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## The Effectiveness of Daily Chlorhexidine Hygiene in Reducing Future Hospital-Acquired Infections for Hospitalized Patients



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### ABSTRACT

**Background:** Hospital-acquired infections are a major cause of mortality in hospitals. Chlorhexidine is widely used in hospitals to prevent infection. This is a treatment used across the globe. **Purpose:** The purpose of this review was to determine the effectiveness of chlorhexidine and its role in infection prevention. **Method:** The patient intervention comparison and outcome (PICO) question is: What is the effectiveness of daily chlorhexidine hygiene in reducing future hospital-acquired infection for hospitalized patients? The method used was a systematic review of the literature of chlorhexidine hygiene in the hospital setting using computer databases. **Findings:** Originally, chlorhexidine was used as a topical antiseptic to prevent postoperative infections, although recently it has been used in daily hygiene for infection prevention. In addition to bathing with it, chlorhexidine is also used for daily oral hygiene. Three key findings were evident during this study. These were: consistency, uses beyond skin bathing, and infection prevention on different floors. **Conclusion:** While some findings varied slightly, overall, the consensus was that chlorhexidine greatly reduces the risk of infection in the hospital and can prevent bacteria from colonizing.



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## INTRODUCTION

Across the healthcare system, hospital-acquired infections use up considerable resources and money to treat. As a result, preventative measures are becoming popular to attempt to conserve resources and stop the infections before they start. In a report by Healthy People 2020, approximately \$25-31.5 billion can be saved just by using preventative measures [1]. Most healthcare-acquired infections are preventable through good hand hygiene [2]. Chlorhexidine is an agent that has been used for the past couple of decades to eliminate any potential infection-causing microorganisms. This is a treatment that is used across the globe. Although most of the research was done in the United States, some of the researches used for this literature review are from other countries.

Chlorhexidine is relatively inexpensive, readily available, and easily implemented. Except for rare allergies, adverse reactions to the use of chlorhexidine are uncommon. However, it is only fair to note that hypersensitivity reactions range from mild cutaneous reactions to anaphylaxis or death [3]. Nevertheless, hospitals across the world have begun implementing chlorhexidine hygiene protocols and using chlorhexidine in the preparation of surgical sites. A great amount of research has been done to discover the effectiveness of these practices. The purpose of this literature review was to determine the effectiveness of chlorhexidine and its role in infection prevention. The PICO question is: What is the effectiveness of daily chlorhexidine hygiene in reducing future hospital-acquired infection for hospitalized patients?

## METHOD

To find the studies, mostly the Cumulative Index for Nursing and Allied Health Literature (CINAHL) was used. The keywords searched were chlorhexidine, bathing, dressings, oral care, infection, and prevention. Two studies were from 2016. For other studies, the results were filtered to studies written from 2018 to 2021 and full-text studies to provide the most recent research data. In addition, more filters were applied to ensure that only peer-reviewed academic journals were utilized in this literature review.

After searching for “chlorhexidine bathing” with the above filters, 56 results were obtained. Out of these 56 studies, five were found that were relevant. These studies were included in the

review. An additional search was done with the keywords “chlorhexidine oral care.” This yielded 10 results. Out of these 10 articles, one was used in the literature review. A third search with the keywords “chlorhexidine dressings” yielded 10 results. From these 10 studies, one was added to the literature review. A fourth search was conducted using the keywords “chlorhexidine catheters,” which yielded eight results. Out of the eight, one was included in the literature review. A fifth search was done and used the keywords “chlorhexidine infection prevention.” Out of 132 sources found, two studies were used. An effort was made to use the highest tiers of evidence-based practice standards in nursing [4]. More studies were used after the initial review to complement the findings. Figure 1 shows the research methods used in the study.

