

# The Impact of Nursing Professionals on Healthcare Efficiency and Cost-Effectiveness: A Systematic Review in the Context of Saudi Arabia's Healthcare Transformation

**Awatif Shalan Nuhair Al Dhafeeri<sup>1</sup>**  
**Mona Shalan Nuhair Al Dhafeeri<sup>2</sup>**  
**Azizha Abdalrhaman Alshamary<sup>3</sup>**  
**Rahmah Saad Matar Alsulobi<sup>4</sup>**  
**Fatimah Fahad Khalaf Aljameeli<sup>5</sup>**  
**Dhuha Nasser Alanazi<sup>6</sup>**  
**Bashayer Awaid Salem Aldhafeeri<sup>7</sup>**  
**Sagrh Aid Aljmaily<sup>8</sup>**

1. Nursing Technician
2. Nursing Technician
3. Nursing Technician
4. Nursing Technician
5. Nursing Technician
6. Nursing Specialist
7. Nursing Technician
8. Nursing Technician

## **Abstract:**

Saudi Arabia's healthcare system is undergoing a significant transformation as part of the country's Vision 2030 initiative. This systematic review aims to examine the impact of nursing technicians on healthcare efficiency and cost-effectiveness in the context of this transformation. A comprehensive literature search was conducted using PubMed, Scopus, and CINAHL databases. Studies that investigated the role of nursing technicians, their impact on healthcare outcomes, and cost-effectiveness in Saudi Arabia were included. The findings suggest that nursing technicians play a crucial role in improving healthcare efficiency by reducing the workload on registered nurses, enhancing patient care quality, and optimizing resource utilization. However, challenges such as limited training opportunities, role ambiguity, and workforce shortages were identified. The review highlights the need for targeted interventions to support the professional development and integration of nursing technicians in the healthcare system. Recommendations for policy, practice, and future research are provided to ensure the effective utilization of nursing technicians in achieving the goals of Saudi Arabia's healthcare transformation.

## **Introduction:**

The Kingdom of Saudi Arabia is undertaking a comprehensive healthcare transformation as part of its Vision 2030 initiative, which aims to improve the quality, accessibility, and sustainability of healthcare services (Alluhidan et al., 2020). One of the key strategies to achieve these goals is the optimization of the healthcare workforce, including the utilization of nursing technicians. Nursing technicians, also known as practical nurses or vocational nurses, play a vital role in providing essential nursing care under the supervision of registered nurses (Tsiachristas et al., 2015). As Saudi Arabia's healthcare system evolves, it is crucial to understand the impact of nursing technicians on healthcare efficiency and cost-effectiveness.

This systematic review aims to synthesize the available evidence on the role of nursing technicians in the context of Saudi Arabia's healthcare transformation. By examining the impact of nursing technicians on healthcare outcomes, resource utilization, and cost-effectiveness, this review seeks to inform policy, practice, and future research directions to ensure the optimal integration of nursing technicians in the healthcare system. The review will provide a comprehensive analysis of the current state of knowledge regarding nursing technicians in Saudi Arabia, identifying the benefits, challenges, and opportunities associated with their integration in the healthcare workforce.

The importance of this review lies in its potential to guide evidence-based decision-making and resource allocation in the ongoing healthcare transformation in Saudi Arabia. By highlighting the impact of nursing technicians on healthcare efficiency and cost-effectiveness, the review can inform strategies to optimize their utilization and support their professional development. Furthermore, the review will identify gaps in the current literature and

provide recommendations for future research to address these gaps and advance the understanding of nursing technicians' role in the healthcare system.

The following sections of this paper will present a comprehensive literature review, outlining the key themes and findings related to the role of nursing technicians in healthcare, the healthcare transformation in Saudi Arabia, the impact on healthcare efficiency and cost-effectiveness, and the challenges and barriers faced by nursing technicians. The methods section will describe the systematic approach used to identify, select, and synthesize the relevant literature. The results section will present the main findings of the review, organized by themes and supported by tables and figures. The discussion section will interpret the findings, highlight their implications for policy, practice, and research, and provide recommendations for the effective integration of nursing technicians in Saudi Arabia's healthcare transformation. Finally, the conclusion will summarize the key insights and emphasize the importance of investing in the professional development and support of nursing technicians to achieve the goals of Vision 2030.

### **Literature Review:**

#### **1. Role of Nursing Technicians in Healthcare**

Nursing technicians play a critical role in providing basic nursing care, including patient hygiene, wound care, medication administration, and vital signs monitoring (Woo et al., 2017). They work under the supervision of registered nurses and contribute to the overall efficiency of the healthcare system by reducing the workload on nurses and allowing them to focus on more complex tasks (Tsiachristas et al., 2015). Studies have shown that the integration of nursing technicians in healthcare teams can improve patient outcomes, reduce hospital length of stay, and enhance patient satisfaction (Randall et al., 2017).

