

Systematic review of the impact of nurse interventions on patients' experiences receiving medical care

Nawal Munwer Almutairi¹
Entesar Ayed Alshammary²
Sahar Hamad Alharthi³
Amal Ahmed Khabarni⁴
Baraah Ahmed Hawbani⁵
Atyaf Mohamed Damkan⁶
Zaid Najih Aid Al-Sharari⁷
Eid Shahat Abualari⁸
Bassam Abdullah Alsharari⁹
Hind Suleman Al Enazi¹⁰
Essam Suliman Salamah Alhejaili¹¹
Mohammed Musleh Al-Radady¹²

1. Nurse, Alyamamah Hospital
2. Nurse, Alyamamah Hospital
3. Nurse, Alyamamah Hospital
4. Nurse, Alyamamah Hospital
5. PICU Nurse, Jazan General Hospital
6. PW Nurse, Jazan General Hospital
7. Health Assistant, Al-Jawf Region, Al-Qurayyat Governorate, Al-Hadithah General Hospital
8. Nurse, Academic Affairs And Training Administration
9. Nursing Technician, Al-Jouf Health Complex, Qurayyat General Hospital
10. Nurse ,Gharnata Health Center
11. Nursing Technician (King Fahad Hospital In Madinah)
12. Nursing, Al-Haram Hospital In Madinah

Abstract

Background

Nurses, making up 59% of the global healthcare workforce, play a crucial role in delivering primary healthcare and achieving the Sustainable Development Goals (SDGs). Integrating evidence-based practices into nursing is essential to enhance patient care and reduce health inequities. Despite progress, implementing these practices faces challenges from individual, social, and environmental factors.

Methods

This systematic review evaluated the effects of healthcare professional-level implementation strategies on nursing practices and patient outcomes, using the Cochrane Effective Practice and Organisation of Care (EPoC) Taxonomy. Searches were conducted across multiple databases, and 204 studies were included, comprising randomized controlled trials, cluster trials, and non-randomized studies. The primary outcome was adherence to clinical practices, while secondary outcomes included attitudes, knowledge, and patient health indicators. Data were analyzed using meta-analytic techniques, and the certainty of evidence was assessed with the GRADE approach.

Results

Implementation strategies significantly improved adherence to clinical practices. Positive effects were observed in nurses' knowledge, skills, and attitudes. Multifaceted strategies combining education, feedback, and tailored interventions demonstrated the most consistent improvements. However, patient outcomes showed limited gains, with moderate to low certainty of evidence. Most studies originated from high-income settings, highlighting a gap in research within low- and middle-income countries.

Conclusion

Implementation strategies effectively enhance nursing practices, particularly when tailored and multifaceted. However, their direct impact on patient outcomes remains modest. Future research should explore diverse healthcare settings, emphasize sustainability, and expand the use of underutilized strategies to advance global nursing practices.

Background

Nurses constitute approximately 59% of the global healthcare workforce, playing a critical role in delivering both independent and collaborative care across various health services (1, 2). Their contributions are essential for achieving the 2030 Sustainable Development Goals (SDGs) set by the United Nations, particularly in promoting health and well-being for individuals of all ages (3, 4). As integral providers of primary healthcare,

nurses ensure the delivery of quality care, support patient safety, and engage in clinical decision-making (5, 6). To enhance patient care and advance equity in health, it is vital to encourage the integration of evidence-based practices into nursing routines on a global scale (7, 8). Nursing responsibilities encompass a wide array of tasks, such as administering medications, assessing health conditions, performing diagnostic tests and screenings, documenting care, maintaining infection control, providing vaccinations, and offering health behavior counseling (9).

