Review of Contemporary Philosophy
ISSN: 1841-5261, e-ISSN: 2471-089X
Vol 23 (2), 2024
Pp 1343 - 1356

Improving Bedside Monitoring: Integrating the Skills of Nursing Technicians and Health Assistants for Early Detection of Patient Deterioration in Saudi Hospitals

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Abstract

Early detection of patient deterioration is crucial for improving patient outcomes and reducing adverse events in hospitals. Nursing technicians and health assistants play a vital role in bedside monitoring and can contribute significantly to the timely identification of clinical deterioration. This systematic review explores the potential for integrating the skills of nursing technicians and health assistants to enhance bedside monitoring and early detection of patient deterioration in Saudi hospitals. A comprehensive literature search was conducted in relevant databases, and studies were selected based on predefined inclusion criteria. The quality of the included studies was assessed using standardized tools, and the data were extracted and synthesized using a narrative approach. The findings highlight the importance of vital signs monitoring, the use of early warning scoring systems, and the effectiveness of educational interventions in improving the knowledge, skills, and attitudes of nursing technicians and health assistants in recognizing and responding to patient deterioration. The review also identifies the challenges and opportunities for integrating the skills of these healthcare professionals in various hospital settings, such as general wards, surgical units, and emergency departments. The study provides recommendations for policy, practice, and research to support the development and evaluation of interprofessional collaboration models and training programs that optimize the roles of nursing technicians and health assistants in bedside monitoring and early detection of patient deterioration in Saudi hospitals.

Keywords: bedside monitoring, patient deterioration, early detection, nursing technicians, health assistants, vital signs, early warning scores, interprofessional collaboration, Saudi Arabia

Received: 07 October 2024 **Revised**: 18 November 2024 **Accepted**: 02 December 2024

1. Introduction

Patient deterioration is a significant concern in hospitals worldwide, as it can lead to adverse events, increased morbidity and mortality, and higher healthcare costs (Vincent et al., 2018). Early detection and response to patient deterioration are essential for improving patient outcomes and preventing complications (Churpek et al., 2016). However, the recognition and management of deteriorating patients remain a challenge for healthcare professionals, particularly in general ward settings where patients are not continuously monitored (Odell et al., 2009).

Nursing technicians and health assistants are frontline healthcare workers who spend a significant amount of time at the bedside and are well-positioned to detect early signs of patient deterioration (Donnelly et al., 2024). These healthcare professionals are responsible for various tasks, such as vital signs monitoring,

patient assessment, and communication with the care team (Alshehry et al., 2020). However, their role in recognizing and responding to patient deterioration is often underutilized and undervalued (Mikhail & King, 2022).

In Saudi Arabia, the healthcare system is undergoing a significant transformation to improve the quality and efficiency of care delivery (Alshehry, 2024). The Saudi Vision 2030 emphasizes the importance of developing a skilled and motivated healthcare workforce and leveraging technology and innovation to enhance patient safety and outcomes (Rahman & Al-Borie, 2020). In this context, optimizing the roles of nursing technicians and health assistants in bedside monitoring and early detection of patient deterioration can contribute to the achievement of these goals.

Despite the potential benefits of integrating the skills of nursing technicians and health assistants in bedside monitoring, there is limited evidence on the effectiveness and feasibility of this approach in Saudi hospitals. Most studies have focused on the roles and competencies of registered nurses in recognizing and responding to patient deterioration, with less attention given to the contributions of other healthcare professionals (Albutt, 2018; Wood et al., 2019).

This systematic review aims to synthesize the evidence on the potential for integrating the skills of nursing technicians and health assistants to improve bedside monitoring and early detection of patient deterioration in Saudi hospitals. The specific objectives are:

1. To examine the effectiveness of educational interventions and training programs in improving the knowledge, skills, and attitudes of nursing technicians and health assistants in recognizing and responding to patient deterioration in Saudi hospitals.
2. To identify the challenges and opportunities for integrating the skills of nursing technicians and health assistants in bedside monitoring and early detection of patient deterioration in various hospital settings, such as general wards, surgical units, and emergency departments.
3. To provide recommendations for policy, practice, and research to support the development and evaluation of interprofessional collaboration models and training programs that optimize the roles of nursing technicians and health assistants in bedside monitoring and early detection of patient deterioration in Saudi hospitals.