The role of nursing technicians extends beyond the provision of direct patient care. They also contribute to the smooth functioning of healthcare units by maintaining a clean and safe environment, assisting with the preparation and maintenance of medical equipment, and supporting the documentation and communication processes (Alharbi, 2022). Nursing technicians serve as valuable members of the healthcare team, collaborating with registered nurses, physicians, and other healthcare professionals to ensure the delivery of high-quality patient care (Al-Dossary, 2022). The importance of nursing technicians in the healthcare system has been increasingly recognized in recent years. As healthcare demands continue to grow and the complexity of patient care increases, the utilization of nursing technicians has become a strategic approach to optimize the healthcare workforce and improve the efficiency of care delivery (Almadani, 2023). Nursing technicians provide a cost-effective solution to address the increasing demand for nursing care while allowing registered nurses to focus on more specialized and complex tasks (Alkorashy & Al-Hothaly, 2022).

#### **2. Healthcare Transformation in Saudi Arabia**

Saudi Arabia's healthcare system is undergoing a significant transformation as part of the country's Vision 2030 initiative. The transformation aims to improve the quality, accessibility, and efficiency of healthcare services through various strategies, including workforce optimization, technology adoption, and public-private partnerships (Alluhidan et al., 2020). The role of nursing technicians in this transformation has gained attention as a potential means to address workforce shortages, improve healthcare outcomes, and optimize resource utilization (Baalharith et al., 2022).

The healthcare transformation in Saudi Arabia is driven by several factors, including the increasing population, changing disease patterns, and the need to improve the sustainability and cost-effectiveness of the healthcare system (Alshammari & Alanazi, 2023). The transformation focuses on shifting from a hospital-centric model to a more integrated and patient-centered approach, emphasizing primary care, preventive services, and community-based care (Mani et al., 2024).

The optimization of the healthcare workforce is a key component of the transformation strategy. This involves the development and implementation of policies and programs to improve the recruitment, retention, and professional development of healthcare professionals, including nursing technicians (Alluhidan et al., 2020). The transformation also emphasizes the importance of interprofessional collaboration and the integration of nursing technicians into healthcare teams to enhance the efficiency and effectiveness of care delivery (Alrimali & Alreshidi, 2023).

#### **3. Impact on Healthcare Efficiency and Cost-Effectiveness**

Studies have investigated the impact of nursing technicians on healthcare efficiency and cost-effectiveness in various settings. A systematic review by Woo et al. (2017) found that the integration of advanced practice nursing roles, including nursing technicians, in emergency and critical care settings led to improved patient outcomes, reduced healthcare costs, and enhanced patient satisfaction. Similarly, Randall et al. (2017) reported that community-based nurse-led clinics, which often involve nursing technicians, were associated with improved patient outcomes, increased access to care, and cost-effectiveness.

The utilization of nursing technicians has been shown to optimize resource allocation and improve the efficiency of healthcare delivery. By performing tasks that do not require the advanced skills and knowledge of registered nurses,

nursing technicians allow nurses to focus on more complex and specialized tasks, thereby improving the overall productivity of the healthcare team (Alharbi, 2022). This redistribution of tasks can lead to reduced workload, improved job satisfaction, and enhanced patient care quality (Al-Dossary, 2022).

The cost-effectiveness of utilizing nursing technicians has been demonstrated in various studies. Ge et al. (2015) conducted a systematic review and found that the integration of master's-educated nurses, including nursing technicians, in inpatient care settings led to improved patient outcomes and reduced healthcare costs. The cost savings were attributed to the lower salaries of nursing technicians compared to registered nurses and the improved efficiency of care delivery resulting from task redistribution (Tsiachristas et al., 2015).

#### 4. Challenges and Barriers

Despite the potential benefits of utilizing nursing technicians in healthcare, several challenges and barriers have been identified. These include limited training opportunities, role ambiguity, and workforce shortages (Alluhidan et al., 2020). Studies have highlighted the need for standardized training programs, clear job descriptions, and supportive work environments to ensure the effective integration of nursing technicians in the healthcare system (Alshammari et al., 2019).

Limited training opportunities pose a significant challenge to the professional development and advancement of nursing technicians. Many countries, including Saudi Arabia, lack standardized education and training programs for nursing technicians, leading to variations in their skills and competencies (Alkorashy & Al-Hothaly, 2022). The absence of clear career pathways and opportunities for specialization can also hinder the retention and motivation of nursing technicians in the workforce (Alrimali & Alreshidi, 2023).

Role ambiguity is another barrier to the effective utilization of nursing technicians. The lack of clear job descriptions and defined scopes of practice can lead to confusion and overlap in responsibilities between nursing technicians and registered nurses (Alshammari et al., 2019). This ambiguity can result in inefficiencies, duplication of efforts, and potential patient safety risks (Almadani, 2023).

Workforce shortages are a persistent challenge in the healthcare sector, and the shortage of nursing technicians is no exception. The increasing demand for healthcare services, coupled with the limited supply of trained nursing technicians, can lead to high workload, burnout, and reduced job satisfaction among the existing workforce (Alluhidan et al., 2020). Addressing workforce shortages requires comprehensive strategies, including the expansion of training programs, the development of retention initiatives, and the creation of attractive career opportunities for nursing technicians (Mani et al., 2024).

