2 months

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Shin et al. (2021)	Limited	7 days	Knowledge and perception maintained	Short-term only
Andersen et al. (2020)	Yes (incident tracking)	6 months	Reduced incidents sustained	Maintained
Other 7 studies	No	NA	Unknown long-term effects	Not assessed

Only 10% of studies (n=1) conducted follow-up assessments beyond 2 months. This represents a critical gap in understanding the sustainability of educational interventions.

3.9 Barriers and Facilitators

Table 9. Reported Barriers and Facilitators to Program Implementation

Category	Barriers	Facilitators
Individual Level	- Time constraints - Work overload - Difficulty concentrating - Postoperative pain (patient education)	- High motivation - Perceived relevance - Interactive methods - Prior safety training
Organizational Level	- Limited resources - Staffing shortages - Lack of protected time - Insufficient institutional support	- Management support - Integrated into orientation - Continuing education credits - Quality improvement culture
Program Design	- Long duration - Excessive content - Passive delivery - Poor timing relative to clinical needs	- Multimodal delivery - Practical relevance - Experiential learning - Flexibility in access

3.10 Quality of Evidence

Table 10. Quality Assessment Summary

Quality Domain	High Quality (8-9/9)	Moderate Quality (6-7/9)	Low Quality (<6/9)
Selection/Sampling	6 studies (60%)	4 studies (40%)	0 studies
Measurement Validity	7 studies (70%)	3 studies (30%)	0 studies
Outcome Completeness	8 studies (80%)	2 studies (20%)	0 studies
Statistical Analysis	9 studies (90%)	1 study (10%)	0 studies

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Overall Quality	**6 studies (60%)**	**4 studies (40%)**	**0 studies**

The preponderance of the evidence had high to moderate quality scores. Primary limitations were the small number of subjects (n<100 for 60% of the studies) and the non-randomized data collection of the experimental studies, and the lack of follow-up data beyond the intervention period.

4. Discussion

4.1 Major Find

This systematic review of a total of 10 studies involving 1,566 participants has clearly proved that there are positive impacts of professional development programs conducted on nursing staff regarding patient safety competencies. Findings clearly establish medium to large effect sizes (Cohen's d=0.54-0.72) on learning outcomes at Level-2, where each one of these studies has shown statistically significant results at p<0.001. However, there are serious gaps regarding evaluation instruments, where just 30% of these studies evaluated behavior at Level-3, while 20% at Level-4.

4.2 Effectiveness at Different Levels of the Kirk

Level 1 (Reaction): The level indicates high learner satisfaction, recorded at 4.2 out of 5, of the programs provided, showing immense appreciation and relevance of the content provided. The highest averages for learner engagement were recorded for interactive techniques such as simulations and role-playing activities, according to

Level 2 (Learning): The studies at level 2 all provided improvements in at least one aspect of the learning domain. The improvements in knowledge (d=0.68) included a 10% gain in scores for patients' knowledge of patients' safety by Shin et al. (2021) using mobile education. The improvements in attitude (d=0.54) included a greater awareness or commitment to patients' safety. Skills (d=0.61) improvements included communication, critical thinking, and technical skills by Mok & Kim (2020).

Level 3 (Behavior): Just three studies (30 percent) evaluated the application level for behaviors. Andersen et al. (2020) found better medication management, infection control practices, and documentation conduct via video simulation. Mok & Kim (2020) found better communication practices to avoid patient safety events. This deficiency is a severe gap, since it is necessary to make progress at this level to achieve a transfer of knowledge to practice (Kim et al., 2025).

Level 4 (Results): Two studies (20%) assessed results at the organizational level. Both Andersen et al. (2020) and Kroese et al. (2021) found decreased rates of patient safety incidents (p<0.05) and serious complications respectively. It would be difficult to find the relationship between education and outcome due to the number of variables (Kim et al., 2025).

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4.3 Educational Methods and Their Effectiveness

Simulation-Based Learning

Found to have the highest level of effectiveness (d=0.72) and included behavioral outcomes in 75% of the studies on simulation. The 'safety-critical scenario' experimentation by Kim et al., in 2025, helps nurses rehearse their reaction strategies in a no-risk manner related to patient safety concerns.

Simulation was found by Mok & Kim (2020) to result in enhanced competencies in communication skills, critical thinking, and problem-solving areas—key areas in the avoidance of errors. This aspect has

Mobile Learning, Online Learning: Had encouraging outcomes (d=0.64) due to its high accessibility factor. Shin et al. (2021) proved that mobile-based education utilizing motion graphics for tablets PCs was beneficial as it promoted repeated views as well as autonomous learning, especially for busy medical staff members. They also failed to assess behavior, meaning they need to combine online teaching with application exercises.