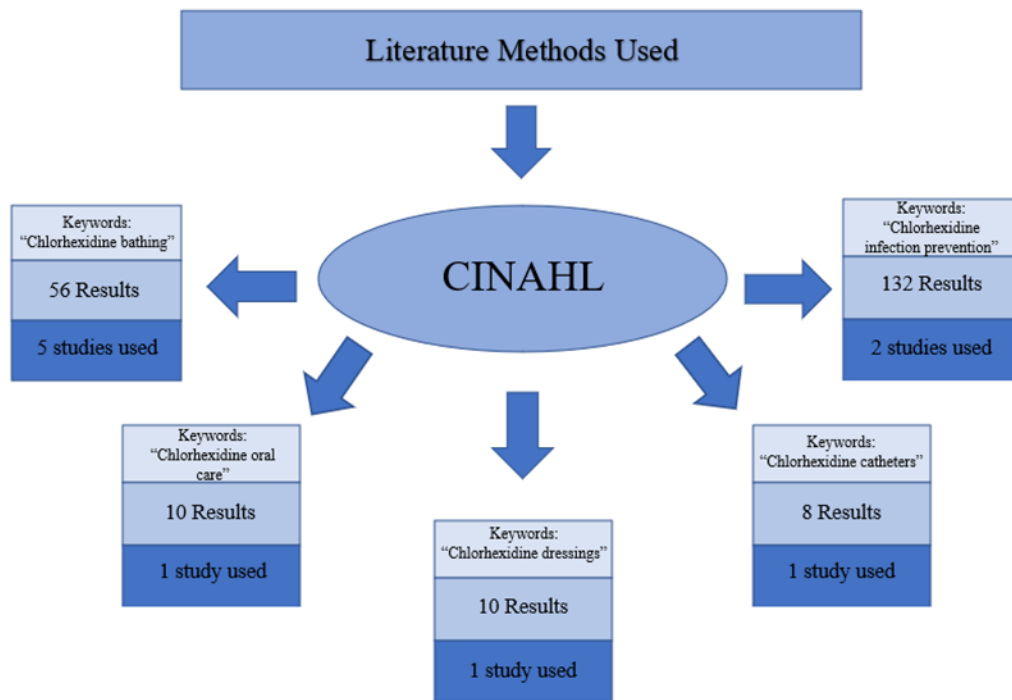


Figure 1. Research methods: Databases, keywords, and results.

## LITERATURE REVIEW

After extensively searching the literature, some key findings were identified. Findings included consistent use of chlorhexidine, uses beyond skin bathing, and infection prevention on different

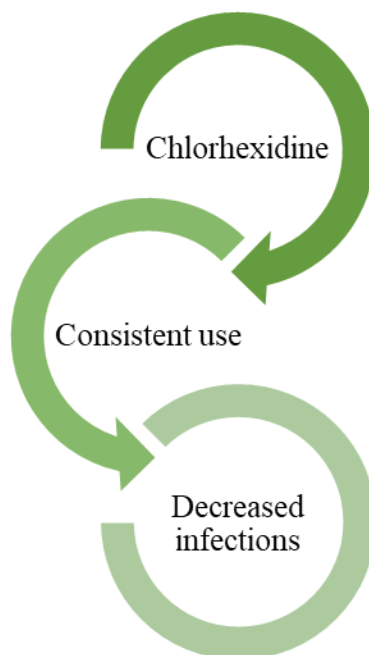
floors. While other information could be seen, overall, these were the top three that had the most evidence and were mentioned the most.

### **Consistent Use of Chlorhexidine**

Consistency was the same across many of the research studies that were reviewed (see Figure 1). Kes *et al.* [5] did a study on how using chlorhexidine for oral care can prevent the occurrence of ventilator-associated pneumonia (VAP) and ventilator-associated tracheobronchitis (VAT). In this study, oral care with chlorhexidine 0.12% was performed three times a day. Oral care with chlorhexidine having reduced the incidence of nosocomial pneumonia among critically ill patients, suggests a benefit of oral hygiene in decreasing the incidence of hospital-acquired pneumonia, including VAP in ICUs [6].

Schmudde *et al.* [7] studied the results of a pilot program that performed hygiene with chlorhexidine from the navel down to the knees twice a day with patients who had indwelling urinary catheters. If the patients had incontinent bowel movements, this hygiene was repeated. One of the studies exploring the benefit of antiseptics in reducing UTI suggests the benefit of using chlorhexidine in reducing UTIs [8].