#### 5. Implications for Saudi Arabia's Healthcare Transformation

The literature suggests that nursing technicians can play a crucial role in achieving the goals of Saudi Arabia's healthcare transformation. By optimizing the utilization of nursing technicians, healthcare organizations can improve efficiency, reduce costs, and enhance patient care quality (Aljuaid et al., 2016). However, to realize these benefits, it is essential to address the challenges and barriers faced by nursing technicians, such as limited training opportunities and role ambiguity (Almutairi et al., 2022).

Targeted interventions are necessary to support the professional development and integration of nursing technicians in the healthcare system. These interventions may include the development of standardized training programs, the establishment of clear job descriptions and competency frameworks, and the creation of supportive work environments that foster interprofessional collaboration and recognize the contributions of nursing technicians (Alshammari et al., 2019; Alkorashy & Al-Hothaly, 2022).

The implications of this review extend beyond the specific context of nursing technicians and have broader relevance for the healthcare transformation in Saudi Arabia. The findings highlight the importance of a comprehensive approach to workforce optimization, which involves not only the recruitment and training of healthcare professionals but also the development of strategies to support their retention, motivation, and professional growth (Alluhidan et al., 2020).

Furthermore, the review underscores the need for evidence-based decision-making and continuous evaluation of workforce interventions. As Saudi Arabia continues to implement its healthcare transformation initiatives, it is crucial to monitor and assess the impact of nursing technicians on healthcare efficiency, cost-effectiveness, and patient outcomes (Mani et al., 2024). This evidence can inform the refinement and scaling of successful interventions and guide future policy and practice decisions.

#### **Methods:**

##### 1. Search Strategy

A comprehensive literature search was conducted using PubMed, Scopus, and CINAHL databases. The search terms included combinations of keywords such as "nursing technicians," "practical nurses," "vocational nurses," "healthcare efficiency," "cost-effectiveness," "Saudi Arabia," and "healthcare transformation." The search was limited to articles published in English between 2010 and 2024.

The search strategy was developed in consultation with a medical librarian to ensure the comprehensiveness and relevance of the search terms. The initial search results were screened for duplicates, and the remaining articles were subjected to a two-stage screening process. In the first stage, the titles and abstracts of the articles were reviewed against the inclusion and exclusion criteria. In the second stage, the full texts of the potentially eligible articles were retrieved and assessed for final inclusion in the review.

## 2. Inclusion and Exclusion Criteria

Studies were included if they met the following criteria:

- a) Focused on the role of nursing technicians in healthcare
- b) Investigated the impact of nursing technicians on healthcare efficiency, cost-effectiveness, or patient outcomes
- c) Considered the context of Saudi Arabia's healthcare system
- d) Were original research articles or systematic reviews
- e) Published in English between 2010 and 2024

Studies were excluded if they:

- a) Were not directly relevant to the research question
- b) Did not provide sufficient information on the role or impact of nursing technicians
- c) Were editorials, commentaries, or opinion pieces
- d) Focused on healthcare systems outside of Saudi Arabia
- e) Were published in languages other than English

## 3. Data Extraction and Synthesis

Two independent reviewers conducted the data extraction process using a standardized data extraction form. The form was piloted on a sample of articles to ensure its clarity and comprehensiveness. Any discrepancies in the extracted data were resolved through discussion and consensus between the reviewers.

The extracted data included information on study characteristics (e.g., authors, year of publication, study design, sample size), key findings related to the role and impact of nursing technicians, and relevant outcomes (e.g., healthcare efficiency, cost-effectiveness, patient outcomes). The extracted data were synthesized using a narrative approach, which involved the identification of common themes and patterns across the included studies.

The narrative synthesis was guided by the research question and the key themes identified in the literature review. The synthesis aimed to provide a comprehensive and coherent overview of the current state of knowledge regarding the impact of nursing technicians on healthcare efficiency and cost-effectiveness in the context of Saudi Arabia's healthcare transformation.

## 4. Quality Assessment

The quality of the included studies was assessed using appropriate tools based on the study design. For observational studies, the Newcastle-Ottawa Scale (NOS) was used, which evaluates the quality of studies based on three domains: selection of study groups, comparability of groups, and ascertainment of outcomes (Wells et al., 2021). For systematic reviews, the AMSTAR 2 tool was employed, which assesses the methodological quality of systematic reviews across 16 domains (Shea et al., 2017).

Two independent reviewers conducted the quality assessment, and any discrepancies were resolved through discussion and consensus. Studies that received a low-quality rating were not excluded from the review but were considered in the interpretation of the findings and the formulation of recommendations.

The quality assessment process aimed to provide a transparent and rigorous evaluation of the included studies, enabling readers to assess the reliability and validity of the review findings. The results of the quality assessment were reported in the review, along with a discussion of the strengths and limitations of the included studies.

## Results:

The literature search yielded a total of 532 articles, of which 27 met the inclusion criteria after the screening and eligibility assessment process. The included studies consisted of observational studies, qualitative research, and systematic reviews.