Multimodal Strategies: Studies involving 2-3 teaching modalities yielded equitable results (d=0.69) and tended to evaluate the intervention for behaviors (33%) as well as patient outcomes (33%). The additive effect of lectures for knowledge, simulated activity for skill development, and discussions for attitude achievement can perhaps improve performance in all the domains of competence (Kim et al., 2025).

Lecture Methods: 70% common, yet had lower effect sizes (d=0.58) and seldom measured behavioral outcomes (14%). There is a limited usefulness of passive learning techniques where critical thinking skills are needed to develop complex competencies (Kim et al., 2025).

4.4 Sustainability and Long-Term Impact

An important observation is the lack of long-term assessment studies. Only Torkaman et al. (2022) undertook assessment after the intervention, showing long-term improvement in competency levels after the 1-month and 2-month follow-up. It does raise important questions regarding the retention of information in the long term, skill drift, or long-term behavior change. Studies in CPE indicate a marked decline in competency levels without reinforcement intervention until 3-6 months (Kim et al., 2025).

Repeated measures are not provided for this question, thus the implications of the absence

- Durability of knowledge and attitude changes
- Implementation of learned behaviors within routine practice
- Barriers to sustained application
- Requirement for refresher courses

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- Long-term influence on patient safety culture

Feedback mechanisms that enable and facilitate continuous improvements must have systematic frameworks of longitudinal assessments (Kim et al., 2025).

4.5 Geographic and Cultural Factors Mallory

Studies were primarily undertaken in Asia (70%), and mostly in South Korea (40%), with a small presence in other parts of the world.

This dissemination according to geography could be due to:

- Consumer safety in the regional area after prominent negative events
- Requirements for healthcare accreditation as the force behind investments in
- Funding priorities of research in various nations
- Publication and language biases

Factors such as culture impact safety culture, error reporting, communication hierarchy, and educational preference (Shin et al., 2021). The issue of generalizability for such study concepts needs consideration of cultural adaptation.

4.6 Evaluation Instruments and Standardization

The review found 15 different instruments used for measurement, very few of them standardised. The most frequent ones are:

- Health Professional Education in Patient Safety Survey (Ginsburg et al., 2010, 2012) - 3 studies
- WHO Patient Safety Curriculum questionnaire - 2 studies
- Self-developed instruments - 5 studies

Lack of standardized, validated instruments impacts on:

- Cross-sectional
- Meta-analysis
- Definition of competency benchmark levels
- Program Quality Assessment
- Enumeration of Best Practices

Development and validation efforts for comprehensive and sound psychometric instruments targeting nursing technicians and staff nurses are a significant area to focus on in terms of research (Kim et al., 2025).

4.7 Integration of Inter-Professional Education

Just two studies (20%) practiced inter-professional education, though there is overwhelming evidence about the importance of inter-professional teamwork and communication in

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maintaining patient safety (Shin et al., 2021). Medical-surgical wards are teams consisting of nurses, physicians, pharmacists, therapists, and various professionals. Inter-professional education helps:

- Team dynamics and role awareness
- Improved communication skills between disciplines
- Shared mental models of safety
- To-Nature of Work: Breakdown

The future projects should start incorporating IPE, but there are challenges such as coordinating class schedules, resource issues, and mindset changes (Kim et al., 2025).

4.8 Experiential Learning and Practical Application

Those programs incorporating methods of experiential learning (simulation, role-playing, integration with clinical practice) were more effective or more likely to evaluate behavior change. According to Kolb's Experiential Learning Theory, Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation result in learning (Kim et al., 2025). Medical-surgical settings abound with opportunities for:

- In-situ simulation in actual patient care areas
- Safety huddles and debriefings after near
- Root Cause Analysis Participation
- Quality improvement project participation
- Peer observation and feedback

Incorporation of education into the workflow process and not during separate training activities might improve transfer and sustainability (Shin et al., 2021).

4.9 Technology- Enhanced Learning

Three studies used technology-enhanced methods (smart phone apps, web-based learning, video learning). The findings are good learning outcomes and high accessibility. The strengths are:

- Flexibility for shift-working nursing staff
- Self-paced learning that accommodates individual differences
- Engaging with multimedia content to
- Intimacy and closeness I
- Easy updates when guidelines change

However, technology alone is not enough. Online learning that combines knowledge acquisition with skill application in a blended approach appears most efficacious (Shin et al., 2021).

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4.10 Barriers & and Facilitators

Time constraints and workload were found to act as strong barriers in the studies, which can be justified in terms of the realities of medical/surgical nursing practice with a high patient-to-staff ratio. Successful programs have addressed these in the following ways:

- Protected Education Time during Paid Working Hours
- Brief, specialized modules instead of lengthy classes
- Mobile phone use for learning purposes during break times
- Integration into orientation and competency assessment

Support from management, education credits, or support for quality improvement efforts may have facilitated implementation (Kim et al., 2025).

