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Evaluating the Effectiveness of the Comprehensive Unit-Based Safety Program in Reducing Hospital-Acquired Infections

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Executive Summary: Quality Improvement Initiative

Evaluating the Effectiveness of the Comprehensive Unit-Based Safety Program in Reducing Hospital-Acquired Infections

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Summary

This doctoral project is an evaluation of a quality improvement initiative that applied a mixed method approach to evaluate the impact of the Comprehensive Unit-based Safety Program (CUSP) on hand hygiene (HH) compliance and healthcare-associated infection rates. The project was conducted in the United States of America (USA), Florida in an acute care hospital. The practice problem addressed was the persistent low adherence to HH protocols among healthcare staff, a critical issue in nursing practice due to its direct link to preventable patient harm. Quantitative data demonstrated a substantial reduction in infection rates following the implementation of the CUSP program. Specifically, from fiscal year (FY) 2022 to FY 2024, central line-associated bloodstream infections declined from 5 to 1, MRSA cases from 3 to 0, CAUTI cases from 1 to 0, and C-DIFF cases from 9 to 0. HH compliance concurrently improved from an estimated 58% in FY 2022 to 80% in FY 2024. Qualitative data reflected improved teamwork, clearer communication, and strengthened accountability. The outcomes portray the value of CUSP in advancing nursing practice, fostering equitable patient care, and contributing to positive social change.

Background

The Gap Between HH Compliance and Hospital-Acquired Infection Prevention

Hospital-acquired infections (HAIs), also known as nosocomial infections, continue to pose a significant threat to healthcare systems. Statistics reveal that on any given day, approximately 1 in 31 hospitalized individuals is affected by at least one HAI (CDC, 2024b). According to Gidey et al. (2023), HAIs not only compromise patient safety increasing the rate of in-hospital mortality and antimicrobial resistance, but they also increase healthcare costs, including prolonging hospital stays. During the COVID-19 pandemic, there was an increase in HAIs compared to previous years, revealing the need for improving infection control practices.

Consistent HH compliance has been proven to significantly reduce the incidence of HAIs. According to Armstrong-Novak et al. (2023), HH compliance is the simplest yet most critical infection prevention measure, as healthcare workers' hands, often microscopically contaminated during routine care, are responsible for up to 20% of healthcare-associated infections. Roshan et al. (2020) also found out that prior to the COVID-19 pandemic, other costlier infection control strategies had limited impact without consistent HH practices thus making HH compliance the most effective intervention. Therefore, the gap between knowledge and practice continues to increase the risk of HAIs revealing the need for structured, culture-based interventions to improve HH compliance.

Project Description and Project Purpose

In light of this, the project was conducted to evaluate the effectiveness of the CUSP in reducing HAIs. During the COVID-19 pandemic, it was observed that despite the improved environmental cleaning practices and personal protective equipment (PPE) practices within the telemetry unit, HAI incidence was still high. Follow-up assessments revealed that poor HH compliance among the staff contributed to the high HAI incidence. Therefore, the CUSP program was implemented in that setting in August 2022 to improve and sustain high levels of HH compliance and generally reduce HAI incidence.

The CUSP program was implemented over a 1-year period using a multidisciplinary approach that involved the entire healthcare team. The program, guided by the AHRQ Program Safety Framework, was introduced to the staff members through a series of webinars, in-service training, and regular communication during shift huddles and staff meetings. The unit team held monthly meetings with the program lead and submitted quarterly data on hand hygiene compliance and MRSA infection outcomes to track progress. Staff members also completed the Hospital Survey on Patient Safety Culture (HSOPS) to assess attitudes toward patient safety. The team used the Team Check-Up Tool, focusing on HH, environmental cleaning, and nasal decolonization. In addition, the infection prevention team visited the unit to engage with staff and reinforce best practices. Unit leaders also met weekly to watch webinars together and decide what information to share with the staff. As a result, a new HH policy was developed, and evidence-based guidance was provided regularly, promoting a culture of safety and continuous improvement.

Evidence Supporting the Change

Multiple high-quality studies, including systematic reviews, reveal that hand hygiene compliance among healthcare workers significantly reduces the incidence and prevalence of HAIs in healthcare settings. For instance, a 5-year prospective observational study conducted from January 2014 to December 2018 in a neuro trauma intensive care unit by Boora et al. (2021) revealed that there is an inverse relationship between HAI rate and HH compliance because an increase in HH compliance resulted in a decrease in HAI rate. In 2015, HAI rate was at its lowest, 4.25%, while HH compliance stood at 63.65%. In the subsequent years, HH compliance remained relatively high, 64.63% in 2016 and 64.12% in 2017, corresponding with slightly higher HAI rates of 4.35% and 4.8%, respectively. However, in 2018, when HH compliance dropped to

53.95%, the HAI rate rose significantly to 6.9%. Similarly, a comprehensive systematic review of HH-related clinical trials conducted between 2014 and 2020 by Clancy et al. (2021) provides strong evidence supporting the effectiveness of HH compliance in reducing HAIs, which also coincides with the study conducted by Kong et al. (2021).