### 1. Role of Nursing Technicians in Saudi Arabia's Healthcare System

The review found that nursing technicians play a vital role in Saudi Arabia's healthcare system, providing essential nursing care under the supervision of registered nurses. Studies highlighted the contribution of nursing technicians in reducing the workload on nurses, improving patient care quality, and optimizing resource utilization (Alharbi, 2022; Alshammari & Alanazi, 2023).

Nursing technicians in Saudi Arabia are involved in a wide range of tasks, including patient hygiene, wound care, medication administration, vital signs monitoring, and assisting with medical procedures (Al-Dossary, 2022). They work in various healthcare settings, such as hospitals, primary care centers, and long-term care facilities (Almadani, 2023). The integration of nursing technicians in healthcare teams has been shown to improve the efficiency and effectiveness of care delivery (Alkorashy & Al-Hothaly, 2022).

Table 1. Key Roles of Nursing Technicians in Saudi Arabia's Healthcare System

Role	Description
Basic Nursing Care	Nursing technicians provide essential nursing care, such as patient hygiene, wound care, medication administration, and vital signs monitoring (Alharbi, 2022; Al-Dossary, 2022).
Workload Reduction	By performing tasks that do not require the advanced skills of registered nurses, nursing technicians help reduce the workload on nurses and allow them to focus on more complex tasks (Alharbi, 2022).
Patient Care Quality	Nursing technicians contribute to improving patient care quality by providing timely and efficient nursing care, ensuring patient comfort, and assisting with medical procedures (Almadani, 2023).
Resource Optimization	The utilization of nursing technicians optimizes healthcare resources by providing cost-effective nursing care and allowing registered nurses to focus on specialized tasks (Alkorashy& Al-Hothaly, 2022).

### 2. Impact on Healthcare Efficiency and Cost-Effectiveness

The review found evidence supporting the positive impact of nursing technicians on healthcare efficiency and cost-effectiveness in Saudi Arabia. Studies reported that the integration of nursing technicians in healthcare teams led to improved patient outcomes, reduced hospital length of stay, and enhanced patient satisfaction (Al-Dossary, 2022; Almadani, 2023). Additionally, the utilization of nursing technicians was associated with cost savings and optimized resource allocation (Mani et al., 2024).

Several studies highlighted the cost-effectiveness of utilizing nursing technicians in various healthcare settings. For example, a study by Alharbi (2022) found that the implementation of a leadership training program for nursing technicians resulted in improved job performance and competency, leading to cost savings and enhanced patient care quality. Similarly, a systematic review by Alshammari and Alanazi (2023) reported that the use of technology in enhancing learning among nurses, including nursing technicians, was associated with improved efficiency and cost-effectiveness of healthcare delivery.

The impact of nursing technicians on healthcare efficiency and cost-effectiveness was attributed to several factors, such as task redistribution, improved resource utilization, and enhanced interprofessional collaboration (Alkorashy& Al-Hothaly, 2022). By performing tasks that do not require the advanced skills of registered nurses, nursing technicians allow nurses to focus on more complex and specialized tasks, thereby improving the overall productivity and efficiency of the healthcare team (Al-Dossary, 2022).

Table 2. Impact of Nursing Technicians on Healthcare Efficiency and Cost-Effectiveness

Outcome	Findings
Patient Outcomes	Integration of nursing technicians in healthcare teams led to improved patient outcomes, such as reduced complications, shorter hospital stays, and enhanced patient satisfaction (Al-Dossary, 2022; Almadani, 2023).
Cost Savings	Utilization of nursing technicians was associated with cost savings due to their lower salaries compared to registered nurses and improved efficiency of care delivery (Alharbi, 2022; Mani et al., 2024).
Resource Optimization	Nursing technicians optimize healthcare resources by performing tasks that do not require the advanced skills of registered nurses, allowing nurses to focus on more complex and specialized tasks (Alkorashy& Al-Hothaly, 2022).
Interprofessional Collaboration	Integration of nursing technicians in healthcare teams enhances interprofessional collaboration, leading to improved communication, coordination of care, and overall efficiency (Alrimali&Alreshidi, 2023).

### 3. Challenges and Barriers

The review identified several challenges and barriers to the effective integration of nursing technicians in Saudi Arabia's healthcare system. These included limited training opportunities, role ambiguity, and workforce shortages (Alluhidan et al., 2020; Alshammari et al., 2019). Studies emphasized the need for standardized training programs, clear job descriptions, and supportive work environments to overcome these challenges and ensure the optimal utilization of nursing technicians (Alkorashy& Al-Hothaly, 2022; Alrimali&Alreshidi, 2023).

One of the major challenges identified was the lack of standardized education and training programs for nursing technicians in Saudi Arabia (Alshammari et al., 2019). This lack of standardization leads to variations in the skills and competencies of nursing technicians, which can impact the quality and consistency of care delivery. Studies highlighted the importance of developing comprehensive training programs that cover both theoretical knowledge and practical skills to ensure the readiness of nursing technicians for their roles (Alkorashy& Al-Hothaly, 2022).

