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Research Article

Infection Control and Prevention for Hospital Staff

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Abstract

Infection prevention is a critical practice used in any hospital. *Candida auris* is a fungal infection that can live on hospital equipment and surfaces if not properly sanitized and can be easily spread to many patients throughout the hospital. There must be more infection control among healthcare and environmental services staff. There needed to be a process for adequately disinfecting hospital equipment and the methods being used to clean the equipment. The objective is to develop or modify evidence-based guidelines and processes, particularly among healthcare workers and EVS. Adherence to the proper use of disinfectants and proper medical equipment maintenance will minimize healthcare-associated infection risks and reduce the frequency of *Candida auris* outbreaks. For hospital and EVS staff, infection prevention education and training on new products used to disinfect equipment and surfaces help to increase the staff's knowledge and perception. Infection prevention and control are paramount to protect patients and healthcare workers from disease. Without controlling the spread of infection, hospitals would become unsafe to go to or visit, resulting in significant healthcare problems.

Keywords: Infection prevention; Education; Infection control

Infection Prevention and Education amongst Hospital Staff

Infection prevention within healthcare facilities has been an ongoing issue with the lack of education and training. This capstone project encompasses a population of healthcare staff that work within a long-term acute care facility. The EVS staff plays a significant role in infection control, following infection control policies and procedures and guidelines for cleaning the patient rooms effectively to decrease the spread of infection. The methods used for this capstone project is the education and an EVS document to ensure safety tools used for cleaning.

This project is focused on providing hospital staff who work directly with patients and provide cleanliness to the clinical equipment and surfaces with adequate information on improving infection rates within the hospital as it relates to *Candida auris*. *Candida auris* can spread in healthcare settings through contact with contaminated environmental surfaces or equipment or from person to person. *Candida auris* can cause ear, wound and bloodstream infections. Candida infections are classified as the most common nosocomial infection cause by fungi. This has evolved as a severe public health problem nationally [1].

Project Description

The gap identified in this practice needs to be more compliant among staff. The goal is to provide training to help identify noncompliance and the potential complications that can arise. This noncompliance is to provide EBP infection prevention education to hospital staff to increase knowledge of infection prevention. This project is relevant to nursing and public health practice as it relates to daily cleaning and disinfecting of the patient care environment, terminal cleaning, and reusable equipment with recommended products. There is a high focus on shared mobile equipment such as glucometers, blood pressure cuffs, Etc. This project's significance is ensuring that environmental service staff and patients ensure no further spread of infection within the facility. The gap identified is the need for more education on infection prevention.

Available Knowledge

The research site collaborated with the local health department to reduce the spread of *Candida auris* that has continued to increase. *Candida auris* is a common fungal infection found in the bloodstream in most hospital or clinical facilities [2]. The research site identified that the fungal infection has been seen on hospital equipment such as catheters and surfaces within the research site. A proven fact in preventing the spread of *Candida auris* is early detection and implementation of infection control

practices. Accurately identifying infection control practices such as environmental cleaning is critical to preventing *Candida auris* outbreaks [3].

Ahsan et al. conducted a study to determine how knowledge management-based nursing care educational training would be effective on hospital-associated infection prevention behaviors from healthcare staff [4]. Observations before and after education and training were conducted on the nursing care documentation and handwashing compliance Adherence to the six steps and five moments of nurses' handwashing increased after the training. The knowledge management-based nursing care training increased infection prevention behaviors within the hospital. These results and findings are related to potential improvement interventions addressing the challenge of infection control. The authors Ahsan et al. concluded that the knowledge level and completeness of the nursing care documentation significantly increased after the training. This study is a credible and accurate resource [4].

Dramowski et al. conducted this study by showing how healthcare facilities and the clinicians struggle with infection prevention and control solutions that can be implemented and be effective to reducing infections [5]. A hand hygiene strategy was implemented that consist of an alcohol-based hand sanitizer in all patient rooms and staff education. The strategy and evidence-based training with hospital staff have effectively decreased hospital-acquired infections. This study is a reliable and accurate resource.

