SYSTEMATIC REVIEW

Enhancing Hand Hygiene Compliance among ICU and NICU Visitor Families: The Impact of Advanced Nursing Roles, the Barriers and Challenges: A Review.

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Abstract
Proper hand hygiene is crucial for preventing,, infections in intensive care units (ICUs) and neonatal intensive care units (NICUs). Despite the awareness among healthcare personnel and visitors of its importance, compliance with regulations is often inadequate. Advanced nurse educators and infection control professionals can significantly improve these habits. This review investigates whether advanced nursing positions improve hand hygiene among ICU and NICU families, as well as visitors, focusing on enhancing hand hygiene programs, identifying effective solutions, recognising practice shortcomings, and providing recommendations. The methodology involved a search of databases, including PubMed, CINAHL, Scopus, and Google Scholar, using relevant keywords related to hand hygiene and advanced nursing roles. The analysis included research on visitor hand hygiene in ICUs and NICUs, specifically focusing on advanced nursing responsibilities. Only articles published in English were selected. Out of the initial 1,430 articles, 36 met the inclusion criteria. The study found that advanced nurse roles had a positive effect on hand hygiene adherence in the ICU and NICU. Effective strategies included educational programs, proactive engagement, and regular follow-up. Challenges, such as nurse workloads, were also identified. Continuous training, family involvement, and infection control programs were highlighted as important for improving hand hygiene behaviours. Through structured programmes and education, as well as advanced nursing roles, nurses can significantly lower infection rates and improve patient outcomes. To improve hand hygiene in critical care, comprehensive interventions, and strong leadership should be prioritised.

Keywords: *Advanced Nursing Roles, Hand Hygiene Compliance, ICU and NICU, Infection Control, Visitor Education*

Introduction

Hand hygiene is a critical component in preventing healthcare-associated infections (HAIs), particularly in high-risk areas such as Intensive Care Units (ICUs) and Neonatal Intensive Care Units (NICUs) [1]. These units house patients who are extremely vulnerable to infections due to their compromised health conditions. Despite the well-documented importance of hand hygiene, compliance rates among healthcare workers and visitors often remain suboptimal. This underscores the need for effective strategies to enhance hand hygiene practices [1].

Nurses play an integral role in healthcare settings, not only providing direct patient care but also acting as educators and role models for other healthcare staff and visitors. Advanced nursing roles, including those of nurse educators, infection control specialists, and clinical nurse leaders, have been increasingly recognized for their potential to influence hand hygiene behaviours positively [2]. Through educational interventions, monitoring and feedback, and the implementation of evidence-based practices, nurses can significantly enhance hand hygiene competence among healthcare workers and visitors alike [3-4].

The objective of this review is to examine the impact of advanced nursing roles on enhancing hand hygiene competence among families visiting patients in ICU and NICU settings. By synthesizing findings from previous research, this review aims to highlight effective strategies employed by nurses, identify gaps in current practices, and provide recommendations for future initiatives.

Methodology

Literature search and selection criteria

To ensure a comprehensive review of the impact of advanced nursing roles on enhancing hand hygiene competence among ICU and NICU visitor families, a systematic literature search was conducted. The search aimed to identify relevant studies published in peer-reviewed journals.

Search Strategy

The literature search was conducted using several electronic databases, including PubMed, CINAHL, Scopus, and Google Scholar. The search terms included combinations of the following keywords: "hand hygiene," "ICU," "NICU," "nurse," "advanced nursing roles," "infection control," "visitor education," and "hand hygiene compliance." Boolean operators (AND, OR) were used to refine the search results and ensure a broad yet focused retrieval of relevant literature.

Inclusion Criteria

This review focuses on studies examining hand hygiene practices among visitors, family members, and relatives in ICU settings. Specifically, it investigates the contributions of nurses, particularly those in advanced roles such as nurse educators, infection control specialists, and clinical nurse leaders. To be included in this review, studies must examine visitor hand hygiene practices. They could use various research methodologies, including quantitative or qualitative approaches like randomised controlled trials, observational studies, and descriptive studies. Only studies published in English were considered.

Exclusion Criteria

Studies were excluded if they did not focus on hand hygiene or were unrelated to ICU/NICU settings. In addition, studies that only focused on healthcare workers' hand hygiene practices without involving visitor families were also excluded. Furthermore, non-peer-reviewed articles, such as conference abstracts, opinion pieces, and editorials, were excluded as well.