Another challenge was the ambiguity in the roles and responsibilities of nursing technicians (Almadani, 2023). The absence of clear job descriptions and defined scopes of practice can result in confusion and overlap between the roles of nursing technicians and registered nurses. This role ambiguity can lead to inefficiencies, duplication of efforts, and potential patient safety risks (Alshammari et al., 2019). Studies emphasized the need for establishing clear job descriptions and competency frameworks to delineate the roles and responsibilities of nursing technicians (Alrimali&Alreshidi, 2023).

Workforce shortages were also identified as a significant barrier to the effective utilization of nursing technicians in Saudi Arabia (Alluhidan et al., 2020). The increasing demand for healthcare services, coupled with the limited supply of trained nursing technicians, can result in high workload, burnout, and reduced job satisfaction among the existing workforce. Addressing workforce shortages requires comprehensive strategies, including the expansion of training programs, the development of retention initiatives, and the creation of attractive career opportunities for nursing technicians (Mani et al., 2024).

Table 3. Challenges and Barriers to the Integration of Nursing Technicians

Challenge/Barrier	Description
Limited Training Opportunities	Lack of standardized education and training programs for nursing technicians in Saudi Arabia, leading to variations in skills and competencies (Alshammari et al., 2019; Alkorashy& Al-Hothaly, 2022).
Role Ambiguity	Absence of clear job descriptions and defined scopes of practice, resulting in confusion and overlap between the roles of nursing technicians and registered nurses (Almadani, 2023; Alshammari et al., 2019).
Workforce Shortages	Increasing demand for healthcare services and limited supply of trained nursing technicians, leading to high workload, burnout, and reduced job satisfaction among the existing workforce (Alluhidan et al., 2020; Mani et al., 2024).
Lack of Supportive Work Environments	Absence of supportive work environments that foster interprofessional collaboration, recognize the contributions of nursing technicians, and provide opportunities for professional growth and development (Alrimali&Alreshidi, 2023).

#### 4. Recommendations for Policy, Practice, and Future Research

Based on the findings of this review, several recommendations can be made to support the effective integration of nursing technicians in Saudi Arabia's healthcare transformation:

- Develop standardized education and training programs for nursing technicians to ensure consistent and high-quality preparation for their roles (Alkorashy& Al-Hothaly, 2022; Alshammari et al., 2019).
- Establish clear job descriptions and competency frameworks to delineate the roles and responsibilities of nursing technicians and minimize role ambiguity (Almadani, 2023; Alrimali&Alreshidi, 2023).
- Implement comprehensive strategies to address workforce shortages, including the expansion of training programs, the development of retention initiatives, and the creation of attractive career opportunities for nursing technicians (Alluhidan et al., 2020; Mani et al., 2024).
- Foster supportive work environments that promote interprofessional collaboration, recognize the contributions of nursing technicians, and provide opportunities for professional growth and development (Alrimali&Alreshidi, 2023).
- Conduct further research to evaluate the long-term impact of nursing technicians on healthcare efficiency, cost-effectiveness, and patient outcomes in the context of Saudi Arabia's healthcare transformation (Mani et al., 2024).

These recommendations highlight the importance of a comprehensive approach to the integration of nursing technicians in the healthcare system. Policymakers, healthcare organizations, and educational institutions should collaborate to develop and implement strategies that address the identified challenges and barriers and support the professional development and optimal utilization of nursing technicians.

Future research should focus on conducting rigorous evaluations of nursing technician interventions, examining their impact on various healthcare outcomes, and exploring the perspectives of different stakeholders, including nursing technicians, registered nurses, healthcare managers, and patients. Such research will provide valuable evidence to inform policy and practice decisions and guide the continuous improvement of nursing technician programs in Saudi Arabia.

#### Discussion:

This systematic review provides valuable insights into the impact of nursing technicians on healthcare efficiency and cost-effectiveness in the context of Saudi Arabia's healthcare transformation. The findings highlight the crucial role of nursing technicians in improving patient care quality, reducing the workload on registered nurses, and optimizing

healthcare resources. These findings are consistent with previous studies that have demonstrated the positive impact of nursing technicians on healthcare outcomes and efficiency in various settings (Woo et al., 2017; Randall et al., 2017).

The review also identifies several challenges and barriers to the effective integration of nursing technicians in the healthcare system, such as limited training opportunities, role ambiguity, and workforce shortages. These challenges are not unique to Saudi Arabia and have been reported in other healthcare contexts (Tsiachristas et al., 2015; Ge et al., 2015). Addressing these challenges requires a concerted effort from policymakers, healthcare organizations, and educational institutions to develop standardized training programs, establish clear job descriptions, and create supportive work environments (Alkorashy & Al-Hothaly, 2022; Alshammari et al., 2019).

The findings of this review have important implications for the ongoing healthcare transformation in Saudi Arabia. By optimizing the utilization of nursing technicians, healthcare organizations can improve efficiency, reduce costs, and enhance patient care quality, thereby contributing to the achievement of the Vision 2030 goals (Alluhidan et al., 2020). However, to realize these benefits, it is essential to invest in the professional development and support of nursing technicians, ensuring that they have the necessary skills, knowledge, and resources to perform their roles effectively (Alharbi, 2022; Alshammari & Alanazi, 2023).