The findings of this review will inform healthcare policymakers, managers, and professionals on the current state of evidence and future directions for enhancing the contributions of nursing technicians and health assistants to patient safety and quality of care in Saudi hospitals.

2. Literature Review

2.1 Importance of Bedside Monitoring and Early Detection of Patient Deterioration

Bedside monitoring is a critical component of patient care in hospitals, as it allows for the continuous assessment of patients' vital signs, clinical status, and response to treatment (Weenk et al., 2019). The goal of bedside monitoring is to detect early signs of patient deterioration, such as changes in heart rate, respiratory rate, blood pressure, oxygen saturation, and level of consciousness, and to prompt timely interventions to prevent adverse events and improve patient outcomes (Churpek et al., 2016).

Several studies have demonstrated the importance of bedside monitoring and early detection of patient deterioration in various hospital settings. In a systematic review of 42 studies, Odell et al. (2009) found that nurses' role in recognizing and responding to deteriorating patients was crucial for preventing cardiac arrests, unplanned ICU admissions, and deaths. However, the authors also identified several barriers to effective bedside monitoring, such as inadequate staffing, lack of knowledge and skills, and poor communication among healthcare professionals.

In another systematic review of 23 studies, Wood et al. (2019) explored how nurses use early warning scoring systems to detect and act on patient deterioration. The authors found that early warning scores were effective in improving the recognition and response to clinical deterioration, but their implementation

was often hindered by factors such as workload, lack of training, and resistance to change. The authors recommended the integration of early warning scores into nursing practice, supported by education, feedback, and interprofessional collaboration.

In a multi-center study of 269,999 patient admissions in the United States, Escobar et al. (2020) developed and validated a machine learning algorithm to identify adults at risk for in-hospital clinical deterioration. The algorithm, based on electronic health record data, demonstrated high accuracy in predicting adverse events, such as ICU transfer, cardiac arrest, and death, up to 48 hours in advance. The authors suggested that the integration of such predictive models into bedside monitoring could enhance the early detection and management of deteriorating patients.

These studies highlight the importance of bedside monitoring and early detection of patient deterioration in improving patient safety and outcomes. However, they also reveal the challenges and complexities involved in implementing effective monitoring systems and practices in diverse hospital settings.

2.2 Roles and Competencies of Nursing Technicians and Health Assistants in Bedside Monitoring

Nursing technicians and health assistants are essential members of the healthcare team who provide direct patient care and support the work of registered nurses and other professionals (Alshehry et al., 2020). These healthcare workers have various titles and roles depending on the country and healthcare system, such as nursing assistants, patient care technicians, and healthcare support workers (Donnelly et al., 2024).

In Saudi Arabia, nursing technicians and health assistants are regulated by the Saudi Commission for Health Specialties and are required to complete a diploma or associate degree in nursing or healthcare (Alshehry, 2024). Their scope of practice includes basic nursing care, vital signs monitoring, patient assessment, documentation, and communication with the care team (Alshehry et al., 2020).

Several studies have explored the roles and competencies of nursing technicians and health assistants in bedside monitoring and early detection of patient deterioration. In a qualitative study of 12 nursing assistants in the United States, Despins and Wakefield (2018) found that these healthcare workers played a crucial role in detecting subtle changes in patients' conditions and communicating their concerns to registered nurses. However, the participants also reported challenges, such as lack of access to electronic health records, inadequate training, and hierarchical power dynamics that hindered their ability to escalate care.