In another study, Wei *et al.* [9] focused on the use of chlorhexidine-impregnated dressings for central lines. However, the dressings still required a consistent amount of change. For maximal effectiveness, they needed to be changed once a week. Scallan *et al.* [10] looked at patients who were given a bathing regimen starting four days before their scheduled surgery. This was a standardized routine that was written out to be consistently performed from one patient to the next. Chapman *et al.* [11] studied the comparison of medical-surgical critical care patients using chlorhexidine and non-chlorhexidine bathing in a randomized controlled trial. The study lasted for five years from January 2010 to August 2015. The study included daily chlorhexidine gluconate bathing compared to patients who used a non-chlorhexidine solution for daily bathing. The results showed that patients who consistently bathed with chlorhexidine gluconate had a 52% reduction in healthcare-associated infection. Another study showed the benefit of adding chlorhexidine to alcohol for skin antisepsis in reducing early surgical site infections compared with alcohol alone [12].



**Figure No. 2: Consistency in using chlorhexidine to kill bacteria.**

In another study, Tien *et al.* [13] focused on the effects of a chlorhexidine bathing solution used consistently compared to a non-chlorhexidine bathing solution. Involved with this study were patients with central lines. The study was a controlled cohort study that supplied one group of patients with a 2% chlorhexidine bathing solution and the control group with a non-chlorhexidine bathing solution. The non-chlorhexidine solution was considered the hospital's “usual” bathing practice. These solutions were used in the daily bathing of the patient; they were not used for central line dressing changes. They found that there was a 60% decrease in gram-positive cocci bacteria on the central line with the patients who used the chlorhexidine bathing solution in their daily bathing practice [13].

### **Uses Beyond Skin Bathing**

Chlorhexidine is also quite effective when used for oral care. Kes *et al.* [5] studied the effects of using 0.12% chlorhexidine three times a day on ventilated patients. This was done to determine whether using 0.12% chlorhexidine was better than using sodium bicarbonate for the prevention of VAP and VAT. While no significant difference was seen in the two groups in terms of VAT prevention, there were improved outcomes in terms of VAP prevention in the group that was

given oral care with chlorhexidine 0.12%. They concluded with the suggestion that nurses in intensive care units may want to consider adopting the use of chlorhexidine for frequent oral care in ventilated patients [5].

Recently there has been an increase in the use of chlorhexidine-impregnated dressings for central lines. Wei *et al.* [9] did a meta-analysis on the use of these dressings. The research consisted of studies that have been done on these dressings the last for 20 years. They compared the chlorhexidine dressings with a control group. After the analysis, the authors realized that the rate of catheter-related bloodstream infections (CRBSIs) was 15% for those who had the chlorhexidine dressings versus 26.3% for those who were in the control group. This data demonstrates the use of chlorhexidine in dressings can dramatically decrease the risk of hospital-acquired infection in those with central lines [9]. Some uses of chlorhexidine as observed in the literature are listed in Figure 3.

Chlorhexidine Antiseptic Used	for oral care
	for skin bathing
	for ventilated patients to prevent VAP
	for central line dressing
	for indwelling catheters
	for preventing post-op infections
	for cleaning skin or wound
	for using before surgery or injection
	for cleaning the hands

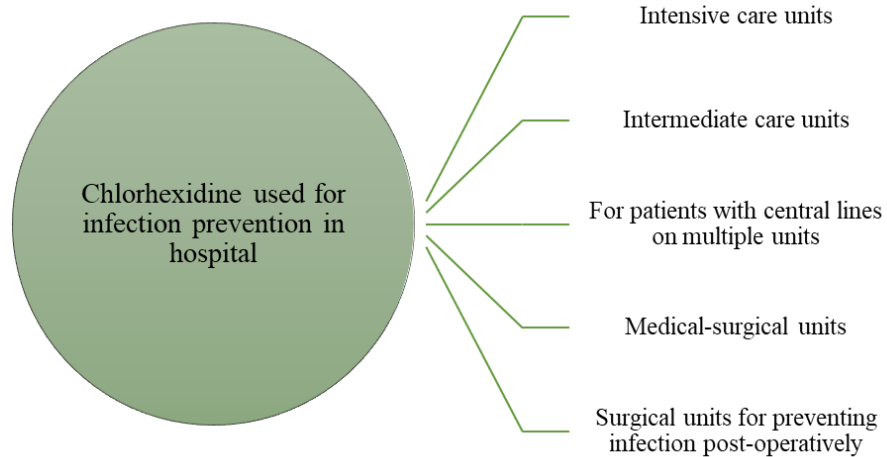
**Figure No. 3: Uses for chlorhexidine antiseptic**