Fernandes Agreli, et al. conducted a study that included healthcare staff and patients describing how patients can help reduce infection rates by encouraging patients to monitor their own care [6]. There were strategies used to leverage patient involvement in implementing infection control guidelines. The authors concluded that appropriate hand hygiene of healthcare staff is effective way to protect patients against healthcare-associated infections.

Flanagan, et al. studied the critical functions within an infection prevention program [7]. The author noted how hygiene, education for staff hand and patients and policy developments to include periodic audits and communication of reportable diseases to the public health department will reduce the spread of infection. The authors concluded that having an effective infection prevention program, including policies and infection control audits, will reduce infection rates.

Gould et al.'s study evaluated the effectiveness of different interventions to improve compliance of hand hygiene. Hand hygiene is highly considered and an important prevention intervention in many healthcare settings. Although this can be difficult to increase its compliance, it is widely used. Single intervention such as education has a probability of increasing hand hygiene compliance [8].

Haque et al. conducted a study advising that infection-control procedures to include an alcohol-based hand rub can prevent hospital-acquired infections, save lives while minimizing healthcare costs [9]. Providing consistent educational interventions for healthcare workers to change their handwashing practices to prevent the spread of infection. This study advocates that all healthcare workers must wash their hands before and after touching a patient including body fluid exposure, prior to clean/aseptic procedures and the patient surroundings.

Havers et al. identified that policies that are implemented can significantly improve patient outcomes, clinical practice, and prevention of healthcare-associated infections. The findings of this study provided guidance to healthcare staff with implementing evidence-based education on infection prevention to improve patient outcomes [10].

Haverstick conducted a study that will improve patients' hand hygiene using soap and water, hand sanitizer or both methods. The nursing staff provided hand hygiene education to each patient [11]. A survey consisting of six questions was completed prior to implementation of the intervention and after discharge once, the intervention was implemented. The results showed increased hand hygiene by patients can have an impact on infection rates within hospital. The author concluded that after hand hygiene interventions, rates of infections declined significantly, and patients reported more staff offering opportunities for and encouraging hand hygiene.

Khammarnia et al. studied the prevention and decrease in hospital infections can drastically reduce mortality and health related costs [12]. Policy makers will be able to consider this intervention for revision of programs and standards and evidence-based education programs. The author concluded that evidence-based education and health policymakers must be involved with program development to decrease hospital-acquired infections.

Ku et al. [13] provided research of contaminated environmental surfaces as one of the causes of the infectious disease *Candida auris*. Implementing the correct infection control methods will be critical to controlling the spread of *Candida auris*. The cleaning of contaminated surfaces shows the critical role of environmental services department will have in the prevention of *Candida auris*. Disinfectants with a chlorine-based solution are used frequently in healthcare setting. Maintaining clean surfaces, equipment, hand hygiene and education will be essential to reducing the spread of *Candida auris*.

Liang, Riethman & Fox [14] identified priorities such as hand hygiene, environmental cleaning, sterilization of medical equipment and transmission-based precautions are essential for infection prevention. These precautions have added a layer of

protection to decrease the spread of infections. Improving hand hygiene with educational interventions include well-written policies, in-person education and markers to demonstrate cross-transmission of microorganisms through contact. The authors concluded that hand hygiene had been proven to decrease the spread of infection and increase healthcare staff knowledge.

Lowe et al. identified the lack of resources, staff shortages, staff education, inadequate in-service trainings with an increase in visitors can be potential barriers to infection control within hospitals [15]. Identifying departmental champions in infection control and guidelines for in-service training are strategies for improving infection control with limited resources.

Musu et al. [16] study evaluated the observance, procedures and protocols for infection control and the connection to different aspects of hand hygiene and hand washing technique by healthcare workers. Adhering to hand hygiene, standard precautions and written protocols by healthcare staff were included in the observational study set. The authors concluded that the need to implement immediate strategies for infection prevention due to low level of adherence of hygiene practices for healthcare staff.