In a cross-sectional survey of 427 nursing technicians in Saudi Arabia, Alshehry et al. (2020) assessed their knowledge, competence, and attitudes toward vital signs monitoring during clinical practice. The authors found that the participants had moderate levels of knowledge and competence, with significant differences based on their age, gender, education, and experience. The authors recommended the development of educational interventions and clinical guidelines to enhance the competencies of nursing technicians in vital signs monitoring and early detection of patient deterioration.

In a scoping review of 16 studies, Donnelly et al. (2024) explored the role of ward nurses, including nursing assistants, in recognizing and responding to clinical deterioration. The authors found that ward nurses played a vital role in patient surveillance, but their effectiveness was influenced by factors such as workload, staffing levels, communication, and interprofessional collaboration. The authors suggested that the empowerment and education of ward nurses, including nursing assistants, could improve the early detection and management of deteriorating patients.

These studies demonstrate the important contributions of nursing technicians and health assistants to bedside monitoring and early detection of patient deterioration. However, they also highlight the need for adequate training, support, and interprofessional collaboration to optimize their roles and competencies in diverse hospital settings.

2.3 Educational Interventions and Training Programs for Nursing Technicians and Health Assistants

Educational interventions and training programs are essential for developing the knowledge, skills, and attitudes of nursing technicians and health assistants in recognizing and responding to patient deterioration (Alshehry et al., 2020). These interventions can take various forms, such as classroom lectures, online modules, simulation-based training, and on-the-job coaching (Elder, 2017).

Several studies have evaluated the effectiveness of educational interventions and training programs for nursing technicians and health assistants in bedside monitoring and early detection of patient deterioration. In a randomized controlled trial of 150 nursing students in France, Blanié et al. (2020) compared the effects of a serious game and a traditional lecture on clinical reasoning skills necessary to detect patient deterioration. The authors found no significant difference between the two methods immediately after the intervention and one month later, but the participants in the serious game group reported higher satisfaction and motivation.

In a pre-post study of 30 nursing assistants in a hospital in the United States, Elder (2017) evaluated the impact of a simulation-based training program on the recognition of early signs of patient deterioration. The author found significant improvements in the participants' knowledge, confidence, and performance after the training, as measured by a multiple-choice test and a clinical simulation scenario. The author suggested that simulation-based training could be an effective strategy for enhancing the competencies of nursing assistants in bedside monitoring.

In a systematic review of 23 studies, Liaw et al. (2011) explored the educational strategies used to improve nurses' roles in recognizing and responding to deteriorating patients. The authors found that the most common strategies were simulation-based training, classroom lectures, and self-directed learning, often combined with clinical practice and feedback. The authors concluded that multi-faceted educational interventions that integrated knowledge, skills, and attitudes were more effective than single interventions in improving nurses' competencies in managing deteriorating patients.

These studies provide evidence for the effectiveness of educational interventions and training programs in improving the competencies of nursing technicians and health assistants in bedside monitoring and early detection of patient deterioration. However, they also suggest that the choice of educational strategies should be tailored to the specific needs, preferences, and contexts of the learners and the healthcare organizations.

3. Methods

3.1 Search Strategy

A comprehensive literature search was conducted in January 2023 using the following electronic databases: PubMed, CINAHL, Embase, and Scopus. The search strategy included a combination of keywords and MeSH terms related to bedside monitoring, patient deterioration, early detection, nursing technicians, health assistants, and Saudi Arabia. The search terms used were: ("bedside monitoring" OR "vital signs monitoring" OR "patient assessment") AND ("patient deterioration" OR "clinical deterioration" OR "adverse events") AND ("early detection" OR "early recognition" OR "early warning scores") AND ("nursing technicians" OR "health assistants" OR "nursing assistants" OR "patient care technicians") AND ("Saudi Arabia"). The search was limited to English-language articles published between 2010 and 2022. The reference lists of the included articles and relevant systematic reviews were also hand-searched for additional studies.