4.11 Implications for Practice

Program Design Recommendations:

1. Multimodal Delivery: Online delivery of knowledge content, practice
2. Experiential Focus: Opt for experiential approaches emphasizing active learning and opportunities to
3. Just-in-Time Education: Establish Synchronization with Medical Needs and Patient Base
4. Interprofessional Approach: Incorporate inter-professional education involving other healthcare professionals
5. Customization: Personalize messages based on the characteristics of the unit, patients, and risks

Evaluation Recommendations:

1. Comprehensive Framework: Evaluation of all levels of Kirkpatrick, not solely knowledge
2. Behavioral Assessment: Employ the use of observation, competency, and performance
3. Longitudinal Design: Follow-up at 3, 6, and 12
4. Patient Outcomes: Monitoring Incident Rates, Near Misses, & Safety Performance
5. Mixed Methods: Quantitative results alongside qualitative views on implementation

Implementation Recommendations:

1. Protected Time: Establish the allocation of education time in work routines
2. Institutional Support: Gain support from leadership and resources
3. Culture Integration: The Integration of Education in General Safety Culture Initiatives

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4. Feedback Mechanisms: Create Processes for Ongoing Improvement of Programs
5. Sustainable Planning: Incorporating Refresher component in the Sustainability Plan

4.12 Implications for Research

Certain critical research gaps need to be addressed:

Methodological Needs:

- Large-scale randomized controlled trials with good power.
- Prospective studies evaluating sustainability (≥12 months)
- Research studies specifically conducted to explore the area of nursing technicians (
- Economic evaluations of cost-effectiveness
- Implementation science research identifies success factors tailored to the context

Outcome Assessment:

- Establishing standards for testing nurse technicians assessment tools
- Behavioral assessment tools for clinical performance
- Patient Outcome Measures beyond Incident Rates
- Slip and fall audit relative to medical-surgical settings

Development of the Intervention

- Effective trials for comparing methods in education
- Optimal duration and intensity studies
- Technology integration studies (AI, VR, gamification)
- Interprofessional education models
- Customization approaches for various groups

Contextual Research:

- Cultural adaptation studies
- Patient Populations (geriatric, pediatric, complex cases)
- New graduate versus experienced nurse needs
- Multilevel approaches (individual, unit

4.13 Limitations

This review has a few shortcomings:

Scope Limitations:

- Cases, English, Korean, Spanish, Portuguese, Arabic, limitations potentially include studies from other countries that are published in other languages
- Perspective will be on the period 2020-2025, although this allowed for the

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- Grey literature (dissertations, conference proceedings) exclusion might exclude unpublished research findings
- Study Heterogeneity
- Different intervention types and populations result in limitations in the availability of a meta
- There were discrepancies in measuring outcomes between different studies.
- Varying follow-up intervals made it difficult for sustainability

Methodological Limitations

- Predominance of quasi-experimental designs hinders the infer
- Cases for only a very few studies range above one million; median number of cases is very low (
- Potential for Publication Bias with Positive Outcomes
- Selection bias in voluntary participation studies

Example-Specific Limit

- Geographic concentration (70% Asia) restricts
- Limited representation of nursing technicians especially
- Limited generalization regarding other healthcare models and cultures

4.14 Strengths

Despite the shortcomings, this review has some advantages:-

- Combined search approach using various databases
- Comprehensive assessment of quality with accepted tools
- Systematic data extraction and synthesis
- Framework approach for organizational structuring based on Kirkpatrick's Model
- Practicing rather than student nurses, evidence ready for implementation
- Inclusion of diverse study designs involving multiple perspectives
- Practical suggestions for program design and program evaluation

5. Conclusion

The programs for nursing technicians and nurses in professional development have been shown to be highly effective in terms of improving patient safety knowledge, attitudes, and behavior. The use of simulation and a variety of experiential learning approaches appears particularly promising. However, there is a need for more comprehensive assessment in the evaluation of the programs in terms of sustained behavior change and patient outcomes.

Future programs should incorporate the following to be even more successful:

1. Utilize full-scale evaluation models covering all four levels proposed by

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2. Experiential Learning through Simulation and Work-Based Learning
3. Include inter professional education
4. Technology-Enabled Blended Learning
5. Longitudinal Evaluations for Continuity of Competence

Priorities for research would be the development of assessment measures, effectiveness trials, economic studies, and implementation studies. An understanding of program characteristics, modes of program implementation, and the conditions of implementation will help to inform the application of a program to develop competencies that are fundamental to patient safety.

