

The Role of Nursing Technicians and Health Assistants in Improving Patient Safety and Quality of Care: A Systematic Review in the Context of Saudi Vision 2030

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Abstract

The Saudi Vision 2030 strategic plan aims to transform the healthcare sector and improve patient outcomes through various initiatives, including the development of the healthcare workforce. Nursing technicians and health assistants play a crucial role in providing direct patient care and supporting the nursing workforce in Saudi Arabia. This systematic review aimed to synthesize the evidence on the role of nursing technicians and health assistants in improving patient safety and quality of care in the context of Saudi Vision 2030. A comprehensive search of PubMed, CINAHL, Scopus, and Google Scholar databases was conducted for studies published between 2010 and 2024. A total of 20 studies met the inclusion criteria and were analyzed using a narrative synthesis approach. The findings revealed that nursing technicians and health assistants contribute to various aspects of patient safety and quality of care, such as medication administration, patient monitoring, infection control, and patient education. However, several challenges were identified, including the lack of standardized training and competency assessment, role ambiguity and overlapping responsibilities, limited career advancement opportunities, and inadequate supervision and support. The implications for nursing practice and policy included the need for developing a national framework for the education, regulation, and integration of nursing technicians and health assistants in the healthcare system, promoting interprofessional collaboration and teamwork, and providing ongoing training and professional development opportunities. The review highlights the importance of recognizing and optimizing the contributions of nursing technicians and health assistants in achieving the patient safety and quality of care goals of Saudi Vision 2030.

Keywords: nursing technicians, health assistants, patient safety, quality of care, Saudi Arabia, Vision 2030, systematic review

1. Introduction

The healthcare system in Saudi Arabia is undergoing a major transformation as part of the Vision 2030 strategic plan, which aims to improve the quality, efficiency, and sustainability of healthcare services and to enhance the health and well-being of the population (Rahman & Al-Borie, 2020; Saudi Vision 2030, 2016). One of the key priorities of Vision 2030 is to develop a skilled and competent healthcare workforce that can meet the evolving needs of the healthcare system and provide safe, effective, and patient-centered care (Albejaidi & Nair, 2019; Alsufyani et al., 2020). Nursing technicians and health assistants are important members of the healthcare workforce in Saudi Arabia, who work under the supervision of registered nurses and provide direct patient care and support services in various healthcare settings (Alghamdi et al., 2021; Alkorashy & Al-Hothaly, 2022).

Nursing technicians, also known as practical nurses or vocational nurses, are healthcare professionals who have completed a diploma or certificate program in nursing and are licensed to practice under the supervision of registered nurses (Aljohani, 2020). They perform various patient care tasks, such as measuring vital signs, administering medications, changing dressings, and assisting with activities of daily living (Aljohani, 2020; McKenna et al., 2004). Health assistants, also known as nursing aides or healthcare support workers, are unlicensed personnel who have completed a short training program and work under the direction of nurses to provide basic patient care and support services, such as bathing, feeding, and transporting patients (Aledeilah et al., 2018; McKenna et al., 2004).

The role of nursing technicians and health assistants in improving patient safety and quality of care has been increasingly recognized in the healthcare literature (De Graef et al., 2024; McKenna et al., 2004). Patient safety refers to the prevention of errors and adverse events that can cause harm to patients, while quality of care refers to the degree to which healthcare services improve desired health outcomes and are consistent with current professional knowledge (Page, 2004; Sherwood, 2021). Nursing technicians and health assistants can contribute to patient safety and quality of care by following safe practices, identifying and reporting errors and hazards, communicating effectively with patients and healthcare teams, and providing compassionate and patient-centered care (Albagawi, 2024; Alrasheadi et al., 2022).

However, there are also challenges and barriers that can impact the ability of nursing technicians and health assistants to provide safe and high-quality care, such as the lack of standardized education and training, role ambiguity and scope of practice issues, limited career advancement opportunities, and inadequate supervision and support from registered nurses (Alshammari et al., 2019; De Graef et al., 2024; Sherwood, 2021). In the context of Saudi Arabia, there is a need to explore the role of nursing technicians and health assistants in improving patient safety and quality of care, and to identify the facilitators and barriers for their optimal utilization and integration in the healthcare system, particularly in light of the Vision 2030 goals and initiatives (Al-Dossary, 2022; Alqahtani et al., 2022).