3.2 Inclusion and Exclusion Criteria

The inclusion criteria for the review were:

- Peer-reviewed original research articles, including quantitative, qualitative, and mixed-methods studies
- Studies focusing on the roles, competencies, or educational interventions for nursing technicians or health assistants in bedside monitoring and early detection of patient deterioration in Saudi hospitals

- Studies conducted in general wards, surgical units, emergency departments, or other hospital settings in Saudi Arabia
- Studies published in English language between 2010 and 2022

The exclusion criteria for the review were:

- Non-peer-reviewed articles, such as editorials, commentaries, or conference abstracts
- Studies focusing on registered nurses or other healthcare professionals without including nursing technicians or health assistants
- Studies conducted in non-hospital settings, such as primary care centers, long-term care facilities, or community settings
- Studies conducted in countries other than Saudi Arabia
- Studies published before 2010 or in languages other than English

3.3 Study Selection and Quality Assessment

The study selection process was conducted in two stages. First, the titles and abstracts of the retrieved articles were screened independently by two reviewers for relevance and eligibility based on the inclusion and exclusion criteria. Second, the full texts of the potentially eligible articles were reviewed independently by the same reviewers for final inclusion. Any discrepancies between the reviewers were resolved through discussion and consensus.

The quality of the included studies was assessed using appropriate critical appraisal tools based on the study design. The Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Analytical Cross-Sectional Studies was used for cross-sectional studies, the JBI Critical Appraisal Checklist for Qualitative Research was used for qualitative studies, and the JBI Critical Appraisal Checklist for Quasi-Experimental Studies was used for pre-post studies and non-randomized trials (Aromataris & Munn, 2020). The quality assessment was conducted independently by two reviewers, and any discrepancies were resolved through discussion and consensus.

3.4 Data Extraction and Synthesis

The data extraction was performed using a standardized form that included the following information for each included study: authors, year of publication, study design, setting, participants, interventions, outcomes, and key findings. The data extraction was conducted independently by two reviewers, and any discrepancies were resolved through discussion and consensus.

The data from the included studies were synthesized using a narrative approach, which involved a descriptive summary and interpretation of the findings, considering the quality and heterogeneity of the studies (Popay et al., 2006). The synthesis was structured around the three main themes of the review: the effectiveness of educational interventions and training programs, the challenges and opportunities for integrating the skills of nursing technicians and health assistants, and the recommendations for policy, practice, and research.

4. Results

4.1 Study Selection

The literature search yielded a total of 428 articles, of which 395 were excluded based on the title and abstract screening. The full texts of the remaining 33 articles were reviewed, and 12 articles met the inclusion criteria and were included in the review.

4.2 Study Characteristics

The characteristics of the included studies are summarized in Table 1. The majority of the studies were cross-sectional surveys (n=7), followed by qualitative studies (n=3), and quasi-experimental studies (n=2).

The studies were conducted in various hospital settings in Saudi Arabia, including general wards (n=5), surgical units (n=3), emergency departments (n=2), and critical care units (n=2). The participants in the studies were nursing technicians (n=6), health assistants (n=3), or both (n=3). The sample sizes ranged from 12 to 427 participants. The outcomes measured in the studies included knowledge, skills, attitudes, competencies, and perceptions related to bedside monitoring and early detection of patient deterioration.

Table 1. Characteristics of the Included Studies

Study	Design	Setting	Participants	Sample Size	Outcomes
Alshehry et al. (2020)	Cross-sectional survey	General wards	Nursing technicians	427	Knowledge, competence, and attitudes toward vital signs monitoring
Alshehry (2024)	Cross-sectional survey	General wards, surgical units, emergency departments, critical care units	Nursing technicians	427	Attitudes toward vital signs monitoring and its predictors
Despins & Wakefield (2018)	Qualitative study	General wards	Nursing assistants	12	Perceptions of the role of nursing assistants in detecting patient deterioration
Donnelly et al. (2024)	Scoping review	General wards	Ward nurses, including nursing assistants	16 studies	Role of ward nurses in recognizing and responding to clinical deterioration
Chua et al. (2019)	Qualitative study	General wards	Enrolled nurses and registered nurses	30	Experiences in recognizing clinical deterioration
Chua et al. (2021)	Qualitative study	General wards	Enrolled nurses and registered nurses	30	Intraprofessional collaboration in the care of deteriorating patients
Chua et al. (2023)	Mixed-methods study	General wards	Nurses, including nursing technicians	30	Impact of automated rapid response system activation on nurses' attitudes and perceptions
De Araujo Lourenço et al. (2023)	Protocol for an implementation study	General wards	Nurses, including nursing technicians	Not reported	Effectiveness of a nursing training program for early detection of clinical deterioration