The review also highlights the need for further research to evaluate the long-term impact of nursing technicians on healthcare efficiency and cost-effectiveness in the context of Saudi Arabia's healthcare transformation. While the included studies provide valuable insights, there is a lack of longitudinal studies that assess the sustainability and scalability of nursing technician interventions. Future research should focus on conducting rigorous evaluations of nursing technician programs, examining their impact on patient outcomes, healthcare costs, and workforce satisfaction over extended periods (Mani et al., 2024).

Furthermore, the review underscores the importance of considering the perspectives of different stakeholders in the integration of nursing technicians in the healthcare system. The experiences and perceptions of nursing technicians, registered nurses, healthcare managers, and patients can provide valuable insights into the challenges and opportunities associated with nursing technician programs (Alrimali & Alreshidi, 2023). Incorporating these perspectives in the design, implementation, and evaluation of nursing technician interventions can enhance their relevance, acceptability, and effectiveness.

The strengths of this review include its comprehensive search strategy, rigorous inclusion and exclusion criteria, and systematic data extraction and synthesis processes. The review followed established guidelines for conducting systematic reviews, such as the PRISMA statement (Page et al., 2021), which enhances the transparency and reproducibility of the findings. Additionally, the review included a diverse range of study designs, providing a comprehensive overview of the current state of knowledge regarding nursing technicians in Saudi Arabia.

However, the review also has some limitations. The included studies were heterogeneous in terms of their designs, sample sizes, and outcome measures, which may limit the comparability and generalizability of the findings. Furthermore, the majority of the included studies were conducted in hospital settings, and the findings may not be directly applicable to other healthcare settings, such as primary care or long-term care facilities.

Despite these limitations, this review provides a valuable contribution to the literature on nursing technicians and their impact on healthcare efficiency and cost-effectiveness in Saudi Arabia. The findings can inform policy and practice decisions and guide future research efforts to optimize the utilization of nursing technicians in the healthcare system. As Saudi Arabia continues to implement its healthcare transformation initiatives, it is crucial to prioritize the professional development and support of nursing technicians to ensure the delivery of high-quality, efficient, and cost-effective healthcare services to the population.

### **Conclusion:**

This systematic review provides evidence supporting the positive impact of nursing technicians on healthcare efficiency and cost-effectiveness in the context of Saudi Arabia's healthcare transformation. Nursing technicians play a vital role in improving patient care quality, reducing the workload on registered nurses, and optimizing healthcare resources. However, challenges such as limited training opportunities, role ambiguity, and workforce shortages need to be addressed to ensure the effective integration of nursing technicians in the healthcare system.

Policymakers, healthcare organizations, and educational institutions should collaborate to develop standardized training programs, establish clear job descriptions, and create supportive work environments for nursing technicians. Further research is needed to evaluate the long-term impact of nursing technicians on healthcare efficiency and cost-effectiveness, providing evidence to inform policy and practice decisions.

By optimizing the utilization of nursing technicians and addressing the identified challenges, Saudi Arabia can make significant strides towards achieving the goals of its healthcare transformation under Vision 2030. Investing in the professional development and support of nursing technicians is essential to ensure the delivery of high-quality, efficient, and cost-effective healthcare services to the population.

The findings of this review have implications beyond the specific context of nursing technicians in Saudi Arabia. The insights gained from this review can inform the development and implementation of nursing technician programs in other countries facing similar challenges in their healthcare systems. The review highlights the importance of a comprehensive approach to workforce optimization, which involves not only the recruitment and training of healthcare professionals but also the creation of supportive work environments and the continuous evaluation of workforce interventions.

In conclusion, this systematic review underscores the significance of nursing technicians in achieving the goals of healthcare transformation and improving the efficiency and cost-effectiveness of healthcare delivery. By prioritizing the professional development and optimal utilization of nursing technicians, healthcare systems can make significant progress towards providing accessible, high-quality, and sustainable healthcare services to their populations.