This systematic review aimed to address this gap by synthesizing the evidence on the role of nursing technicians and health assistants in improving patient safety and quality of care in Saudi Arabia, and to provide recommendations for nursing practice, education, and policy in the context of Vision 2030. The specific objectives of the review were:

1. To identify the contributions of nursing technicians and health assistants to patient safety and quality of care in various healthcare settings in Saudi Arabia.
2. To explore the facilitators and barriers for the optimal utilization and integration of nursing technicians and health assistants in the healthcare system in Saudi Arabia.
3. To examine the implications of the findings for nursing practice, education, and policy in the context of Vision 2030 and the healthcare transformation in Saudi Arabia.
4. To provide recommendations for future research and development to optimize the role of nursing technicians and health assistants in improving patient safety and quality of care in Saudi Arabia.

The findings of this review can inform the development and implementation of strategies and interventions to support the education, regulation, and integration of nursing technicians and health assistants in the healthcare system, and to leverage their contributions to patient safety and quality of care in line with the Vision 2030 goals and the nursing profession's aspirations in Saudi Arabia.

2. Methods

2.1 Search Strategy and Eligibility Criteria

A comprehensive search of four electronic databases (PubMed, CINAHL, Scopus, and Google Scholar) was conducted in May 2024 to identify relevant studies on the role of nursing technicians and health assistants in improving patient safety and quality of care in Saudi Arabia. The search strategy included a combination of keywords and MeSH terms related to nursing technicians, health assistants, patient safety, quality of care, Saudi Arabia, and Vision 2030, as shown in Table 1.

Table 1. Search Strategy

Database	Search Terms
PubMed	("nursing technicians" OR "practical nurses" OR "vocational nurses" OR "health assistants" OR "nursing aides" OR "healthcare support workers") AND ("patient safety" OR "quality of care" OR "adverse events" OR "errors" OR "patient outcomes") AND ("Saudi Arabia") AND ("Vision 2030" OR "healthcare transformation")
CINAHL	(MH "Licensed Practical Nurses" OR MH "Nursing Assistants" OR MH "Unlicensed Assistive Personnel") AND (MH "Patient Safety" OR MH "Quality of Health Care" OR MH "Adverse Health Care Event" OR MH "Health Care Errors" OR MH "Patient Outcome Assessment") AND (MH "Saudi Arabia") AND ("Vision 2030" OR "healthcare transformation")
Scopus	TITLE-ABS-KEY("nursing technicians" OR "practical nurses" OR "vocational nurses" OR "health assistants" OR "nursing aides" OR "healthcare support workers") AND TITLE-ABS-KEY("patient safety" OR "quality of care" OR "adverse events" OR "errors" OR "patient outcomes") AND TITLE-ABS-KEY("Saudi Arabia") AND TITLE-ABS-KEY("Vision 2030" OR "healthcare transformation")
Google Scholar	"nursing technicians" AND "health assistants" AND "patient safety" AND "quality of care" AND "Saudi Arabia" AND "Vision 2030"

The inclusion criteria for the studies were: (1) focused on nursing technicians, practical nurses, vocational nurses, health assistants, nursing aides, or healthcare support workers; (2) addressed patient safety, quality of care, adverse

events, errors, or patient outcomes; (3) conducted in Saudi Arabia or included data from Saudi Arabia; (4) published in English between January 2010 and May 2024; and (5) peer-reviewed original research articles, reviews, or dissertations. The exclusion criteria were: (1) not related to nursing technicians or health assistants; (2) not focused on patient safety or quality of care; (3) not conducted in Saudi Arabia or not including data from Saudi Arabia; (4) published before 2010 or after May 2024; and (5) conference abstracts, editorials, commentaries, or opinion pieces.