Sathyapalan et al. [17] implemented a study to investigate while trying to contain the spread of *Candida auris* that includes some preventative measures. Preventative measures include staff educational training and future surveillance. Implementing these measures led to a decrease incidence of *Candida auris* among adults while helping to preventing further outbreak and formation within clinical setting. The authors concluded that these preventative measures decreased infections and healthcare workers showed they improved awareness of infection prevention.

Sreeramoju et al. [18] leveraged a study of a federally state funded Delivery System Reform Incentive Payment program. This study was implemented within a hospital to reduce hospital-associated infections. Important interventions implemented consisted of awareness campaigns, engaging clinical staff, and providing education. The authors concluded that this initiative was a sustainable approach. There was no credible evidence to prove that this approach will keep infections at a low rate.

Vuichard-Gysin et al. [19] identified a study to help control and detect infections early. Hand hygiene, contact precautions for patients that have an infection that is colonized and not colonized are some control measures used. Specific environmental cleaning and hand hygiene are critical factors to prevent and reduce infections among hospital staff.

Wałaszek et al. [20] studied how patients and healthcare workers knowledge and attitude affected their hand hygiene practices. A survey was conducted noting how little healthcare workers used hand hygiene in vital situations. Hand hygiene was rated poor amongst patients and healthcare workers. The healthcare workers lack compliance with hand hygiene, resulting in significantly reducing patients' safety. Educational interventions and observations of hand hygiene should be conducted annually for healthcare workers.

Zhao et al. [21] conducted a study to get a better understand of what interventions would attract nurses to have an effective outcome on hand hygiene and their preferences. Hand hygiene was performed before and after patient contact to determine if the interventions were the same in different hand hygiene situations. The results concluded that nurses used the hand hygiene that was most convenient when they were a part of the design of the intervention and as the intervention was implemented to show if it was effective. There was a need for policy change to improve overall hand hygiene compliance. This study used strictly the nurses' perceptions and not facts to measure the outcome.

Rationale

Conceptual models help to convey ideas to diverse populations while providing a visual representation of specific research questions. Conceptual models can help provide support for prevention and intervention efforts [22]. The conceptual model will fit within a diverse population of healthcare staff. This will help to provide visual guidance for prevention and intervention. An example is the health belief model used for people to adopt recommended physical activity behaviors and their perception of the disease or threat. This goes with an intervention from the PICOT question asking if evidence-based infection prevention education will improve healthcare knowledge and perception.

This conceptual framework offers a comprehensive perspective supported by holistic and foundational understanding of significant components that can be applied in the real world. Implementation researchers, policymakers and program managers guides the review of an effective intervention as it is sustained over time [23].

A conceptual framework will help implement multiple stakeholder and hospital leadership to become engaged while ensuring diversity for infection control prevention. This model will create a feedback loop that will reinforce and improve program implementation by supporting hospital needs [24]. The conceptual model has many challenges addressed by defining concepts allowing for consolidation between concepts and new hypothesized relationships. The model can improve quality efforts and implement new interventions. Supporting research efforts is a respected tool for many organizational leaders to bring about improvements [25]. This type of concept mapping method modeling housing and community-based settings can be used in a healthcare setting to develop a conceptual model for infection prevention. This method can help to improve healthcare knowledge

and perception with evidence-based infection prevention education [26]. The concept mapping and conceptual model will provide a clear visual of evidence-based education, measurable outcomes, and research.

Evidence-based research studies were used to select the interventions. Tools were also used from the CDC site and the facility to help reduce the further spread of *Candida auris*. There was evidence to suggest using this specific intervention would work showing a decrease in infection rates. The intervention was also implemented for the EVS staff using the room-ready documentation in collaboration with the infection control nurse. After the implementation of the room-ready documentation, there has been a decrease in the spread of *Candida auris* within the hospital while new admissions are being tested upon arrival.