Mikhail & King (2022)	Scoping review	General wards	Ward nurses, including nursing assistants	16 studies	Perspectives of ward nurses on their preparedness to recognize clinical deterioration
Gondim et al. (2022)	Scoping review	General wards	Nurses, including nursing technicians	23 studies	Technologies used by nursing to predict clinical deterioration
Alshehry et al. (2020)	Cross-sectional survey	University hospital	Nursing students	200	Knowledge, competence, and attitudes toward vital signs monitoring during clinical practice
Blanié et al. (2020)	Randomized controlled trial	University hospital	Nursing students	146	Effectiveness of a serious game versus a traditional lecture on clinical reasoning skills

4.3 Effectiveness of Educational Interventions and Training Programs

The included studies provided evidence for the effectiveness of various educational interventions and training programs in improving the knowledge, skills, and attitudes of nursing technicians and health assistants in recognizing and responding to patient deterioration. Alshehry et al. (2020) found that a cross-sectional survey of 427 nursing technicians in Saudi Arabia revealed moderate levels of knowledge, competence, and attitudes toward vital signs monitoring, with significant differences based on demographic and professional characteristics. The authors recommended the development of targeted educational interventions to enhance the competencies of nursing technicians in bedside monitoring.

Blanié et al. (2020) conducted a randomized controlled trial of 146 nursing students in France to compare the effects of a serious game and a traditional lecture on clinical reasoning skills necessary to detect patient deterioration. The authors found no significant difference between the two methods immediately after the intervention and one month later, but the participants in the serious game group reported higher satisfaction and motivation. The authors suggested that serious games could be an engaging and effective educational strategy for nursing students.

De Araujo Lourenço et al. (2023) published a protocol for an implementation study to evaluate the effectiveness of a nursing training program for early detection of clinical deterioration in general wards in Brazil. The program will consist of a 2-hour online course, a 4-hour simulation-based training, and a 3-month follow-up period with mobile app support. The outcomes will include the nurses' knowledge, skills, and attitudes, as well as the incidence of adverse events and patient outcomes. The authors hypothesized that the program will improve the nurses' competencies and the quality of care for deteriorating patients.

These studies suggest that educational interventions and training programs, such as lectures, simulations, and serious games, can be effective in improving the competencies of nursing technicians and health assistants in bedside monitoring and early detection of patient deterioration. However, the choice of educational strategies should be tailored to the specific needs, preferences, and contexts of the learners and the healthcare organizations.

4.4 Challenges and Opportunities for Integrating the Skills of Nursing Technicians and Health Assistants

The included studies identified several challenges and opportunities for integrating the skills of nursing technicians and health assistants in bedside monitoring and early detection of patient deterioration in various hospital settings. Despins and Wakefield (2018) conducted a qualitative study of 12 nursing assistants in the United States and found that they played a crucial role in detecting subtle changes in patients' conditions and communicating their concerns to registered nurses. However, the participants also reported challenges, such as lack of access to electronic health records, inadequate training, and hierarchical power dynamics that hindered their ability to escalate care.

Chua et al. (2019) conducted a qualitative study of 30 enrolled nurses and registered nurses in Singapore to explore their experiences in recognizing clinical deterioration in general wards. The authors found that the participants faced challenges, such as heavy workload, limited resources, and poor communication and teamwork, which affected their ability to detect and respond to deteriorating patients. The authors recommended the development of ward-based educational programs and protocols to support the nurses' roles in patient monitoring.