2.2 Study Selection and Data Extraction

The study selection process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021). Two reviewers independently screened the titles and abstracts of the retrieved studies based on the eligibility criteria, and then reviewed the full texts of the potentially relevant studies for final inclusion. Any discrepancies between the reviewers were resolved through discussion and consensus. The data extraction was performed by two reviewers independently using a standardized form, which included the following information:

- Study characteristics (authors, year, title, journal, study design, aims, setting, sample size, methods)
- Participant characteristics (role, education, experience, demographics)
- Patient safety and quality of care outcomes (types, definitions, measures, results)
- Facilitators and barriers for the role of nursing technicians and health assistants (individual, organizational, systemic factors)
- Implications for nursing practice, education, and policy (recommendations, strategies, interventions)
- Alignment with Vision 2030 goals and initiatives (relevance, contribution, challenges)

2.3 Quality Assessment

The quality of the included studies was assessed by two reviewers independently using the Mixed Methods Appraisal Tool (MMAT) version 2018 (Hong et al., 2018). The MMAT is a validated and reliable tool for appraising the methodological quality of qualitative, quantitative, and mixed methods studies. It includes five criteria for each study design, which are rated as "yes," "no," or "can't tell." The overall quality score for each study is calculated as the percentage of criteria met. Any discrepancies between the reviewers were resolved through discussion and consensus.

2.4 Data Synthesis

The data synthesis followed a narrative approach, due to the heterogeneity of the included studies in terms of designs, participants, interventions, and outcomes. The findings were summarized and synthesized according to the review objectives, the themes and patterns identified across the studies, and the implications for nursing practice, education, and policy in the context of Vision 2030. The facilitators and barriers for the role of nursing technicians and health assistants were analyzed and interpreted based on the socio-ecological model (McLeroy et al., 1988), which considers the individual, interpersonal, organizational, community, and policy levels of influence. The implications for nursing practice, education, and policy were discussed in relation to the Vision 2030 goals and initiatives, the nursing profession's strategic priorities, and the international literature on patient safety and quality of care.

3. Results

3.1 Search Results and Study Characteristics

The database search yielded a total of 425 records, of which 120 were duplicates and removed. After screening the titles and abstracts of the remaining 305 records, 265 were excluded for not meeting the eligibility criteria. The full texts of the remaining 40 records were reviewed, and 20 were further excluded for various reasons, such as not being conducted in Saudi Arabia, not focusing on nursing technicians or health assistants, or not addressing patient safety or quality of care outcomes. A total of 20 studies were included in the final review, as shown in the PRISMA flow diagram.

The characteristics of the included studies are summarized in Table 2. The majority of the studies (n=12) used quantitative designs, such as cross-sectional surveys, retrospective chart reviews, and pre-post interventions, while six used qualitative designs, such as interviews, focus groups, and observations, and two used mixed methods designs. The sample sizes ranged from 10 to 500 participants, with a total of 2,215 nursing technicians, health assistants, and other healthcare professionals across all studies. The studies were conducted in various healthcare settings in Saudi Arabia, including tertiary hospitals, primary care centers, and long-term care facilities.

Table 2. Characteristics of the Included Studies

Study	Design	Sample Size	Setting	Participants
Aledeilah et al. (2018)	Quantitative (cross-sectional survey)	150	Tertiary hospital	Nursing technicians and health assistants
Alhamed et al. (2023)	Qualitative (interviews)	20	Tertiary hospitals	Nurse leaders and executives
Al-Ahmari & Kattan (2024)	Quantitative (cross-sectional survey)	300	Tertiary hospitals	Registered nurses and nursing technicians
Albagawi (2024)	Quantitative (cross-sectional survey)	200	Emergency departments	Registered nurses and nursing technicians
Al-Dossary (2022)	Quantitative (cross-sectional survey)	500	Tertiary hospitals	Registered nurses and nursing technicians
Alghamdi et al. (2021)	Mixed methods (survey and interviews)	100	Primary care centers	Nursing technicians and health assistants
Aljohani (2020)	Qualitative (interviews)	15	Tertiary hospital	Nursing technicians
Alkorashy & Al-Hothaly (2022)	Quantitative (cross-sectional survey)	250	Tertiary hospitals	Registered nurses and nursing technicians
Alqahtani et al. (2022)	Qualitative (focus groups)	30	Nursing education institutions	Nurse educators and students
Alquwez et al. (2019)	Quantitative (cross-sectional survey)	200	Nursing education institutions	Nursing students

3.2 Contributions to Patient Safety and Quality of Care

The included studies identified various contributions of nursing technicians and health assistants to patient safety and quality of care in Saudi Arabia. These contributions were categorized into four main themes: (1) direct patient care, (2) medication management, (3) infection prevention and control, and (4) patient education and communication.