Selection Process

The initial search yielded 1,430 articles. After removing duplicates, 100 articles remained. The titles and abstracts of these articles were screened for relevance, resulting in 215 articles deemed eligible for full-text review. The PRISMA chart results indicate that 36 articles constituted the

final review following a thorough evaluation of the full texts.

Data Extraction and Analysis

Data from the selected studies were extracted using a standardized literature review matrix form. This form captured key information, including study design, sample size, intervention details, outcomes measured, and key findings. The extracted data were then analysed to identify common themes, effective strategies, and gaps in the literature. This systematic approach to literature search and selection ensured that the review included high-quality studies that provide valuable insights into the impact of advanced nursing roles on enhancing hand hygiene competence among families visiting ICUs.

Results

The review identified four key themes which are: 1) the impact of advanced nurse roles on hand hygiene compliance, 2) the engagement of relatives, visitors, and families in hand hygiene and infection prevention in ICUs, 3) barriers to hand hygiene compliance and 4) nurse-led interventions and structured programmes. These themes highlight the critical areas where hand hygiene practices can be improved and the importance of nursing leadership in promoting compliance.

The impact of advanced nurse roles on hand hygiene compliance

The impact of advanced nursing roles on enhancing hand hygiene competence among families visiting ICUs is a critical aspect of healthcare. Nurses play a crucial role in influencing hand hygiene practices among staff and visitors, which ultimately affects patient safety and infection control [5]. Research has shown that a high nursing workload is associated with poor adherence to hand hygiene, emphasizing the need for effective management strategies to support nurses in maintaining proper hand hygiene practices [6]. Additionally, the knowledge, attitudes, and practices of hand hygiene among nursing students are essential. They represent the future nursing workforce, and their training significantly influences their future hand hygiene practices [7-8].

The engagement of relatives, visitors, and families in hand hygiene and infection prevention in ICUs

In addition, patient involvement in promoting hand hygiene among nurses is vital. Patient engagement can have a positive impact on nurses' adherence to hand hygiene protocols [9]. In the context of NICUs, Family-Centered Care has been found to influence clinician-parent collaborations and shape the culture within NICUs, highlighting the importance of involving families in promoting hand hygiene practices [10-11]. Furthermore, the implementation of infection control link nurse programs has proven effective in improving compliance with hand hygiene among nurses, underscoring the significance of structured programs in enhancing hand hygiene practices [12-13].

Barriers to hand hygiene compliance

It is important to consider the barriers that nursing staff face when it comes to hand hygiene performance. Addressing these barriers is crucial for improving hand hygiene practices [14]. Furthermore, research has shown that multimodal interventions are effective in increasing nursing students' adherence to hand hygiene. This highlights the value of comprehensive approaches in promoting proper hand hygiene practices [15]. Additionally, the impact of hospital design and unit admission on staff, family, and patient satisfaction emphasizes the need for a holistic approach to promoting hand hygiene within healthcare facilities [16-17].

Nurse-led interventions and structured programmes

Advanced nursing roles play a crucial role in improving hand hygiene practices among ICU and NICU visitor families. Studies have

demonstrated that interventions such as interactive training in small groups [18] and implementing infection control link nurse programs and educational interventions significantly enhance hand hygiene practices among healthcare workers [19]. These interventions typically involve multifaceted approaches, including role modelling, in-service training, and implementing the WHO's Multimodal Hand Hygiene Improvement Strategy [11-12]. Immediate verbal feedback, continuous monitoring, and providing feedback have also been identified as effective strategies for improving hand hygiene compliance [20-21]. Factors that influence the sustainability of hand hygiene adherence include strong leadership, collaboration, and proactive education by healthcare professionals [22]. Context-based multimodal interventions are recommended for improving hand hygiene adherence among nursing students [14]. Educational interventions and continuous training are crucial for enhancing hand hygiene practices among healthcare workers and visitors, ultimately reducing the risk of healthcare-associated infections [23-24].

Discussion

Impact of advanced nurse roles on hand hygiene compliance

Nurses are crucial in influencing hand hygiene practices among staff and visitors, which has important implications for patient safety and infection control [4]. Research consistently shows that a heavy nursing workload is associated with poor adherence to hand hygiene, highlighting the need for effective management strategies to support nurses in maintaining proper hand hygiene practices [5]. It is also important to consider the knowledge, attitudes, and practices of hand hygiene among nursing students, as they represent the future nursing workforce, and their training significantly impacts their hand hygiene practices [6-7].

Advanced nurse roles are essential in promoting hand hygiene compliance among patients' relatives, family members, and visitors in ICUs. These roles involve implementing structured programs, educational initiatives, and active engagement strategies to enhance infection prevention practices. Involving patients and family members in infection control through education and participation has been proven effective in preventing the transmission of healthcare-associated infections [25].