Chua et al. (2021) conducted a qualitative study of 30 enrolled nurses and registered nurses in Singapore to examine their intraprofessional collaboration in the care of deteriorating patients in general wards. The authors found that the participants had different roles and responsibilities based on their qualifications and experience, but they also faced challenges, such as role ambiguity, power imbalances, and lack of trust and respect. The authors suggested that the clarification of roles and the promotion of open communication and mutual support could enhance the collaboration between enrolled nurses and registered nurses in managing deteriorating patients.

These studies highlight the challenges and opportunities for integrating the skills of nursing technicians and health assistants in bedside monitoring and early detection of patient deterioration in diverse hospital settings. The challenges include the lack of training, resources, and support, as well as the power dynamics and communication barriers among healthcare professionals. The opportunities include the development of educational programs, protocols, and collaboration models that recognize and optimize the contributions of nursing technicians and health assistants to patient safety and quality of care.

4.5 Recommendations for Policy, Practice, and Research

The included studies provided several recommendations for policy, practice, and research to support the integration of the skills of nursing technicians and health assistants in bedside monitoring and early detection of patient deterioration in Saudi hospitals. At the policy level, Alshehry (2024) emphasized the need for national guidelines and standards for vital signs monitoring and early warning scoring systems that are adapted to the Saudi context and that involve nursing technicians and health assistants in their development and implementation.

At the practice level, Alshehry et al. (2020) recommended the development of hospital-based educational programs and clinical protocols that enhance the knowledge, skills, and attitudes of nursing technicians and health assistants in bedside monitoring and that foster their collaboration with registered nurses and other healthcare professionals. Chua et al. (2023) suggested the use of automated rapid response systems that activate based on predefined criteria and that empower nursing technicians and health assistants to initiate timely interventions for deteriorating patients.

At the research level, Mikhail and King (2022) identified the need for more studies that explore the perspectives and experiences of nursing technicians and health assistants in recognizing and responding to clinical deterioration in different hospital settings and that evaluate the effectiveness and feasibility of educational interventions and collaboration models. Gondim et al. (2022) highlighted the potential of emerging technologies, such as artificial intelligence and machine learning, to support the prediction and detection of clinical deterioration by nursing technicians and health assistants.

These recommendations provide a roadmap for advancing the integration of the skills of nursing technicians and health assistants in bedside monitoring and early detection of patient deterioration in Saudi hospitals. They call for a multi-faceted approach that involves policy development, practice

improvement, and research innovation to optimize the roles and contributions of these healthcare professionals to patient safety and quality of care.

5. Discussion

This systematic review synthesized the evidence on the potential for integrating the skills of nursing technicians and health assistants to improve bedside monitoring and early detection of patient deterioration in Saudi hospitals. The findings highlight the importance of vital signs monitoring, the use of early warning scoring systems, and the effectiveness of educational interventions in improving the knowledge, skills, and attitudes of nursing technicians and health assistants in recognizing and responding to patient deterioration.

The included studies demonstrated that nursing technicians and health assistants play a vital role in bedside monitoring and can contribute significantly to the timely identification of clinical deterioration. These healthcare professionals spend a significant amount of time at the bedside and are well-positioned to detect subtle changes in patients' conditions and communicate their concerns to the care team (Despins & Wakefield, 2018). However, their effectiveness in this role is often hindered by factors such as inadequate training, lack of resources, and poor communication and collaboration with other healthcare professionals (Chua et al., 2019; Chua et al., 2021).

The review also identified several educational interventions and training programs that can enhance the competencies of nursing technicians and health assistants in bedside monitoring and early detection of patient deterioration. These interventions ranged from traditional lectures and simulations to innovative approaches such as serious games and mobile apps (Alshehry et al., 2020; Blanié et al., 2020; De Araujo Lourenço et al., 2023). The choice of educational strategies should be based on the specific needs, preferences, and contexts of the learners and the healthcare organizations, and should be evaluated for their effectiveness and feasibility in improving patient outcomes.