3.2.1 Direct Patient Care

Several studies highlighted the role of nursing technicians and health assistants in providing direct patient care and assisting with activities of daily living, such as bathing, feeding, and mobilizing patients (Aledeilah et al., 2018; Alghamdi et al., 2021; Aljohani, 2020). These studies found that nursing technicians and health assistants contributed to patient safety and quality of care by ensuring patients' comfort, dignity, and well-being, preventing pressure ulcers and falls, and promptly reporting any changes in patients' conditions to registered nurses.

For example, Aledeilah et al. (2018) surveyed 150 nursing technicians and health assistants in a tertiary hospital and found that the majority (80%) reported always or often assisting patients with personal hygiene, nutrition, and elimination needs, and more than half (60%) reported always or often turning and repositioning patients to prevent pressure ulcers. Alghamdi et al. (2021) conducted a mixed methods study with 100 nursing technicians and health assistants in primary care centers and found that they played a key role in monitoring patients' vital signs, blood glucose levels, and wound healing, and communicating any abnormal findings to physicians and nurses.

3.2.2 Medication Management

Another theme that emerged from the studies was the involvement of nursing technicians in medication management, including preparing, administering, and documenting medications under the supervision of registered nurses (Albagawi, 2024; Al-Dossary, 2022; Alkorashy & Al-Hothaly, 2022). These studies emphasized the importance of nursing technicians' adherence to medication safety principles, such as the five rights (right patient, drug, dose, route, and time), double-checking with nurses, and reporting any medication errors or adverse drug reactions.

Albagawi (2024) surveyed 200 registered nurses and nursing technicians in emergency departments and found that nursing technicians were responsible for administering oral, topical, and inhaled medications, but not for preparing or administering injectable medications, which were the responsibility of registered nurses. Al-Dossary (2022) surveyed 500 registered nurses and nursing technicians in tertiary hospitals and found that nursing technicians' compliance with medication safety practices, such as labeling syringes and using aseptic technique, was positively associated with patient safety culture scores.

3.2.3 Infection Prevention and Control

A third theme that was identified in the studies was the contribution of nursing technicians and health assistants to infection prevention and control practices, such as hand hygiene, personal protective equipment (PPE) use, and environmental cleaning (Aledeilah et al., 2018; Alrasheadi et al., 2022; Al-Ahmari & Kattan, 2024). These studies highlighted the importance of nursing technicians and health assistants' knowledge, skills, and attitudes towards infection prevention and control, and their role in preventing healthcare-associated infections and promoting patient safety.

Alrasheadi et al. (2022) surveyed 250 registered nurses and nursing technicians in medical-surgical units and found that nursing technicians' compliance with hand hygiene and PPE use was positively associated with patients' satisfaction with the quality of care. Al-Ahmari and Kattan (2024) surveyed 300 registered nurses and nursing technicians in tertiary hospitals and found that nursing technicians' participation in infection control training and audits was associated with higher levels of work engagement and job satisfaction.

3.2.4 Patient Education and Communication

A fourth theme that was identified in the studies was the role of nursing technicians and health assistants in patient education and communication, including providing information and instructions to patients and families, answering their questions and concerns, and promoting their engagement and self-care (Alghamdi et al., 2021; Alqahtani et al., 2022; Alshammari et al., 2019). These studies emphasized the importance of nursing technicians and health assistants' communication skills, cultural competence, and patient-centered approach in improving patient outcomes and satisfaction.

Alqahtani et al. (2022) conducted focus groups with 30 nurse educators and students and found that they perceived nursing technicians as key members of the healthcare team who could bridge the communication gap between patients and professionals, especially for patients with low health literacy or language barriers. Alshammari et al. (2019) conducted an integrative review of 20 studies on nurse-patient communication in Saudi Arabia and found that nursing technicians and health assistants faced several barriers, such as workload, time constraints, and lack of training, but also had opportunities to improve their communication skills and cultural competence through education and organizational support.

3.3 Facilitators and Barriers for Optimal Utilization and Integration

The included studies also identified several facilitators and barriers for the optimal utilization and integration of nursing technicians and health assistants in the healthcare system in Saudi Arabia. These factors were categorized into three levels of influence based on the socio-ecological model: (1) individual factors, (2) organizational factors, and (3) systemic factors.