Adopting and sustaining evidence-based practices within nursing is influenced by a complex interplay of individual, social, and environmental factors (9, 10, 11, 12, 13). These factors, as outlined in implementation science frameworks like the Theoretical Domains Framework (TDF), can act as either barriers or facilitators to effective practice (14). Challenges in implementation often include insufficient knowledge, unsupportive social norms, workflow inefficiencies, poor collaboration or leadership, and limited organizational support (9, 10, 11, 12, 13, 15). Evidence from implementation science highlights strategies to address these obstacles and promote behavior change, facilitating the use of evidence-based practices across diverse clinical settings (16, 17, 18). These strategies, which aim to influence nurses' behavior, the clinical environment, or both, are integral to enhancing the quality of healthcare delivery (19, 20, 21).

To structure these strategies, taxonomies like the Cochrane Effective Practice and Organisation of Care (EPOC) Taxonomy categorize interventions aimed at improving professional practice, including 19 approaches such as audit and feedback, clinical guidelines, professional networks, educational resources, and reminders (22). Multifaceted strategies combine several of these approaches to address various barriers simultaneously, potentially offering greater efficiency and improved patient outcomes compared to single-component strategies (23, 24). Determining the relative effectiveness of these multifaceted approaches is essential to optimizing resources and achieving better clinical outcomes (23).

Research on implementation strategies has demonstrated modest impacts on modifying healthcare professionals' behaviors, with limited evidence of substantial improvements in patient outcomes (25). Systematic reviews have examined the effects of strategies such as audit and feedback (17), local opinion leaders (26), printed educational resources (27), and technology-based interventions (28, 29, 30, 31, 32), as well as reminders (33), on clinical practice and patient outcomes. Specifically, reviews targeting nurses have shown positive results regarding the adoption of clinical guidelines and their influence on both nursing practices and patient health (34, 35). However, no comprehensive systematic review and meta-analysis has yet synthesized evidence on the full spectrum of healthcare professional-level implementation strategies defined in the EPOC Taxonomy and their effects on nurses' practices and patient outcomes. Furthermore, there is limited quantitative evidence assessing the influence of these strategies on critical behavioral determinants—such as attitudes, knowledge, intentions, perceived capabilities, skills, and social norms—highlighted in the TDF (14). These determinants are foundational to many behavioral theories, making them essential for understanding and driving practice changes in nursing (36).

Methods

This systematic review adhered to the guidance provided in the Cochrane Handbook for Systematic Reviews of Interventions (37) and followed the reporting standards of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (38).

Search Strategy and Eligibility Criteria

A comprehensive search strategy was devised in collaboration with a research librarian, utilizing controlled vocabulary (e.g., MeSH terms) and keywords related to implementation strategies, nursing professionals, and various study designs. Literature searches were conducted in databases including CINAHL, EMBASE, ERIC, PsycINFO, PubMed, and Web of Science, covering publications from their inception until February 26, 2024. Additional relevant studies were identified by examining the reference lists of selected articles and systematic reviews found through sources like the Cochrane Database of Systematic Reviews and Google Scholar.

Inclusion criteria encompassed studies involving any type of nursing professional (e.g., registered nurses, clinical nurse specialists, licensed practical nurses) within any clinical setting. Studies were excluded if over 10% of participants were other healthcare professionals or if results specific to nurses were not reported. Research focusing on nursing students was also excluded. Implementation strategies were defined as techniques or methods aimed at facilitating the initial adoption and long-term utilization of evidence-based interventions, practices, or programs (22). Eligible studies incorporated at least one of the 19 healthcare professional-level implementation strategies specified in the EPOC Taxonomy (22). Financial, structural, and regulatory interventions, as well as patient-focused organizational strategies, were considered outside the scope of this review.

The review included studies with any comparator or usual care group. Outcomes assessed included objective measures of nurses' practices (e.g., clinical interventions recorded in patient charts, test orders) or subjective measures (e.g., self-reported clinical intervention practices). Studies solely examining determinants of nursing practice were excluded. Regarding study design, the review included randomized studies such as randomized

controlled trials (RCTs), cluster randomized trials (CRTs), and stepped-wedge CRTs, as well as non-randomized controlled studies (NRCS). Cross-sectional studies, observational studies, and case reports were excluded. Only peer-reviewed articles were considered to enable detailed evaluation of interventions, while conference abstracts, dissertations, and theses were excluded.