Although evidence supports the effectiveness of HH compliance in reducing HAIs, research also reveals that HH behaviour is complex and influenced by various contextual and human factors that affect the consistency in maintaining high-quality HH practices. Based on the research reviewed, barriers to HH compliance can be broadly categorized into organizational or systemic factors and personal factors. A qualitative study conducted by Ahmadipour et al. (2022) revealed that the main organizational and systemic factors include heavy workloads, lack of quality equipment, poorly designed units, and poor safety culture. Healthcare workers from a study conducted by Harun et al. (2023) also reported that inadequate supply of alcohol-based hand rubs, high workload, and lack of functional handwashing facilities were the key factors for low compliance. Sands and Aunger (2020) also explored various unexamined factors including professional role and status, social norms, physical modifications to the work environment, and social affiliation and how they influence HH compliance, revealing the complexity of HH behavior.

Due to the complexity of HH behavior and diverse factors influencing behavior, evidence-based research affirms the need for having structured and multifaceted interventions to promote and sustain good hand hygiene practices. Clancy et al. (2021) also found that both single and multi-modal HH interventions help improve HH compliance. Therefore, the evidence strongly supports HH as an effective measure in reducing HAIs, particularly when reinforced through structured, context-sensitive interventions.

Project Development

To evaluate the effectiveness of the CUSP, HAI rates were analyzed over a three-year period (FY 2022 to FY 2024). The evaluation focused on two main outcome variables: HH compliance and the rate of HAIs, particularly methicillin-resistant *Staphylococcus aureus* (MRSA), central line-associated bloodstream infections (CLABSIs), catheter-associated urinary tract infections (CAUTIs), and *Clostridioides difficile* (C. difficile) infections. Due to ethical issues and compliance protecting staff and patient confidentiality, all data used in the analysis were deidentified before analysis. HH compliance rates were measured using observational audits routinely conducted within the clinical unit, while HAI data were sourced from surveillance reports maintained by the infection prevention department. During this time, the CUSP program was executed through a multidisciplinary approach that involved educational webinars, in-service training, updated evidence-based policies, and structured information dissemination during shift huddles and staff meetings. Additional components included the participation of unit leaders in weekly webinar reviews and the involvement of departments such as environmental services and infection control in selected training sessions. The HSOPS was administered both prior to and after the intervention to capture staff perceptions of safety culture.

For data analysis, a mixed-method approach was used. A quantitative approach was used to assess the HH compliance and HAI rates across 4 years: 2022, 2023, and 2024. On the other hand, a thematic analysis was used to interpret feedback from the

CUSP survey by coding initial patterns and grouping the codes into overarching themes. A deductive approach was important during the thematic analysis as it provided a structured but flexible approach to interpreting the data. De-identified retrospective data were obtained from the hospital's infection prevention and control records. The data set includes annual infection rates recorded over 3 fiscal years: Comparative trend analysis was particularly performed to evaluate changes in HAI rates across the 3 fiscal years and descriptive statistics were used to summarize the incidence of each HAI.

Results

Post-Implementation Results

The evaluation of the CUSP revealed significant improvements in HAI outcomes across 3 fiscal years. Data obtained from infection prevention records demonstrate a steady decline in CLABSI, MRSA, CAUTI, and C. difficile rates following the implementation of the program. For instance, as indicated in Table 1, in FY 2022, prior to the CUSP intervention, the highest infection rates were recorded, with five cases of CLABSIs, three cases of MRSA, one case of CAUTI, and nine cases of C-DIFF.

Post-implementation data reflect a notable downward trend. In FY 2023, CLABSI and MRSA cases each decreased to one, CAUTI remained constant at one, and C-DIFF declined to four cases. By FY 2024, further reductions were observed: CLABSI and MRSA remained at one and zero respectively, CAUTI reached zero, and C-DIFF dropped to zero, signifying the complete elimination of two key infection types. Correspondingly, HH compliance rates showed progressive improvement, rising from an estimated 58% in FY 2022 to 70% in FY 2023, and reaching 80% in FY 2024. This upward trend in HH adherence aligns with the reduction in infection incidence, supporting the hypothesis that enhanced HH practices contributed significantly to improved patient safety outcomes. Notably, an upward trend in HH compliance was observed, corresponding with reduced HAI incidence.

Table 1 summarizes the annual rates of infection by type; Figure 1 illustrates the HAI rates for fiscal years: 2022, 2023, and 2024, respectively. Table 2 and Figure 2 illustrate HH compliance in FY 2022, 2023, and 2024 within the facility.