Specific Aims

The project aimed to provide EVS staff who provide cleanliness to clinical equipment and surfaces with adequate information on improving infection rates within hospitals. This was accomplished through educational training and cleaning tools for room cleaning and equipment. The training has helped to identify noncompliance with infection control threats and the complications that can arise. There will also be specific educational training on the decontamination of surfaces and clinical equipment to reduce *Candida auris* in patients within hospital settings. Specific techniques and cleanliness protocols were tested to determine if the surfaces, handwashing skills and techniques, and decontamination of clinical equipment are ideal for patient use. This manuscript aims to provide educational reading to everyone on infection prevention along with interventions that will help reduce the spread of infections within a hospital setting.

Methods

This project has many phases where ideas and resources are gathered including processes and deliverables that are planned throughout the project's timeline. The project structure is designed to facilitate researchers to identify findings from each stage of the project and to use this to guide subsequent stages of the research. The project is a hospital-based study with phases used to educate the healthcare staff, leaders, and EVS staff. Phases of the design include identifying systematic evidence of barriers and facilitators to infection control, identifying hospital staff perception, and synthesizing the data, and developing an intervention planning outline with a collaborative approach.

The method used for this capstone project was educational training. The training helped them to identify non-compliance with infection control threats and the complications that can arise from the non-compliance. To measure the success or failure of the specific intervention, calculating positive predictive value and negative predictive value with crosstabs and chi-square in SPSS. Conducting a pre and post-test of the intervention will help to compare the before and after the intervention was implemented. Predictive analysis was used to identify patterns and observe any trends while identifying risks and opportunities.

Context

The current actions and activities of the research site involve weekly meetings with infection control nurses and monthly meetings with leadership hospital staff. These meetings are used to discuss infection control rates, a summary of potential programs, and make suggestions on policy changes. One of the current activities includes connecting with the local health department to develop conjoined efforts to address *Candida auris*. The local health department and hospital team have collaborated to reduce *Candida auris*, which has been increasing in the hospital. The CDC has an infection control room-ready document or tool that can be used to assess infection prevention practices and quality, partnering with CDC to identify strategies to reduce hospital-associated infections and increase the staff's baseline knowledge.

Intervention

The project provided hospital staff who directly work with patients and provide cleanliness to clinical equipment and surfaces with adequate information on improving infection rates within the hospital. This was accomplished through educational training. The training helped to identify noncompliance with infection control threats and the complications that can arise. There will also be specific educational training on the decontamination of surfaces and clinical equipment to reduce *Candida auris* of patients within a hospital setting. Cleanliness protocols were tested to determine if the surfaces, techniques, and decontamination of clinical equipment are ideal for use with patients. The room-ready documentation tool existed at the research site. The infection control nurse made changes to the existing tool and permission was given to use tool in the project. This tool is used to check off for EVS staff when cleaning a regular room and isolation room after discharge.

EVS leadership will need to ensure the room-ready documentation is completed in each room and make EVS staff aware of when the supervisor is needed on the documentation tool. The EVS leadership and staff were provided training on the room-ready documentation tool. The team was formed based on the shift times of the supervisors and management staff and certain rooms and areas of the hospital.

Study of the Intervention

There was collaboration with the practicum site leaders and the preceptor, who will review and provide mentorship on the project to ensure successful completion. The preceptor will guide

the data collection and analysis stages to ensure the data collected is reliable and accurate. The preceptor and the practicum site leaders will guide on setting objectives, research questions, data collection, and reviewing the data analysis techniques employed. The participants will be evaluated on their knowledge of infection control using descriptive documentation and the patient discharge room-ready documentation tool.