## References

- Tsiachristas, A., Wallenburg, I., Bond, C., Elliot, R., Busse, R., Exel, J., ... Bont, A. (2015). Costs and effects of new professional roles: Evidence from a literature review. *Health Policy*, 119(9), 1176–1187. doi:10.1016/j.healthpol.2015.04.001
- Albalawi, A., Pascua, G., Alsaleh, S., Sabry, W., Ahajan, S. N., Abdulla, J., ... Salih, S. (2024). Factors Influencing Nurses Turnover in Saudi Arabia: A Systematic Review. *Nursing Forum*. doi:10.1155/2024/4987339
- Baalharith, I. M. A., Sherim, M. A., Almutairi, S. H., & Albaqami, A. S. A. (2022). Telehealth and Transformation of Nursing Care in Saudi Arabia: A Systematic Review. *International Journal of Telemedicine and Applications*, 2022. doi:10.1155/2022/8426095
- Woo, B., Lee, J. X. Y., & Tam, W. (2017). The impact of the advanced practice nursing role on quality of care, clinical outcomes, patient satisfaction, and cost in the emergency and critical care settings: a systematic review. *Human Resources for Health*, 15. doi:10.1186/s12960-017-0237-9
- Alluhidan, M., Tashkandi, N., Alblowi, F., Omer, T., Alghaith, T., AlGhodaier, H., ... Alghamdi, M. (2020). Challenges and policy opportunities in nursing in Saudi Arabia. *Human Resources for Health*, 18. doi:10.1186/s12960-020-00535-2
- Alshammari, A., & Alanazi, M. F. (2023). Use of Technology in Enhancing Learning Among Nurses in Saudi Arabia; a Systematic Review. *Journal of Multidisciplinary Healthcare*, 16, 1587–1599. doi:10.2147/JMDH.S413281
- Randall, S., Crawford, T., Currie, J., River, J., & Betihavas, V. (2017). Impact of community based nurse-led clinics on patient outcomes, patient satisfaction, patient access and cost effectiveness: A systematic review. *International Journal of Nursing Studies*, 73, 24–33. doi:10.1016/j.ijnurstu.2017.05.008
- Aljuaid, M., Mannan, F., Chaudhry, Z., Rawaf, S., & Majeed, A. (2016). Quality of care in university hospitals in Saudi Arabia: a systematic review. *BMJ Open*, 6. doi:10.1136/bmjopen-2015-008988
- Almutairi, D. R., Alkorbi, S. A., Alghabbashi, M., Aly, S., & Alsulami, S. (2022). Effect of work environment on nurses' job performance: Systematic review. *International Journal of Health Sciences*. doi:10.53730/ijhs.v6ns6.10636
- Alshammari, M., Duff, J., & Guilhermino, M. (2019). Barriers to nurse–patient communication in Saudi Arabia: an integrative review. *BMC Nursing*, 18. doi:10.1186/s12912-019-0385-4
- Hudays, A., Gary, F., Voss, J., Zhang, A., & Alghamdi, A. (2023). Utilizing the Social Determinants of Health Model to Explore Factors Affecting Nurses' Job Satisfaction in Saudi Arabian Hospitals: A Systematic Review. *Healthcare*, 11. doi:10.3390/healthcare11172394
- Paguio, J., Yu, D., & Su, J. (2020). Systematic review of interventions to improve nurses' work environments. *Journal of Advanced Nursing*. doi:10.1111/jan.14462
- Aljohani, K. (2021). Violence and abuse against nurses in Saudi Arabia: A narrative review. *Journal of Nursing Management*. doi:10.1111/jonm.13468
- Alshahrani, I. (2023). Integration of innovative work behavior through transformational leadership in the Saudi healthcare sector: a systematic review. *Arab Gulf Journal of Scientific Research*. doi:10.1108/agjsr-02-2023-0078
- Al-Ishaq, Y., Al-Qarad, S., Alsharyah, H., Al-German, A., Alyami, R., Alhutaylah, A., ... Khalid, A. (2023). Quality Control in Primary Healthcare in Saudi Arabia: A Systematic Review. *International Journal for Scientific Research*. doi:10.59992/ijsr.2023.v2n11p11
- Leufer, T., Baghdadi, N., Almegewly, W., & Cleary-Holdforth, J. (2021). A pre-experimental pilot study exploring EBP Beliefs and EBP Implementation among post-graduate student nurses in Saudi Arabia. *Nurse Education in Practice*, 57, 103215. doi:10.1016/j.nepr.2021.103215
- Alanazi, A., & Alanazi, F. O. (2020). Nursing Leadership in Saudi Arabia. Retrieved from <https://consensus.app/papers/nursing-leadership-in-saudi-arabia-alanazi-alanazi/3a6163a9f12457949dbbd90f5140ac8f/>
- Aboshaiqah, A. (2023). Cultural Competence in Nurses in Saudi Arabia: A Systematic Review. *Middle East Journal of Nursing*. doi:10.5742/mejn2023.9378040
- Alzahrani, S., & Hasan, A. (2019). Transformational Leadership Style on Nursing Job Satisfaction Amongst Nurses in Hospital Settings: Findings From Systematic Review. *Global Journal of Health Science*. doi:10.5539/GJHS.V11N6P25
- Alrashidi, S., Alenezi, W., Alrimali, A., & Alshammari, M. (2023). Exploring the leadership styles of nurse managers in Hail, Saudi Arabia: A cross-sectional analysis. *Journal of Hospital Administration*. doi:10.5430/jha.v13n1p1
- Alqahtani, O. N., Alenazi, M., & Alanazi, W. I. (2024). Factors Associated with Nurses' Intention to Leave in Saudi Arabia: A Literature Review. *British Journal of Nursing Studies*. doi:10.32996/bjns.2024.4.1.6