Data Extraction

Data extraction was conducted in Covidence by two reviewers independently, with conflicts resolved through discussion or adjudication by a third reviewer. Extracted information included study characteristics, participant details, and intervention features (e.g., categorization of strategies per the EPOC Taxonomy), as well as primary and secondary outcomes. A pre-piloted, standardized data extraction form was used (Microsoft Excel for Office 365). Study authors were contacted via email for clarification and additional data; follow-up reminders were sent twice if no response was received.

Data Analysis

Data were analyzed using random-effects (DerSimonian and Laird method) to assess primary outcomes (clinical practice) and secondary outcomes (e.g., patient outcomes, nurses' attitudes, intentions, knowledge, perceived control, norms, and skills) across various intervention categories outlined in Table 1. Comparisons included the presence versus absence of specific implementation strategies (e.g., audit and feedback in the intervention group [IA] versus no active intervention or an alternative strategy in the control group [CA]) and multifaceted versus single strategies.

Results

Search Outcomes and Included Studies

From a total of 35,000 records identified via bibliographic databases and 39 additional records from other sources, 21,602 unique studies were reviewed. After screening for eligibility, 837 records were assessed, and 204 studies met inclusion criteria. These included 152 randomized trials and 52 controlled non-randomized trials, collectively involving 36,544 nurses (161 studies) and 340,320 patients (88 studies). Corresponding authors were contacted for additional information, with 78 (38%) responding. Data from 160 studies contributed to the primary outcome, which was adherence to desired clinical practices, while 44 studies were synthesized narratively.

Characteristics of Included Studies

Table 2 outlines the features of the studies. Among them, randomized trials were most prevalent (152 studies, 75%), comprising 96 cluster-randomized trials (47%), 51 randomized controlled trials (25%), and 5 stepped-wedge cluster-randomized trials (2%). These trials involved 30,473 nurses and 323,986 patients. The non-randomized studies (52, 25%) included 38 controlled trials (19%), 13 cluster-controlled trials (6%), and 1 controlled time series study (<1%), with 6,071 nurses and 16,334 patients. Most studies were conducted in hospital environments (139 studies, 68%), with fewer in primary care (25 studies, 12%) and nursing home settings (21 studies, 10%). Additional settings included community health centers, outpatient facilities, and skilled nursing units. In terms of income levels, most research was conducted in high-income regions (160 studies, 78%), with fewer in upper-middle-income (37 studies, 18%), lower-middle-income (7 studies, 3%), and low-income (1 study, <1%). The targeted clinical behaviors varied, with 48 studies (24%) addressing multiple behaviors. Other behaviors included providing advice (29 studies, 14%), infection control (26 studies, 13%), diagnosing illnesses (26 studies, 13%), administering medication (14 studies, 7%), documenting care (10 studies, 5%), and care coordination (10 studies, 5%). Fewer studies focused on screening, symptom management, and vaccination (<5%).

The implementation strategies most commonly applied, including educational meetings (intervention: 155 arms; control: 29 arms), educational materials (intervention: 145 arms; control: 22 arms), and clinical practice guidelines (intervention: 64 arms; control: 13 arms). Less frequent strategies included patient-mediated interventions, monitoring healthcare performance, and interprofessional education (<10%). Most strategies integrated clinician education (individual or group) alongside reminders, feedback, and tailored interventions.

When compared with no intervention, implementation strategies significantly improved clinical practice outcomes (76 assessments; SMD: 0.94, 95% CI: 0.72–1.15) and dichotomous practice outcomes (60 assessments; OR: 2.11, 95% CI: 1.70–2.62). Positive effects were also observed in nurses' attitudes (30 assessments; SMD: 0.59, 95% CI: 0.23–0.95), knowledge (37 assessments; SMD: 1.16, 95% CI: 0.82–1.49), and skills (10 assessments; SMD: 0.97, 95% CI: 0.42–1.52). However, patient outcomes showed no significant improvements (10 assessments; SMD: 0.23, 95% CI: -0.01–0.47). Subgroup analyses revealed minimal variations based on setting, study design, or clinical behavior targeted.

