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IMPACT OF AN INFECTION-CONTROL PROGRAM ON NURSES' KNOWLEDGE AND ATTITUDE IN PEDIATRIC INTENSIVE CARE UNITS

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Abstract

Healthcare-associated infections (HAIs) remain highly prevalent in pediatric intensive care units (PICUs), necessitating rigorous preventive programs. This concurrent embedded mixed methods study evaluated impacts of a multifaceted infection control program on nurse knowledge, attitudes, and practices in a 10-bed PICU in Hafar Al-Batin, Saudi Arabia. Quantitative data showed significant knowledge gains from a baseline mean score of 57% to 79% post-intervention, alongside increased perceived capacity and motivation to prevent HAIs. The HAI rate decreased from 13 to 9 per 1000 patient-days over six months. Qualitative analysis of three nurse focus groups revealed positive perceptions of the program's multimodal education, reminders, feedback, leadership support, and motivational strategies. Suggested improvements included continued training, observational audits, and addressing environmental barriers. Integrated results provide a model to guide contextualized infection prevention programs in Saudi pediatric settings and beyond to achieve long-term gains in safety practices and outcomes.

Keywords: infection prevention, pediatric intensive care, nurses, mixed methods evaluation, Saudi Arabia

Introduction

Healthcare-associated infections (HAIs) remain highly prevalent in pediatric intensive care units (PICUs), increasing morbidity, mortality, costs, and treatment complexity (Rosenthal et al., 2012; Zingg et al., 2014). Critically ill children are at heightened risk due to compromised immunity and frequent exposure to invasive devices. Reported HAI rates range from 6.2 to 33 per 1000 patient-days in developing country PICUs (Moreira et al., 2020; Sangsuksawang et al., 2013). Device use, crowding, insufficient nurse staffing, and variable prevention practices exacerbate risks (Dananchai et al., 2021; Koenig & Mehrotra, 2020).

Yet most HAIs are preventable through evidence-based measures (Pessoa-Silva et al., 2017). Hand hygiene, disinfection, care bundles, and nurse-led initiatives can significantly reduce transmission and infection in PICUs (Ider et al., 2012; Rosenthal et al., 2012). However, changing clinician behaviors and practice culture requires multifaceted programs addressing contextual factors (Pessoa-Silva et al., 2017). Evidence-based implementation approaches tailored to local settings are critical but scarce in Saudi Arabia and the region (Mahfouz et al., 2013; Panunto et al., 2021).

This concurrent embedded mixed methods study aimed to evaluate impacts of a tailored multifaceted infection prevention program on nurse knowledge, attitudes, practices, and HAI rates within a 10-bed PICU in Hafar Al-Batin, Saudi Arabia. Combining surveys, focus groups, and outcome data provides a robust assessment to inform effective intervention design and generate insights transferrable to other pediatric contexts in Saudi Arabia.

Background

HAIs in Pediatric ICUs

Intensive care units provide vital support for critically ill children, yet also confer significant infection risks. Heavy device use, compromised immunity, frequent procedures, and crowding increase susceptibility (Ider et al., 2012; Zingg et al., 2014). Reported HAI rates in developing country PICUs range from 13.5 to 35.6 per 1000 patient-days, higher than in pediatric wards or adult ICUs (Dananchai et al., 2021; Moreira et al., 2020; Sangsuksawang et al., 2013). Common infections include bloodstream, respiratory, urinary tract, and surgical site (Rosenthal et al., 2012). Multi-drug resistant organisms pose added challenges (Zingg et al., 2014). HAIs increase length of stay, costs, morbidity, and mortality in vulnerable pediatric patients (Mahfouz et al., 2013).

Evidence-Based Prevention Strategies

Most HAIs are preventable through rigorous infection control programs, potentially reducing rates by over 30% (Pessoa-Silva et al., 2017). Key initiatives in PICUs include hand hygiene promotion, disinfection, care bundles for device insertion and maintenance, antibiotic stewardship, and nurse-driven protocols empowering frontline ownership (Dananchai et al.,

2021; Ider et al., 2012). Addressing environmental, behavioral, and occupational factors is vital alongside technical strategies (Mahfouz et al., 2013). Multifaceted programs achieving large improvements typically combine training, monitoring, leadership support, motivational tools, and strong organizational climate (Pessoa-Silva et al., 2017). However, evidence on effective interventions tailored for Middle East settings is limited (Panunto et al., 2021).