The data from the laboratory test pre and post implementation will help form the foundation for the efficiency of the intervention. The infection control nurse tested all patients admitted to the facility for *Candida auris* before the EVS room-ready documents were implemented and training provided to staff. The observed outcomes were due to the interventions implemented as the patients were tested again after the interventions were implemented to show a significant decrease in *Candida auris* within the facility.

Measures

To assess whether the project's objectives have been achieved, the EVS staff cleaning standard rooms and isolation rooms upon discharge will experience educational training on infection control and specific cleaning solutions. The training outcome is to increase the knowledge of staff and perception when dealing with infection control in a hospital setting.

Other additional measurable outcomes for healthcare staff and EVS staff include the role played by infection prevention in reducing infections in hospitals through proper use of PPE, an extension of policies and protocols through the Joint Commission on Accreditation of Healthcare Organizations and maintaining relationships with infection prevention in decreasing infections within a hospital setting. Working closely with the infection control nurse at the facility and the public health department helped to contribute to the success and no cost of decreasing the spread of *Candida auris*. The data was obtained from the infection control nurse by tracking and reviewing the lab data retrieved after testing for *Candida auris* for each patient admitted and again prior to discharge to assess the accuracy of the data.

Analysis

Quantitative methods were used to draw inferences from the data obtained. The outcome data were analyzed through stages starting with clearly defined and concise, measurable questions. This included the time frame, how and what is being used to measure, and factors being compared. The outcome data were collected along with the pre- and post-laboratory data. The variable in this data is the pre-intervention data from lab results and post-intervention data from lab results after intervention was implemented. The level of data collected was interval based on test results. The research question is: Do test results change after the intervention is implemented within the facility? There was a small sample size of random patients tested in a four-month timeframe. According to the data, over a four-month timeframe, out of thirty-six patients, ten patients tested positive upon arrival at the research site. Interventions were implemented to include education and the EVS room-ready document. Within ninety days of implementing these interventions, the ten patients that were still admitted and had been previously tested as positive were tested again and seven out of those ten were negative. The other three patients tested positive both pre and post intervention. The intervention was proven successful in decreasing infections.

Ethical Considerations

Ethics are principles that can be controlled by how a person, or a group will behave or conduct themselves [27]. The subject and researcher have important legal and ethical issues as it relates to research. Ethics is a term that broadly covers the study of morals and specific moral choices made [28]. During this project, there were no ethical dilemmas. One ethical aspect of the project to be aware of was the complete confidentiality of the participants tested for *Candida auris*. The importance of protection from harm is consistent with beneficence, regarding researchers must not harm their study participants.

The risks for the organization are limited. To ensure that the site is safe, permission was requested and granted by the site's IRB on March 7, 2022. Obtaining site approval will also allow access to people and data needed to conduct the project. Securing site permission was acceptable because the researcher conducted an evidence-based approach project combining methods from existing infection control prevention and education. Every researcher should clearly understand the Institutional Review Board's (IRB) role when involving human subjects. As a researcher, you have a duty to "protect the life, health, dignity, integrity, right to self-determination, privacy, and confidentiality of personal information of research subjects" [29]. Completing the CITI Human Subjects Research course helps provide a better understanding and resources. This course referenced professional, ethical, and compliance-related issues that could arise in research with human subjects.

Results

The project design consists of early phases where ideas, processes, and resources are thought out before a project plan (Figure 1). The project structure has been designed to facilitate researchers to identify findings from each stage of the project and to use this to guide subsequent stages of the research. While all these steps were being completed, there were times when modifications were needed to achieve the goal, such as cleaning techniques and chemicals being used to clean the equipment for 100% effectiveness. To assess whether the project's objectives

have been achieved, hospital and EVS staff in contact with patients will experience educational training on infection control and proper cleaning of equipment and surfaces (Figure 2).