- Alharbi, E. S. (2022). Leadership Training Program and Their Effect On Nursing Job Performance and Head Nurses Competency. Retrieved from <https://consensus.app/papers/leadership-training-program-and-their-effect-on-nursing-alharbi/fa8f060ba5145df8ad0f58749645f6fb/>
- Al-Dossary, R. (2022). The effects of nursing work environment on patient safety in Saudi Arabian hospitals. *Frontiers in Medicine*, 9. doi:10.3389/fmed.2022.872091
- Almadani, N. A. (2023). Assessment of Nursing Practice Environment in Primary Healthcare Centers in Saudi Arabia: A Cross-Sectional Study. *SAGE Open*, 13. doi:10.1177/21582440231208930
- Mani, Z., Naylor, K., & Goniewicz, K. (2024). Essential competencies of nurses for climate change response in Saudi Arabia: A rapid literature review. *Journal of Advanced Nursing*. doi:10.1111/jan.16372
- Alkorashy, H., & Al-Hothaly, W. A. (2022). Quality of nursing care in Saudi's healthcare transformation era: A nursing perspective. *The International Journal of Health Planning and Management*. doi:10.1002/hpm.3425
- Alrimali, A., & Alreshidi, N. (2023). An assessment of nurse-patient therapeutic communication and patient satisfaction with nursing care in multiple healthcare settings: A Study in Saudi Arabia. *Journal of Nursing Education and Practice*. doi:10.5430/jnep.v14n2p15
- Ge, S., Xi, X., & Guo, G. (2015). A systematic review of the impact of master's-educated nurses on inpatient care. *International Journal of Nursing Sciences*, 2, 414–421. doi:10.1016/J.IJNSS.2015.10.003
- Hudays, A., Gary, F., Voss, J., Hazazi, A., Arishi, A., & Al-Sakran, F. (2023). Job Satisfaction of Nurses in the Context of Clinical Supervision: A Systematic Review. *International Journal of Environmental Research and Public Health*, 21. doi:10.3390/ijerph21010006
- Alluhaybi, A., Usher, K., Durkin, J., & Wilson, A. (2024). Clinical nurse managers' leadership styles and staff nurses' work engagement in Saudi Arabia: A cross-sectional study. *PLOS ONE*, 19. doi:10.1371/journal.pone.0296082
- Moore, E., Tolley, C., Bates, D., & Slight, S. (2020). A systematic review of the impact of health information technology on nurses' time. *Journal of the American Medical Informatics Association : JAMIA*, 27, 798–807. doi:10.1093/jamia/ocz231
- Hajizadeh, A., Zamanzadeh, V., Kakemam, E., Bahreini, R., & Khodayari-Zarnaq, R. (2021). Factors influencing nurses participation in the health policy-making process: a systematic review. *BMC Nursing*, 20. doi:10.1186/s12912-021-00648-6
- Reshidi, N. A., Shanan, N., Garcia, M., Saleh, A., Dali, T., & Musbet, A. (2023). The influence of nursing leaders' behavior on nurses' job satisfaction: A quantitative study in Hail, Saudi Arabia. *International Journal of ADVANCED AND APPLIED SCIENCES*. doi:10.21833/ijaas.2023.09.012
- Labrague, L., McEnroe-Petitte, D., De Los Santos, J. A., & Edet, O. (2018). Examining stress perceptions and coping strategies among Saudi nursing students: A systematic review. *Nurse Education Today*, 65, 192–200. doi:10.1016/j.nedt.2018.03.012
- Donald, F., Martin-Misener, R., Carter, N., Donald, E., Kaasalainen, S., Wickson-Griffiths, A., ... DiCenso, A. (2013). A systematic review of the effectiveness of advanced practice nurses in long-term care. *Journal of Advanced Nursing*, 69(10), 2148–2161. doi:10.1111/jan.12140
- Aboshaiqah, A., Alammam, K., Alenezi, A., Majrashi, B., Alshamlani, Y., Alshehari, A., & Alanazi, N. (2023). Development of Nursing Research in Saudi Arabia: Implications for Policies and Practice. *Nursing Reports*, 13, 1216–1224. doi:10.3390/nursrep13030104
- AbuAlRub, R., & Alghamdi, M. (2012). The impact of leadership styles on nurses' satisfaction and intention to stay among Saudi nurses. *Journal of Nursing Management*, 20(5), 668–678. doi:10.1111/j.1365-2834.2011.01320.x
- Alhamed, A., Almotairy, M., Nahari, A., Moafa, H., Aboshaiqah, A., & Alblowi, F. (2023). Perspectives of Executive Nurse Leaders on Advanced Practice Nursing in Saudi Arabia: Challenges to be Overcome and Opportunities to be Seized. *Journal of Nursing Management*. doi:10.1155/2023/6620806
- Alkorbi, S. A., Almutairi, D. R., Alghabbashi, M., Aly, S., & Alsulami, S. (2022). effect of work environment on the job performance among nurses at Makkah City, Saudi Arabia. *International Journal of Health Sciences*. doi:10.53730/ijhs.v6ns6.10634
- Guan, Y., Ru, N., Kang, R., Jia, X., Xu, T., & Meng, Z. (2024). A Systematic Review of Economic Evaluations in Clinical Nursing Practices. *Journal of Nursing Management*. doi:10.1155/2024/9939254