In studies comparing multifaceted strategies with single interventions, small and non-significant effects were found on continuous clinical outcomes (12 assessments; SMD: 0.23, 95% CI: -0.01–0.46) and dichotomous

outcomes (20 assessments; OR: 1.35, 95% CI: 0.76–2.40). These results suggest that multifaceted approaches may not provide substantial advantages over simpler strategies

After reaching out to the authors of all studies, 44 studies were excluded from the primary outcome meta-analysis for various reasons. These included unavailable data ($n=27$) (48–74), irrelevance to the analyses due to comparisons involving groups receiving similar implementation strategies but with design differences ($n=14$) (75–88), or outcomes reported as rates rather than in a compatible format ($n=3$) (89–91).

Among these studies, 25 were exclusively focused on educational strategies. Favorable outcomes were observed in 22 studies within experimental groups. For instance, Kaner et al. (78) found that outreach education improved the application of brief alcohol interventions compared to clinical practice guidelines. Educational meetings, often enhanced with materials or guidelines, contributed positively in several areas: improved blood glucose monitoring (O'Neill et al., 63), better communication (Antonini et al., 48), and enhanced diabetes management (Lim et al., 59). Additional improvements included endotracheal suctioning practices (Day et al., 52), nursing documentation (Müller-Staub et al., 49), and symptom management (Hessig et al., 55). A few studies, such as those by Hammersley et al. (53) and Seeley et al. (68), reported no benefit from educational approaches.

Nine studies examined educational strategies enhanced by technology. These included simulation-focused meetings and feedback, which improved adherence to evidence-based guidelines (Jansson et al., 84, 92), and biosimulated visual demonstrations, which increased protective equipment use (Carrico et al., 87). Other examples include game-based learning enhancing hand hygiene (Wang et al., 85) and e-learning programs advancing physical examination and medication administration (Kinsman et al., 88; Lau et al., 79).

Five studies assessed the effectiveness of audit and feedback alone. Most were inconclusive, with one exception: Charrier et al. (76) found that combining audit and feedback with facilitators enhanced protocol compliance for pressure ulcers and catheter management. Other studies (75, 91, 62, 66) showed no effect on outcomes such as hand hygiene and medication error reporting.

Multifaceted implementation strategies, incorporating multiple approaches beyond education, generally produced favorable results, with 9 out of 10 studies showing improvements. For example, Brennan et al. (50) implemented a tailored guideline intervention that enhanced delirium screenings and reduced rates of delirium. Other strategies, such as combining outreach, materials, and feedback, led to better outcomes in areas like urinary incontinence management (Hödl et al., 56) and relaxation technique adoption (Lin et al., 60). Reynolds et al. (65) found that using educational outreach and feedback increased compliance with certain practices, though significant reductions in infection rates were not observed.

In comparisons of multifaceted versus single-component strategies, all four studies favored multifaceted approaches. For instance, Hong et al. (57) observed better urinary catheter care when combining local opinion leaders with education compared to either approach alone. Johnston et al. (58) noted improvements in pain assessment documentation using a multi-pronged intervention.

Discussion

This systematic review explored the impact of strategies implemented at the healthcare professional level on nursing practices and patient outcomes, analyzing 204 studies. The findings indicate that the majority of strategies were multi-component in nature, often combining individual and group educational interventions (e.g., training sessions, distribution of educational materials, clinical guidelines, interprofessional education) with other elements such as reminders, feedback mechanisms, local opinion leaders, and tailored interventions. About a quarter of the studies targeted multiple clinical behaviors, including providing health education, maintaining hygiene standards, performing assessments, administering treatments, and documenting care. A review of 160 studies, along with a narrative synthesis of 44 others not included in the meta-analysis, demonstrated positive effects of both single and multi-component strategies on clinical practice outcomes. Secondary outcomes, such as nurses' knowledge, skills, attitudes, and perceived control, also improved through strategies like education, reminders, and customized interventions. Positive effects on patient outcomes were observed primarily for group and individual education and tailored interventions.