Additionally, using theoretical models to study hand hygiene behaviour among hospital patients and visitors has resulted in positive outcomes, such as a reduction in infections like methicillin-resistant *Staphylococcus aureus* (MRSA) [26].

Moreover, involving carers in hand hygiene compliance is recognised as a crucial aspect of infection control in healthcare settings [27]. Educating parents and caregivers about the importance of hand hygiene practices can significantly impact compliance rates and help reduce the risk of healthcare-associated infections [28]. Additionally, empowering patients through active participation in infection control measures has been shown to improve adherence to hygiene standards and enhance patient safety [29].

Furthermore, the use of persuasive messaging and newly implemented system interventions has proven effective in enhancing handwashing compliance among visitors in hospital settings. This underscores the essential role of hand hygiene in infection control [26]. Research has also identified key factors that predict compliance with hand hygiene practices, including effective communication from hospital management, peer performance, and stress reduction. These factors can significantly impact overall compliance rates among healthcare workers and visitors in intensive care units (ICUs) [2]. In conclusion, the impact of advanced nurse roles on hand hygiene compliance among patients' relatives, family members, and visitors in ICUs is significant. By implementing structured programs, educational initiatives, and active engagement strategies, healthcare facilities can enhance infection prevention practices, reduce the risk of healthcare-associated infections, and create a

safer healthcare environment for everyone involved.

Relatives, visitors and family engagement in hand hygiene and infection prevention in ICUs

The role of patient involvement in promoting hand hygiene among nurses is extremely important. Patient engagement has the potential to positively impact nurses' adherence to hand hygiene protocols [8]. In neonatal intensive care units (NICUs), Family-Centered Care has been found to influence collaborations between clinicians and parents and shape the culture within NICUs, highlighting the significance of involving families in promoting hand hygiene practices [9].

Engaging relatives, visitors, and families in hand hygiene and infection prevention practices in intensive care units (ICUs) is critical for maintaining a safe healthcare environment. Hand hygiene compliance is a fundamental aspect of infection control, especially in ICUs where patients are vulnerable to healthcare-associated infections (HAIs) [30]. Hospital infections pose a significant risk in healthcare settings, and hand hygiene serves as the primary measure to control the transmission of these infections [30]. Implementing structured programmes that emphasize the importance of hand hygiene can significantly contribute to reducing pathogen transmission and preventing HAIs [31].

Educational initiatives play a vital role in promoting hand hygiene compliance among healthcare workers and visitors. Knowledge, attitude, and practice regarding hand hygiene are essential components in preventing and reducing HAIs [32]. Involving healthcare professional students and workers in educational programmes can deepen their understanding of the importance of hand hygiene in preventing infections. [33]. Additionally, interventions such as infection control procedures and practices, including hand hygiene between patients and before entering ICUs, are essential to minimize the transmission of infections [34].

Furthermore, patient and family engagement in safety practices, including hand hygiene, is advocated to ensure a Patient-Centered Care approach to care [35]. Providing education to parents on the importance of hand hygiene can empower them to advocate for infection prevention measures in healthcare settings [28]. Flexible visitation policies supported by family education can also contribute to reducing anxiety among family members while promoting adherence to infection control practices in ICUs [36]. In conclusion, promoting hand hygiene compliance among relatives, visitors, and families in ICUs through educational initiatives, structured programs, and active engagement is crucial for preventing healthcare-associated infections and creating a safe healthcare environment.

Nurse-Led interventions and structured programmes

The implementation of infection control link nurse programmes has been shown to effectively enhance nurses' compliance with hand hygiene, highlighting the importance of structured programs in improving hand hygiene practices [12–13]. Additionally, multimodal interventions are effective in promoting nursing students' adherence to hand hygiene, emphasising the need for comprehensive approaches [15].

Nurse-led interventions and structured programmes are essential for promoting hand hygiene and infection prevention among relatives, family members, and visitors in ICUs. These interventions are critical for improving compliance with hand hygiene guidelines and reducing the risk of healthcare-associated infections. Educational interventions, such as providing nursing students with comprehensive knowledge of hand hygiene procedures and continuous evaluation, have been proven effective in enhancing infection prevention practices [38].