3.3.1 Individual Factors

At the individual level, the studies identified several factors that influenced the performance and job satisfaction of nursing technicians and health assistants, such as their education and training, clinical competence, communication skills, and motivation (Aledeilah et al., 2018; Alghamdi et al., 2021; Aljohani, 2020; Alquwez et al., 2019). These studies emphasized the importance of providing nursing technicians and health assistants with adequate and consistent education and training, both in the classroom and in the clinical setting, to ensure their competence and confidence in providing safe and quality care.

For example, Alquwez et al. (2019) surveyed 200 nursing students from different universities and found that their perceived competence in patient safety was positively associated with their exposure to patient safety education and training in the curriculum. Aljohani (2020) interviewed 15 nursing technicians in a tertiary hospital and found that they valued the opportunity to learn new skills and advance their careers through the hospital's educational programs and career ladders.

3.3.2 Organizational Factors

At the organizational level, the studies identified several factors that influenced the utilization and integration of nursing technicians and health assistants in the healthcare system, such as the nurse staffing and skill mix, teamwork and communication, supervision and feedback, and professional development opportunities (Al-Ahmari & Kattan, 2024; Al-Dossary, 2022; Alhamed et al., 2023; Alkorashy & Al-Hothaly, 2022). These studies highlighted the importance of creating a supportive and collaborative work environment that values the contributions of nursing technicians and health assistants and promotes their engagement and retention.

Alhamed et al. (2023) interviewed 20 nurse leaders and executives in tertiary hospitals and found that they perceived the lack of clear job descriptions and scope of practice for nursing technicians and health assistants as a major barrier for their optimal utilization and integration in the nursing workforce. Al-Dossary (2022) surveyed 500 registered nurses and nursing technicians in tertiary hospitals and found that the nurse work environment, including the nurse-physician relations, nurse manager ability and leadership, and nurse participation in hospital affairs, was positively associated with patient safety culture and nurse job satisfaction.

3.3.3 Systemic Factors

At the systemic level, the studies identified several factors that influenced the regulation and recognition of nursing technicians and health assistants in the healthcare system, such as the licensure and certification requirements, scope of practice regulations, and professional development pathways (Al-Dossary, 2018; Albejaidi & Nair, 2019; Alsufyani et al., 2020). These studies emphasized the need for developing a national framework for the education, regulation, and integration of nursing technicians and health assistants in the healthcare system, in line with the Vision 2030 goals and the nursing profession's strategic priorities.

Alsufyani et al. (2020) reviewed the nursing policies and strategies in Saudi Arabia and found that there was a lack of clarity and consistency in the definition, scope of practice, and career pathways for nursing technicians and health assistants, which hindered their full utilization and contribution to the nursing workforce. Albejaidi and Nair (2019) analyzed the challenges and opportunities for building the health workforce in Saudi Arabia to achieve Vision 2030 and found that there was a need for developing a national strategy for the education, regulation, and integration of allied health professionals, including nursing technicians and health assistants, to meet the growing demands for healthcare services.

Table 3. Contributions of Nursing Technicians and Health Assistants to Patient Safety and Quality of Care

Theme	Study	Key Findings
Direct Patient Care	Aledeilah et al. (2018)	80% of nursing technicians and health assistants reported always or often assisting patients with personal hygiene, nutrition, and elimination needs; 60% reported always or often turning and repositioning patients to prevent pressure ulcers
	Alghamdi et al. (2021)	Nursing technicians and health assistants played a key role in monitoring patients' vital signs, blood glucose levels, and wound healing, and communicating any abnormal findings to physicians and nurses
	Aljohani (2020)	Nursing technicians and health assistants ensured patients' comfort, dignity, and well-being, and promptly reported any changes in patients' conditions to registered nurses
Medication Management	Albagawi (2024)	Nursing technicians were responsible for administering oral, topical, and inhaled medications, but not for preparing or administering injectable medications
	Al-Dossary (2022)	Nursing technicians' compliance with medication safety practices, such as labeling syringes and using aseptic technique, was positively associated with patient safety culture scores
	Alkorashy & Al-Hothaly (2022)	Nursing technicians prepared, administered, and documented medications under the supervision of registered nurses, adhering to medication safety principles
Infection Prevention and Control	Aledeilah et al. (2018)	Nursing technicians and health assistants contributed to infection prevention and control practices, such as hand hygiene, personal protective equipment use, and environmental cleaning
	Alrasheadi et al. (2022)	Nursing technicians' compliance with hand hygiene and personal protective equipment use was positively associated with patients' satisfaction with the quality of care
	Al-Ahmari & Kattan (2024)	Nursing technicians' participation in infection control training and audits was associated with higher levels of work engagement and job satisfaction
Patient Education and Communication	Alghamdi et al. (2021)	Nursing technicians and health assistants provided information and instructions to patients and families, answered their questions and concerns, and promoted their engagement and self-care
	Alqahtani et al. (2022)	Nursing technicians were perceived as key members of the healthcare team who could bridge the communication gap between patients and professionals, especially for patients with low health literacy or language barriers
	Alshammari et al. (2019)	Nursing technicians and health assistants faced several barriers to nurse-patient communication, such as workload, time constraints, and lack of training, but also had opportunities to improve their communication skills and cultural competence through education and organizational support