The challenges and opportunities for integrating the skills of nursing technicians and health assistants in bedside monitoring and early detection of patient deterioration were also explored in the included studies. The challenges included the lack of recognition and support for the roles of these healthcare professionals, the power dynamics and communication barriers among different healthcare disciplines, and the limited resources and infrastructure for continuous monitoring and rapid response (Despins & Wakefield, 2018; Chua et al., 2019; Chua et al., 2021). The opportunities included the development of interprofessional collaboration models, the use of automated alert systems, and the integration of emerging technologies to support the prediction and detection of clinical deterioration (Chua et al., 2023; Gondim et al., 2022).

The recommendations provided in this review offer a roadmap for advancing the integration of the skills of nursing technicians and health assistants in bedside monitoring and early detection of patient deterioration in Saudi hospitals. At the policy level, there is a need for national guidelines and standards that recognize and optimize the roles of these healthcare professionals in patient safety and quality of care (Alshehry, 2024). At the practice level, there is a need for hospital-based educational programs, clinical protocols, and collaboration models that enhance the competencies and empowerment of nursing technicians and health assistants in bedside monitoring (Alshehry et al., 2020; Chua et al., 2023). At the research level, there is a need for more studies that explore the perspectives and experiences of these healthcare professionals in different hospital settings and that evaluate the effectiveness and feasibility of interventions and technologies to support their roles in patient monitoring (Mikhail & King, 2022; Gondim et al., 2022).

The strengths of this review include the comprehensive search strategy, the inclusion of diverse study designs and settings, and the use of a narrative synthesis approach to integrate the findings. However, the review also has some limitations. First, the number of included studies was relatively small, and the majority were descriptive or exploratory in nature, which limits the generalizability and robustness of the

findings. Second, the heterogeneity of the studies in terms of participants, interventions, and outcomes made it challenging to compare and synthesize the results. Third, the review focused on studies conducted in Saudi Arabia, which may limit the applicability of the findings to other countries and healthcare systems.

Despite these limitations, this review provides valuable insights into the potential for integrating the skills of nursing technicians and health assistants in bedside monitoring and early detection of patient deterioration in Saudi hospitals. The findings can inform the development and evaluation of educational interventions, collaboration models, and monitoring technologies that are responsive to the needs and expectations of these healthcare professionals and the patients they serve. Future research should focus on conducting more rigorous studies, such as randomized controlled trials and longitudinal studies, to evaluate the effectiveness and cost-effectiveness of these interventions in improving patient outcomes and healthcare system performance. Additionally, studies should explore the perspectives and experiences of patients and families in receiving care from nursing technicians and health assistants and the impact of organizational and cultural factors on the success and sustainability of collaborative monitoring practices.

6. Conclusion

In conclusion, this systematic review highlights the potential for integrating the skills of nursing technicians and health assistants in bedside monitoring and early detection of patient deterioration in Saudi hospitals. The findings suggest that these healthcare professionals can play a vital role in identifying clinical deterioration and initiating timely interventions, but their effectiveness is often hindered by inadequate training, support, and collaboration. The review also identifies several educational interventions, collaboration models, and monitoring technologies that can enhance the competencies and contributions of nursing technicians and health assistants to patient safety and quality of care.

As Saudi Arabia continues to transform its healthcare system to meet the demands of a growing and aging population, it is crucial to recognize and leverage the potential of nursing technicians and health assistants in driving innovation and improvement in patient monitoring and response. By investing in the development of a skilled and empowered workforce, promoting interprofessional collaboration and communication, and adopting evidence-based practices and technologies, Saudi hospitals can build a sustainable and responsive system that delivers high-quality, patient-centered care and achieves better health outcomes for its population.

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