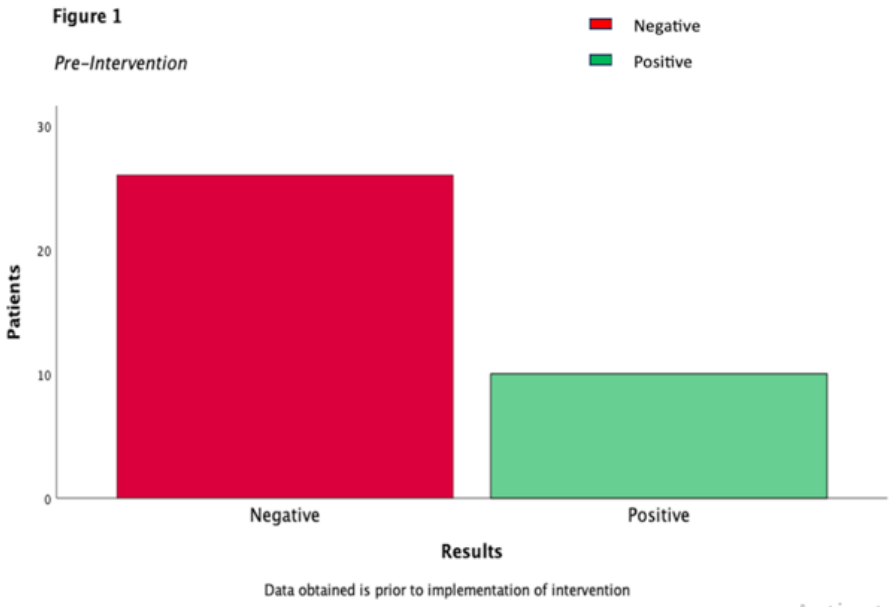

Figure 1: Pre Intervention.

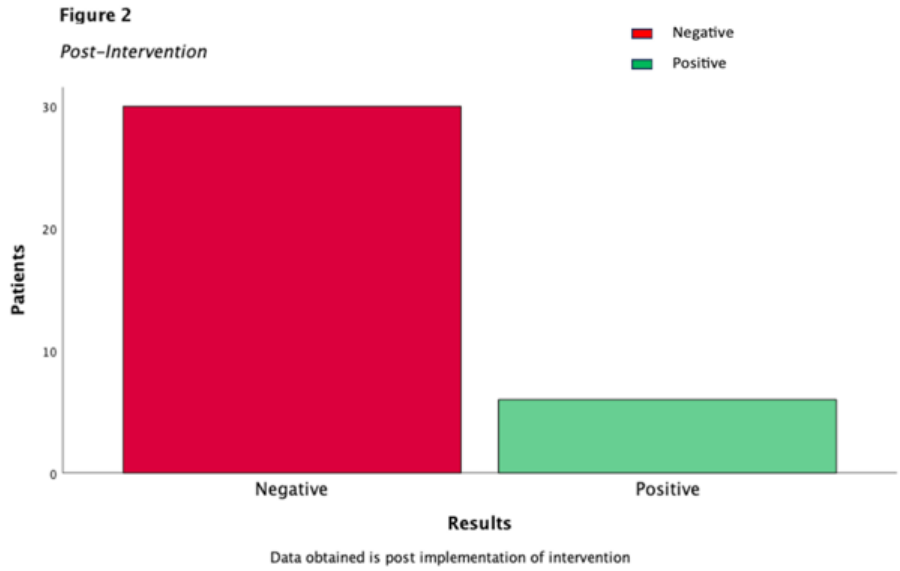

Figure 2: Post-Intervention.

The training outcome is to increase the knowledge of all hospital staff and their perception when dealing with infection control in a hospital setting. The data was analyzed using IBM SPSS Statistics (Version 29) predictive analytics software for the effectiveness of the intervention [30]. The observed associations were that many patients came to the facility with *Candida auris*, and some patients contacted *Candida auris* from the research site. All hospital staff was unaware of how infection can be spread and live on surfaces. The intervention had no unintended consequences, problems, or high costs. There was no increase in the cost of chemical solutions and wipes used to clean the equipment. The room-ready documents for standard and isolation rooms were successful. There was all the data noted from the research site.