The implementation of infection control link nurse programmes has been identified as an effective strategy for improving compliance with

standard precautions and hand hygiene among healthcare workers, including nurses [12]. These programmes involve multifaceted interventions, such as adopting the World Health Organisation's Multimodal Hand Hygiene Improvement Strategy, modelling proper hand hygiene practices, and providing in-service training on hand hygiene [12]. Nurse-led educational interventions have also been shown to enhance nurses' knowledge, attitude, and adherence to hand hygiene practices in ICUs [18]. Furthermore, environmental factors play a significant role in hand hygiene compliance. Studies have emphasized the importance of factors such as the availability and accessibility of washbasins and alcohol-based hand rubs in influencing hand hygiene compliance among healthcare workers and visitors in ICUs [39]. In addition, the use of technology, such as Internet of Things management systems, can contribute to improving hand hygiene compliance in healthcare settings [40]. In conclusion, nurse-led interventions, structured programmes, and educational initiatives are crucial components in promoting hand hygiene and infection prevention among relatives, family members, and visitors in ICUs. By implementing these strategies, healthcare facilities can improve compliance with hand hygiene guidelines, reduce the risk of healthcare-associated infections, and create a safer environment for patients, visitors, and healthcare workers.

Barriers to Hand Hygiene Compliance

Barriers to hand hygiene compliance among relatives and family members in intensive care units (ICUs) are multifaceted and can significantly impact infection control practices. Numerous studies have identified various obstacles that contribute to subpar hand hygiene compliance in healthcare settings. These barriers include limited resources, patient overcrowding, staff shortages, allergic reactions to hand sanitisers, lack of awareness and knowledge, failure to recognise hand hygiene opportunities during patient care, and environmental constraints [10, 41, 13]. The COVID-19 pandemic has also influenced hand hygiene behaviours among healthcare workers, potentially affecting the compliance of family members and visitors in adhering to hand hygiene protocols [42]. Despite efforts to improve hand hygiene compliance, studies have shown that rates remain relatively low in ICUs [43].

Additionally, factors such as forgetfulness, lack of focus, and prioritisation of other tasks have been identified as significant obstacles to adequate hand hygiene practices in hospitals [26]. Environmental factors, including the availability and accessibility of washbasins and alcohol-based hand rubs, also play a pivotal role in shaping hand hygiene compliance among healthcare workers and visitors in ICUs [39]. It is crucial to address the barriers to hand hygiene performance among nursing staff as well, as this is integral to improving hand hygiene practices [14]. Furthermore, the impact of hospital design and unit admission on the satisfaction of staff, family, and patients underscores the need for a comprehensive approach to promoting hand hygiene within healthcare facilities [16-17]. In summary, effectively addressing these barriers through targeted interventions, education, and enhancement of environmental resources is essential for bolstering hand hygiene compliance among relatives and family members in ICUs, thereby reducing the risk of healthcare-associated infections.

Challenges and Limitations in hand hygiene practices

Nurses have a critical role in influencing hand hygiene practices among staff and visitors. This role has a significant impact on patient safety and infection control [5]. However, due to heavy nursing workloads, there is often a decrease in adherence to hand hygiene protocols [6]. This highlights the need for effective management strategies and support systems to help nurses maintain proper hand hygiene practices while managing their demanding responsibilities. Additionally, it is crucial to prioritise the

education and training of nursing students, as they are the future workforce whose practices will shape infection prevention efforts [7-8].

Recommendations

To address the urgent need for improved hand hygiene compliance among healthcare professionals, particularly nurses, current literature offers several strategic recommendations. Firstly, nursing education programmes should be enhanced by incorporating evidence-based curricula that provide comprehensive training in hand hygiene protocols and infection prevention strategies. Including practical demonstrations and simulations will reinforce the application of theoretical knowledge. Secondly, fostering interprofessional education initiatives between nursing and allied healthcare disciplines is essential for promoting a holistic approach to infection control. Collaborative efforts, such as interdisciplinary simulations and team-based learning activities focused on hand hygiene practices, can facilitate this synergy. Thirdly, continuous professional development programmes are crucial for keeping nurses updated on evolving best practices and technological advancements in infection prevention. Workshops, webinars, and online courses covering emerging topics, such as new hand hygiene products and strategies for mitigating healthcare-associated infections, should be included in these programmes.

Additionally, healthcare organisations must prioritise supportive work environments by implementing effective workload management strategies and ensuring the availability of hand hygiene resources throughout patient care areas. Leadership commitment to infection control, along with clear accountability mechanisms and regular performance evaluations, plays a pivotal role in fostering a culture of hand hygiene compliance among healthcare professionals.