Theoretical Framework

The Information-Motivation-Behavioral Skills model guided this study. It posits that performing preventive behaviors requires information, motivation, and skills (WHO, 2016). Educating caregivers enhances knowledge while administrative support, reminders, and feedback foster motivation and skills. Assessing nursing-focused programs through this framework provides insights to guide enhancements addressing gaps in each element. It has underpinned infection prevention initiatives and evaluations globally (Aboumatar et al., 2012).

Methods

Study Design and Setting

This concurrent embedded mixed methods study evaluated an infection prevention program in a 10-bed PICU at Hafar Al-Batin Central Hospital in Saudi Arabia from January to July 2022.

Intervention Description

The 6-month intervention included: 1) Multimodal education on hand hygiene, disinfection, care bundles 2) Visual reminders and posters 3) Electronic surveillance with feedback 4) Motivational cues and leadership support 5) Empowering nurses in protocol adaptation and auditing.

Quantitative Methods

Staff knowledge was assessed pre and post-intervention using a validated questionnaire (Tavolacci et al., 2008). Perceived motivation and behavioral capacity were also surveyed. Deidentified HAI rates were tracked through records review. Pre-post changes were analyzed using statistical tests.

Qualitative Methods

Three semi-structured focus groups were conducted with PICU nurses post-intervention to explore perceptions of the program. Transcripts underwent thematic analysis by two coders. Quantitative and qualitative results were merged interpretively.

Ethical Considerations

Institutional approval and informed consent were obtained. Participation was voluntary and confidential.

Results

Quantitative Outcomes

PICU nurse mean knowledge score increased from 57% at baseline to 79% post-intervention ($p<0.001$). Perceived capacity and motivation to prevent HAIs also rose on a 1-5 scale from 3.2 to 4.1 ($p=0.004$). Documented HAI rates declined from 13.2 to 9.4 per 1000 patient-days over the six months.

Qualitative Themes

Four primary themes emerged from focus groups regarding the infection prevention program:

Multimodal education: "The in-services, posters, email tips, and drills boosted my knowledge and skills." – Thamer, Nurse

Enhanced motivation: "Seeing cases decline with our effort inspired me to keep rigorously maintain practices."– Suad, Nurse

Areas for improvement: "I'd like ongoing refreshers, more auditing, and addressing layout issues." – Abdullah, Nurse

Sustainability: "Habitualizing these practices through engagement, reminding, and accountability will be key." – Ahmed, Nurse

In summary, nurses responded positively to the program's multifaceted education, motivation strategies, and engagement but wanted continued reinforcement.

Discussion

This mixed methods study provides evidence supporting intensive, multifaceted interventions to improve pediatric ICU infection prevention and associated outcomes in Saudi hospitals. The significant nurse knowledge gains, enhanced motivation, and 22% reduction in documented HAI rates quantitatively demonstrate effectiveness. Qualitatively, nurses perceived the blended implementation approach as beneficial but desired ongoing reinforcement.

The trends align with Pessoa-Silva's systematic review showing comprehensive programs combining training, enablement strategies, monitoring, and cultural interventions can substantially reduce HAIs in ICUs (Pessoa-Silva et al., 2017). Tailoring to local context was key, as compliance improved but remained suboptimal in a past Saudi study lacking motivational techniques (Panunto et al., 2021). Qualitative insights here can guide sustainability. Limitations include the small scale. Further spread and evaluation across PICUs is warranted. But the study provides an implementation model to inform pediatric infection prevention in Saudi Arabia.

Conclusion

This multifaceted infection control program significantly improved nurse knowledge, motivation, and practices alongside reduced documented HAI rates in a Saudi PICU. Survey and focus group results suggest bundled education, reminders, feedback, leadership support, and

nurse empowerment contributed to gains. Ongoing training and addressing environmental issues are needed for sustainability. The mixed methods evaluation approach provides useful implications to guide contextualized pediatric infection prevention initiatives in Saudi Arabia. Replicating tailored, evidence-based programs across PICUs can substantially reduce preventable HAIs to protect children's health and safety.

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