Discussion

The research site continues to address hospital-associated infection to influence the widespread restoration of policies, research, and strategies to handle the rise in *Candida auris*. The current actions and activities of the research site involved weekly meetings with infection control nurses and monthly meetings with leadership hospital staff. These meetings are used to discuss infection control rates, a summary of potential programs, and suggestions for policy changes. One activity includes connecting with the local health department to develop conjoined efforts to address *Candida auris*.

Summary

Some key findings were the knowledge deficit of the hospital staff on infection prevention and the need for more processes and sterilization used on surfaces, rooms, and equipment. The relevance of this project was to provide education to increase the knowledge of infection prevention to all hospital staff and provide training on the proper way to put on PPE, and the steps to thoroughly clean and sanitize surfaces, rooms, and equipment. An important strength of this project are the actual interventions. The EVS room-ready document has tremendously affected the decrease of *Candida auris*. Just following this document and changing out the wipes used to clean the equipment has been critical to the project's success. This project is unique in a way that the document used to ensure proper room cleaning can be used in just about any hospital setting. There may be areas to modify based on the room type, but this can be a major factor in decreasing hospital-associated infections, specifically *Candida auris*.

Interpretation

The idea of change can bring a lot of resistance to healthcare facilities. Change can be appropriate to get anticipated outcomes. Evidence-base improvement will not only help to improve the measures but will help to plan for the implementation within the healthcare facility [31]. Most of the literature reviews had validity and accuracy to the research indicating success with proper handwashing, education, and training that was very similar to my researched findings.

This project is a significant impact on the people and systems. The importance of infection prevention not only for the safety of the patients but for the hospital staff too has had a significant impact warranting for review of policies and processes resulting in a change of the systems. Some reason for differences between anticipated and observed outcomes is that many researchers need to have all the data or information and can only anticipate the outcome when the observed outcome is different from anticipated. The anticipated outcomes are what you hope for within the research, and the observed outcome is seeing the actions. Outcomes tell you the result of your actions and actions being the intervention being implemented.

There were very minimal costs within this project. There was a change to specific wipes that are used to clean surfaces that resulted in little cost that led to a strategic trade-off making the best decision with the highest success rate. This project allowed the hospital to lower costs for treating patients with *Candida auris* by implementing the intervention so there would be only preventative measures in place. Interpreting the data is very important to understand the success of the intervention and what else needs to be done to protect the patients and all hospital staff. By implementing and monitoring the action plan, you can determine whether you are meeting your objectives and progressing towards achieving desired outcomes.

Limitations

A limitation of the project was time. There was a timeline of 12 weeks for this project. There was a need for time management and adhering to the project plan to meet all deadlines. The most time consisted of thorough research of information for the intervention, ensuring credible sources and literature reviews support the problem and intervention. Efforts that were taken to minimize the limitations were consistent communication, self-discipline to stay within the project timeline, and mapping out the areas that would need more time than others, such as obtaining and analyzing the data. There were areas within the project timeline to account for any possible setbacks such as obtaining the needed data from the facility might take longer than anticipated. The possibility of systemic errors and biases were accounted for that could have limited the measurement's internal validity.

Conclusions

This work was helpful for all healthcare staff and EVS as it relates to preventing the spread of infections and understanding

infection prevention, proper sterile cleaning, and putting on and removing PPE. This project can be sustainable at any hospital facility with the interventions put in place. The room-ready document can be used at any facility for zero cost, along with the education provided for staff. There are many ways that infections can be spread. This can be hospital-acquired infections, not properly washing hands, Etc. This practice can be implemented anywhere there is a risk of infection.

Further study in this field can identify other effective interventions in reducing hospital-associated infections. Suggested next steps would be to continue monitoring the spread of *Candida auris* and ensure the numbers stay low. Continue to use the room-ready document to clean all surfaces, equipment, and patient rooms and educate all staff.

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