Conclusion

Advanced nursing roles play a pivotal part in enhancing hand hygiene competence among family visitors in the ICU and NICU. This review aims to evaluate whether advanced nursing positions contribute to improved hand hygiene practices within these groups, focusing on the development and enhancement of hand hygiene programmes. It also seeks to identify effective strategies, address existing practice shortcomings, and provide actionable recommendations. By prioritising evidence-based education, fostering interdisciplinary collaboration, and promoting continuous professional development, healthcare facilities can overcome challenges such as resource limitations and environmental constraints. These efforts are crucial for cultivating a robust culture of infection prevention, ultimately leading to improved patient well-being and enhanced healthcare outcomes.

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SAAB wrote the manuscript, and conduct data collection.
KTA review of the manuscript.
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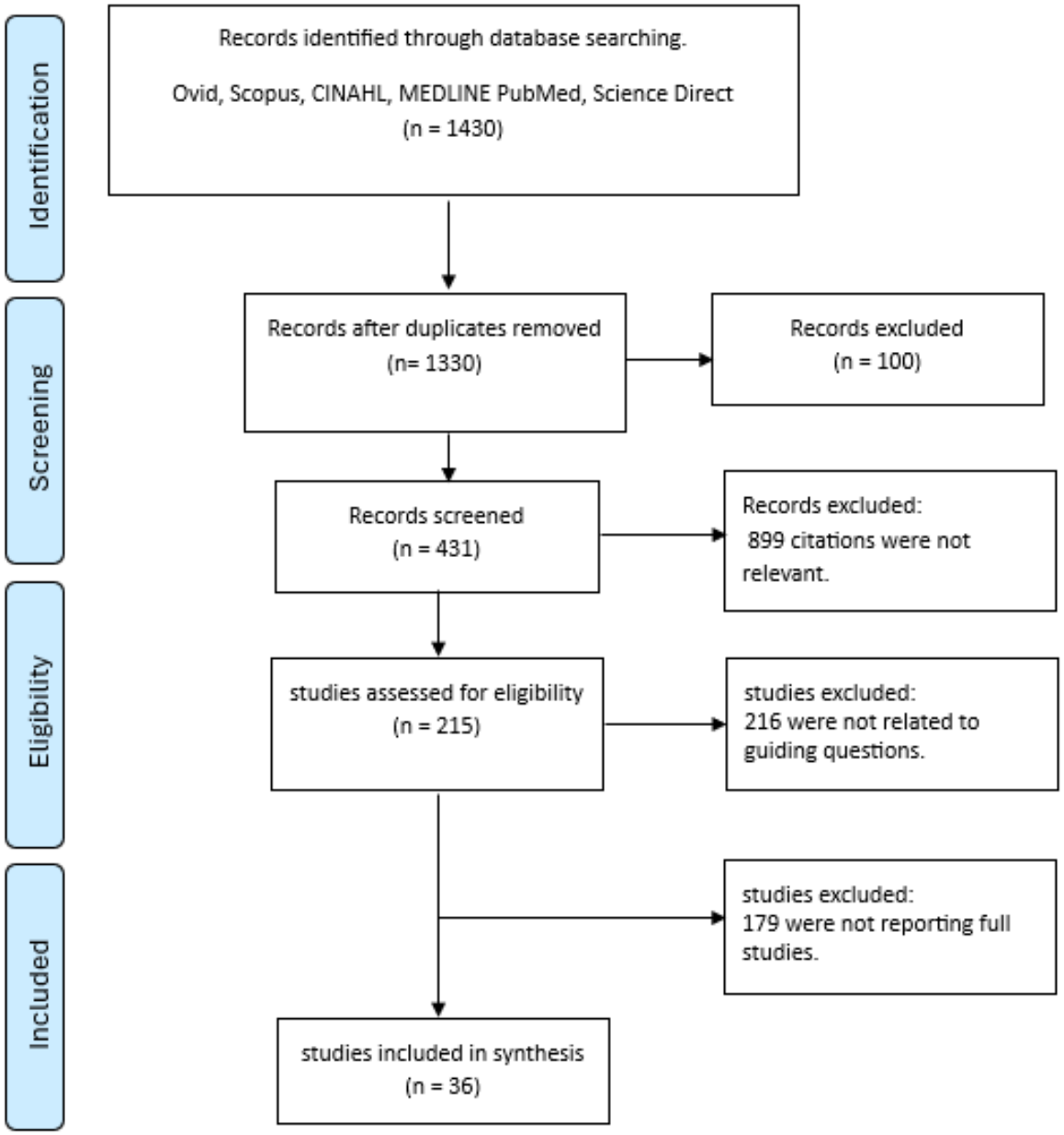

Figure 1. Flow diagram of search strategy

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