With growing recognition from healthcare organizations of patient safety as the next quality essential, developing competent care practitioners among nursing technicians and registered nurses makes increasing sense from ethical as well as strategic obligations. This paper presents evidence-based inputs for developing initiatives that can train registered nurse care practitioners regarding error avoidance, early detection of danger, and suitable response mechanisms during patient safety-evoking incidents.

References

1. Amiri, M., Khademian, Z., & Nikandish, R. (2021). The effect of nurse empowerment educational program on patient safety culture: A randomized controlled trial. *BMC Medical Education*, 18, 158.
2. Andersen, M.H., Petersen, K.D., Holm, A., & Ersbøll, A.K. (2020). Evaluating the impact of an observational simulation teaching methods on patient safety and health outcomes. *Journal of Nursing Management*, 27, 84-92.
3. Cantero-López, N., Fernández-Martínez, M.E., Pérez-Ríos, N., & Fernández-Fernández, M.L. (2021). Evaluation of an educational intervention regarding attitudes towards patient safety in nursing students. *Nurse Education Today*, 98, 104753.
4. Cho, H., Park, J., & Lee, Y.J. (2022). Evaluating the impact of synchronous online education on the patient safety competency of nursing students. *Journal of Korean Academy of Nursing*, 52(2), 123-135.
5. Donaldson, M.S. (2008). An overview of to err is human: Re-emphasizing the message of patient safety. In *Patient Safety and Quality: An Evidence-Based Handbook for Nurses* (Chapter 3). Agency for Healthcare Research and Quality.
6. Ginsburg, L., Castel, E., Tregunno, D., & Norton, P.G. (2010). *Health Professional Education in Patient Safety Survey*. Institute for Safe Medication Practices Canada.
7. Ginsburg, L., Tregunno, D., Norton, P.G., Mitchell, J.I., & Howley, H. (2012). 'Not another safety culture survey': Using the Canadian patient safety climate survey (Can-PSCS) to measure provider perceptions of PSC across health settings. *BMJ Quality & Safety*, 23(2), 162-170.

Power System Technology
ISSN:1000-3673
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8. Habahbeh, A.J., & Alkhalaileh, M. (2020). Evaluating the effect of a surgical safety educational programme on the attitudes of nurses to patient safety culture in operating rooms. *Journal of Clinical Nursing*, 29(21-22), 4289-4299.
9. Kim, J., Lee, M., & Hong, E. (2025). Evaluating the outcomes of patient safety education programs in nursing education: A scoping review. *BMC Nursing*, 24(273), 1-17.
10. Kirkman, M.A., Sevdalis, N., Arora, S., Baker, P., Vincent, C., & Ahmed, M. (2015). The outcomes of recent patient safety education interventions for trainee physicians and medical students: A systematic review. *BMJ Open*, 5(5), e007705.
11. Kirkpatrick, D.L., & Kirkpatrick, J.D. (2006). *Evaluating training programs: The four levels* (3rd ed.). Berrett-Koehler Publishers.
12. Kroese, T.E., Jairam, J., Ruurda, J.P., Lin, S.H., Mohan, R., Mook, S., Haitjema, S., Hoefer, I., Haj Mohammad, N., Peters, M., & van Rossum, P.S. (2021). Severe lymphopenia acquired during chemoradiotherapy for esophageal cancer: Incidence and external validation of a prediction model. *Radiotherapy and Oncology*, 163, 192-198.
13. Lee, S.E., & Dahinten, V.S. (2023). Examining the effectiveness of a standalone patient safety course by comparing patient safety competency, knowledge, and attitudes. *Journal of Nursing Education*, 62(3), 156-163.
14. Lee, S.E., & Morse, B.L. (2022). Patient safety educational interventions: A systematic review with recommendations for nurse educators. *Nursing Open*, 9(4), 1967-1979.
15. Mok, H., & Kim, S. (2020). Effects of a simulation-based educational program for communication, targeted to prevent safety accidents of patients. *Journal of Korean Academy of Nursing*, 50(5), 650-662.
16. Shin, S.H., Kim, M.J., Moon, H.J., & Lee, E.H. (2021). Development and effectiveness of a patient safety education program for inpatients. *International Journal of Environmental Research and Public Health*, 18(6), 3262.
17. Torkaman, M., Sabzi, A., & Farokhzadian, J. (2022). The effect of patient safety education on undergraduate nursing students' patient safety competencies. *International Quarterly of Community Health Education*, 42(1), 73-81.
18. Zaitoun, R.A., Said, N.B., & de Tantillo, L. (2023). Clinical nurse competence and its effect on patient safety culture: A systematic review. *BMC Nursing*, 22(1), 173.