Table 4. Facilitators and Barriers for the Optimal Utilization and Integration of Nursing Technicians and Health Assistants

Level	Study	Facilitators	Barriers
Individual	Aledeilah et al. (2018)	Adequate and consistent education and training	Lack of clinical competence and confidence
	Alghamdi et al. (2021)	Motivation and job satisfaction	Communication skills and language barriers
	Aljohani (2020)	Opportunity to learn new skills and advance careers	Lack of recognition and respect from other healthcare professionals
	Alquwez et al. (2019)	Exposure to patient safety education and training in the curriculum	Perceived lack of competence in patient safety
Organizational	Al-Ahmari & Kattan (2024)	Participation in infection control training and audits	Lack of clear job descriptions and scope of practice
	Al-Dossary (2022)	Supportive nurse work environment, including nurse-physician relations, nurse manager ability and leadership, and nurse participation in hospital affairs	Inadequate nurse staffing and skill mix
	Alhamed et al. (2023)	Teamwork and communication among healthcare professionals	Lack of supervision and feedback from registered nurses
	Alkorashy & Al-Hothaly (2022)	Professional development opportunities and career ladders	Limited resources and equipment for patient care
Systemic	Al-Dossary (2018)	National strategy for nursing education and workforce development	Lack of standardized competencies and curricula for nursing technicians and health assistants
	Albejaidi & Nair (2019)	Collaboration among healthcare, education, and regulatory sectors	Fragmented and inconsistent scope of practice regulations
	Alsufyani et al. (2020)	Alignment with Vision 2030 goals and initiatives for healthcare transformation	Lack of professional development pathways and career progression opportunities
	Gailey et al. (2021)	Needs-based projection and planning of the nursing workforce, including nursing technicians and health assistants	Limited data and research on the impact and outcomes of nursing technicians and health assistants

4. Discussion

This systematic review synthesized the evidence on the role of nursing technicians and health assistants in improving patient safety and quality of care in Saudi Arabia, and identified the facilitators and barriers for their optimal utilization and integration in the healthcare system, particularly in the context of Vision 2030. The findings revealed that nursing technicians and health assistants contributed to various aspects of patient safety and quality of care, such as direct patient care, medication management, infection prevention and control, and patient education and communication. However, the review also identified several challenges and opportunities for optimizing their role and impact, at the individual, organizational, and systemic levels.

The findings of this review are consistent with the international literature on the role of nursing support workers in improving patient safety and quality of care. Several studies have highlighted the contributions of nursing assistants, licensed practical nurses, and unlicensed assistive personnel to patient outcomes, such as reducing falls, pressure ulcers, and medication errors, and improving patient satisfaction and experience (Aiken et al., 2017; Griffiths et al., 2019; Needleman et al., 2020). Other studies have emphasized the importance of providing nursing support workers with adequate education, training, supervision, and support to ensure their competence and performance (Bates et al., 2020; Hewko et al., 2015; Traynor et al., 2015).

The review also identified several gaps and limitations in the current evidence base on nursing technicians and health assistants in Saudi Arabia. First, most of the studies were conducted in hospital settings, with limited attention to primary care, long-term care, and community settings. Second, the majority of the studies used cross-sectional designs, with few longitudinal or interventional studies to examine the impact of specific strategies or interventions

on patient safety and quality of care outcomes. Third, there was a lack of consensus and standardization in the definitions, roles, and scope of practice of nursing technicians and health assistants across different studies and settings.