These findings align with earlier reviews on the effectiveness of implementation strategies. Previous studies have shown that group education, individual education, reminders, and the involvement of key opinion leaders contribute to better adherence to guidelines and improved nursing outcomes (35). For example, Cassidy et al. (34) found that combining educational meetings with tools like materials and opinion leaders supported guideline-consistent nursing care. Similarly, Forsetlund et al. (16) noted improvements in professional practices and patient care through educational meetings, while Giguère et al. (27) suggested that even printed materials alone could enhance practice to some extent. On the other hand, audit and feedback, though widely used, showed inconsistent results. According to Ivers et al. (94), these strategies led to minor improvements among physicians but lacked robust evidence of effectiveness among nurses. In this review, audit and feedback strategies yielded mixed outcomes. However, when high-bias studies were excluded, some positive effects emerged, albeit in limited cases.

The review also revealed that many potential strategies remain underutilized. Only a small proportion of the included studies employed certain strategies listed in the Effective Practice and Organisation of Care (EPOC) Taxonomy, signaling a need to explore these approaches further. Expanding the range of strategies, as suggested by taxonomies like the Expert Recommendations for Implementing Change (ERIC) Taxonomy (20), may help bridge existing gaps in implementation research. Incorporating frameworks such as the Theoretical Domains Framework (TDF) (14) and the Capability, Opportunity, Motivation, and Behavior (COM-B) model (95) may provide deeper insights into the mechanisms driving behavioral change in nursing practice.

The ongoing debate between the effectiveness of single versus multi-component strategies is addressed in this review. While some evidence suggests that multifaceted strategies may offer better results, the outcomes appear context-dependent. Reviews by Squires et al. (96) and Boaz et al. (25) highlight nuanced findings, suggesting that while multifaceted strategies often outperform single approaches, their impact on patient outcomes remains variable. This review observed that tailored interventions—customized to address specific challenges and facilitators—were particularly effective, corroborating the findings of Baker et al. (97). However, translating improvements in nursing practices into measurable patient benefits is a complex process influenced by organizational, cultural, and systemic factors within healthcare systems (16, 17, 25).

The review also identified significant gaps in existing literature. Most studies were conducted in higher-income settings, leaving questions about the applicability of these strategies in other contexts. Previous analyses using the ERIC Taxonomy noted the potential adaptability of many strategies to various healthcare environments (99), but there is a scarcity of rigorous trials evaluating their effectiveness in diverse contexts. Future studies should focus on adapting and testing these strategies across different healthcare systems to ensure equitable advancements in nursing practice and patient care globally.

Strengths of this review include its targeted focus on nursing practice, which facilitates meaningful comparisons across studies, and the incorporation of multiple types of evidence, such as continuous and dichotomous outcome measures. The use of standardized taxonomies and frameworks, as well as systematic data collection processes, further enhances the reliability of the findings. Nonetheless, the review faced challenges, including heterogeneity in study designs, co-interventions that may confound results, and variability in the measurement of outcomes. High heterogeneity across studies, as indicated by I^2 values exceeding 75%, reduces the reliability of pooled estimates. Therefore, findings should be interpreted with caution, recognizing that the effects of strategies depend significantly on contextual factors.

This analysis underscores the importance of implementing tailored, multifaceted strategies that address local barriers while leveraging facilitators to enhance nursing practice. Healthcare organizations should also consider diversifying the strategies they employ by incorporating underutilized methods from the EPOC and ERIC Taxonomies. Moreover, consistent monitoring and evaluation systems are essential to assess the long-term effectiveness of these strategies on nursing practices and patient outcomes.

In conclusion, implementation strategies can significantly enhance evidence-based nursing practices, though their direct effects on patient outcomes are modest. Future research should prioritize understanding the influence of different contexts, sustainability, novel strategies, and their impact on healthcare systems to advance global nursing practices.

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