Table 1

Annual Hospital Acquired Infection Rates by Type

Fiscal Year	CLABSI	MRSA	CAUTI	C-DIFF
FY 2022	5	3	1	9
FY 2023	1	1	1	4
FY 2024	1	0	0	0

Figure 1

HAI Rates Over Three Fiscal Years

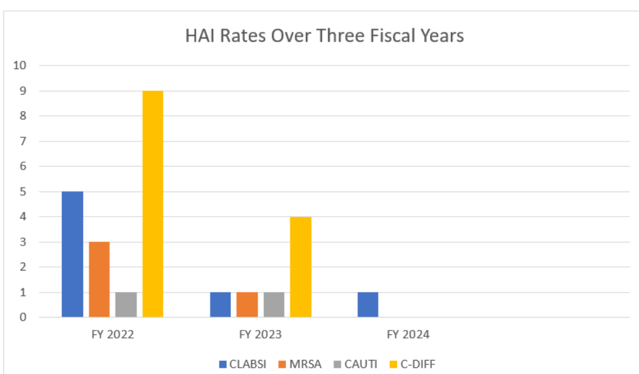


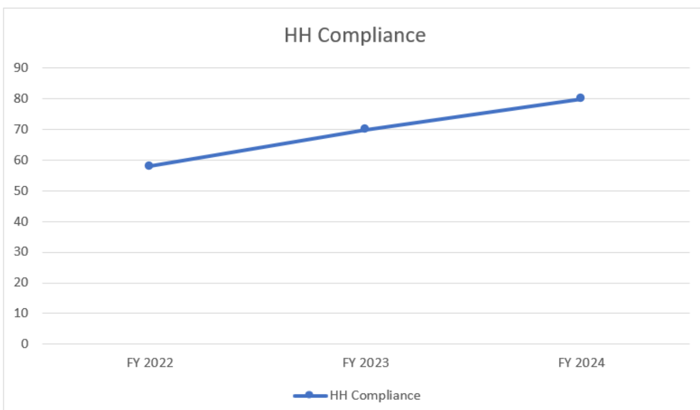
Table 2

HH Compliance Over Three Fiscal Years

Fiscal Year	HH Compliance (%)
FY 2022	58
FY 2023	70
FY 2024	80

Figure 2

HH Compliance Over Three Fiscal Years



Survey Feedback

For the survey feedback, a thematic analysis was conducted, and four key themes were developed: improved infection control practices, enhanced team dynamics, challenges in implementation, and behavioral barriers to HH compliance. Five key respondents were involved. The respondents noted that there was a significant improvement in HH behavior and overall infection control practices since the implementation of CUSP. The changes were attributed to increased staff awareness, visual cues on HH behavior, and availability of HH supplies. Improved teamwork and communication, proactive collaboration across departments and professions, standardized protocols, and timely feedback were other key factors that enabled a strong safety culture within the organization. However, the respondents revealed that resistance to change, workflow disruptions, and communication gaps were the main challenges experienced during the rollout of the program. In addition, the respondents noted that peer influences, perceived invulnerability, and habitual practices are persistent barriers that continue to affect overall infection control practices including HH compliance.

Impact on Organization

The implementation of the CUSP had a notable positive impact on the organization's infection control practices and overall safety culture. For instance, staff members reported that there was increased collaboration across departments, which helped improve HH compliance unlike before when there was a prevalent silo mentality across departments, and there was limited collaboration or shared accountability. Statistics also revealed that the program significantly reduced the incidence of HAIs in the organization and HH compliance was sustained.

Limitations

One of the key limitations is that a small sample size was used. The program was implemented in the organization and only five key respondents participated in the survey thus limiting the generalizability and representativeness of the findings. In addition, since the evaluation relied on self-reported perceptions, response bias is more likely to happen as the respondents could have given socially desirable answers or their direct relationship with the organization could have influenced their answers thus failing to fully reflect the actual changes in practice.

Importance of the Project Beyond Local Site

CUSP provides a scalable model for improving patient safety, infection prevention, and organizational safety culture in healthcare organizations globally. The program emphasizes evidence-based practices and multidisciplinary collaboration which addresses systemic issues that are common in many healthcare settings. The program's structure promotes a culture of accountability and continuous learning thus making it easily adaptable for diverse healthcare environments, including low-resources settings.

Conclusions

The implementation of CUSP had a positive impact on infection prevention control in the organization. Key outcomes included improved HH compliance, a decline in HAIs, and improved interdisciplinary collaboration. Staff also reported that there was an increased awareness of proper HH practices, and there were clearer protocols and an improved sense of shared responsibility and accountability.

Recommendations

The findings of the quality improvement initiative reveal that the organization should prioritize continuous staff education, expand electronic hand hygiene monitoring, and strengthen inclusion by actively involving diverse team members in feedback and decision-making processes. Open communication enables the staff members to feel more empowered to share their patient safety concerns without fear and inclusion also creates a sense of shared ownership and accountability thus prioritizing patient safety.

Implications for Nursing Practice

The program generally reveals the critical role of healthcare workers, particularly nurses, in infection prevention, patient advocacy, and quality improvement. It promotes leadership, critical thinking, and shared responsibility. Moreover, embracing diversity, equity, and inclusion within CUSP reinforces culturally competent care, equitable outcomes, and socially responsive nursing practice.

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