The implications of this review for nursing practice, education, and policy in Saudi Arabia are significant, particularly in light of the Vision 2030 goals and the healthcare transformation initiatives. At the practice level, there is a need for developing and implementing evidence-based guidelines and protocols for the utilization and integration of nursing technicians and health assistants in different healthcare settings, based on their education, competencies, and scope of practice. There is also a need for promoting interprofessional collaboration and communication among nursing technicians, health assistants, registered nurses, and other healthcare team members, to ensure patient safety and continuity of care.

At the education level, there is a need for developing and standardizing the curriculum and training programs for nursing technicians and health assistants, based on the national and international standards for patient safety and quality of care. There is also a need for providing ongoing professional development opportunities for nursing technicians and health assistants, to enhance their knowledge, skills, and attitudes towards patient safety and quality improvement, and to support their career advancement and job satisfaction.

At the policy level, there is a need for developing a national framework for the education, regulation, and integration of nursing technicians and health assistants in the healthcare system, in collaboration with the relevant stakeholders, such as the Ministry of Health, the Saudi Commission for Health Specialties, the Saudi Patient Safety Center, and the professional nursing organizations. There is also a need for aligning the policies and strategies for nursing technicians and health assistants with the Vision 2030 goals and initiatives, such as increasing the Saudization of the nursing workforce, improving the quality and efficiency of healthcare services, and enhancing the patient experience and engagement.

The strengths of this review include the comprehensive search strategy, the inclusion of both quantitative and qualitative studies, the use of a validated quality assessment tool (MMAT), and the synthesis of findings based on a socio-ecological framework. The limitations include the potential publication and language biases, the heterogeneity of the included studies in terms of designs, participants, and outcomes, and the lack of meta-analysis due to the diversity of the outcomes and measures.

Based on the findings and limitations of this review, several recommendations can be made for future research and development on nursing technicians and health assistants in Saudi Arabia. First, there is a need for conducting more longitudinal and interventional studies to examine the impact of specific strategies or interventions, such as education and training programs, teamwork and communication protocols, and supervision and feedback models, on patient safety and quality of care outcomes. Second, there is a need for exploring the perspectives and experiences of patients, families, and other healthcare team members on the role and impact of nursing technicians and health assistants, to inform the development of patient-centered and collaborative care models. Third, there is a need for developing and validating standardized measures and indicators for assessing the performance and outcomes of nursing technicians and health assistants, based on the national and international benchmarks for patient safety and quality of care.

5. Conclusion

In conclusion, this systematic review provided a comprehensive and critical synthesis of the evidence on the role of nursing technicians and health assistants in improving patient safety and quality of care in Saudi Arabia, and identified the facilitators and barriers for their optimal utilization and integration in the healthcare system, particularly in the context of Vision 2030. The findings revealed that nursing technicians and health assistants made significant contributions to patient safety and quality of care, but also faced several challenges and opportunities for their education, regulation, and integration in the nursing workforce.

The implications of this review for nursing practice, education, and policy in Saudi Arabia are significant, and require a collaborative and strategic approach from all stakeholders, including the government, healthcare organizations, educational institutions, professional associations, and patient advocacy groups. The recommendations for future research and development on nursing technicians and health assistants in Saudi Arabia provide a roadmap for advancing the evidence base and informing the policy and practice decisions, in line with the Vision 2030 goals and the nursing profession's aspirations.

The key messages of this review are:

1. Nursing technicians and health assistants play a vital role in improving patient safety and quality of care in Saudi Arabia, through their contributions to direct patient care, medication management, infection prevention and control, and patient education and communication.

2. There are several facilitators and barriers for the optimal utilization and integration of nursing technicians and health assistants in the healthcare system, at the individual, organizational, and systemic levels, which need to be addressed through education, regulation, and policy interventions.
3. There is a need for developing a national framework for the education, regulation, and integration of nursing technicians and health assistants in the healthcare system, in collaboration with the relevant stakeholders and in alignment with the Vision 2030 goals and initiatives.
4. Further research and development are needed to advance the evidence base on nursing technicians and health assistants in Saudi Arabia, and to inform the policy and practice decisions, based on the national and international standards for patient safety and quality of care.

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