### Infection Prevention on Different Floors

The research overwhelmingly showed that chlorhexidine has its place in infection prevention on any type of floor. Kes *et al.* [5] did their research on an ICU. Schmutde *et al.* [7] did their study

on an intermediate care unit. In their meta-analysis, Musuza *et al.* [14] looked at 26 different studies done in multiple units in both ICUs and non-ICUs. In yet another meta-analysis, Wei *et al.* [9] looked at multiple studies that included multiple floors in the hospital. They focused on patients with central lines who were given chlorhexidine dressings. These studies showed chlorhexidine helps with infection prevention. Gouda *et al.* [15] found that healthcare professionals carry their stethoscopes to multiple units. Stethoscopes are a potential vector for healthcare-associated infections worldwide. Ethyl alcohol (EA), isopropyl alcohol (IPA), and chlorhexidine are widely used for disinfecting stethoscopes, however, comparative analysis of these disinfectants is scarce [15]. The microbial growth varies in various departments. Disinfecting a stethoscope with 70%-IPA for just 30 seconds is equally efficient compared to 1 minute and IPA was superior to EA and CH for decontaminating stethoscopes [15].

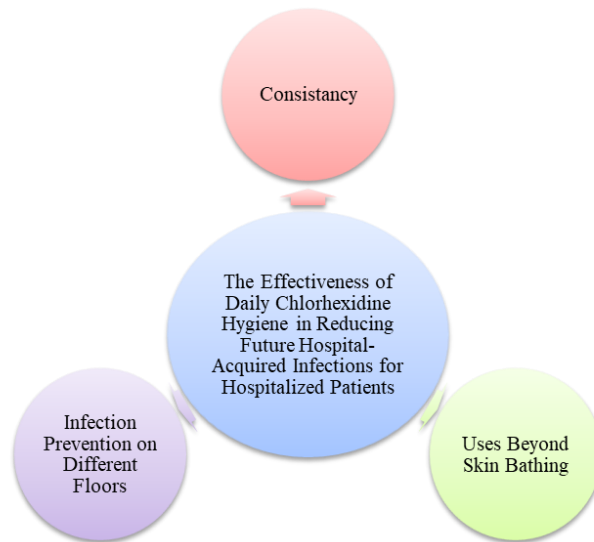
Scallan *et al.* [10] took a different approach when they looked at preoperative patients in a military hospital that was on a medical-surgical unit. In all these studies, the use of chlorhexidine decreased the incidence of hospital-acquired infection (see Figure 4). This data indicates that the use of chlorhexidine has its use in any type of patient care setting, not just intensive care units. Wade *et al.* [16] studied the comparison of chlorhexidine gluconate and povidone-iodine used as antiseptics for the prevention of infection in clean surgery. The study included 14,583 adults who were undergoing clean surgeries. The study found chlorhexidine gluconate to be twice more effective in preventing infection post-operatively than povidone-iodine. Chen *et al.* [17] also indicated in their systematic review that chlorhexidine was superior to povidone-iodine in preventing postoperative surgical site infections, especially for clean-contaminated surgery.



**Figure No. 4: Chlorhexidine is used for infection prevention on different floors**

### Summary of Findings

While many pros and cons for chlorhexidine were mentioned in the literature, the top three were positive. The main finding was that using chlorhexidine with patients consistently was key. The second most mentioned was that chlorhexidine has uses beyond bathing the skin. The third was that the infection prevention was consistent across both ICU and non-ICU hospital floors. Figure 5 shows the main findings as they correspond with the PICO question.



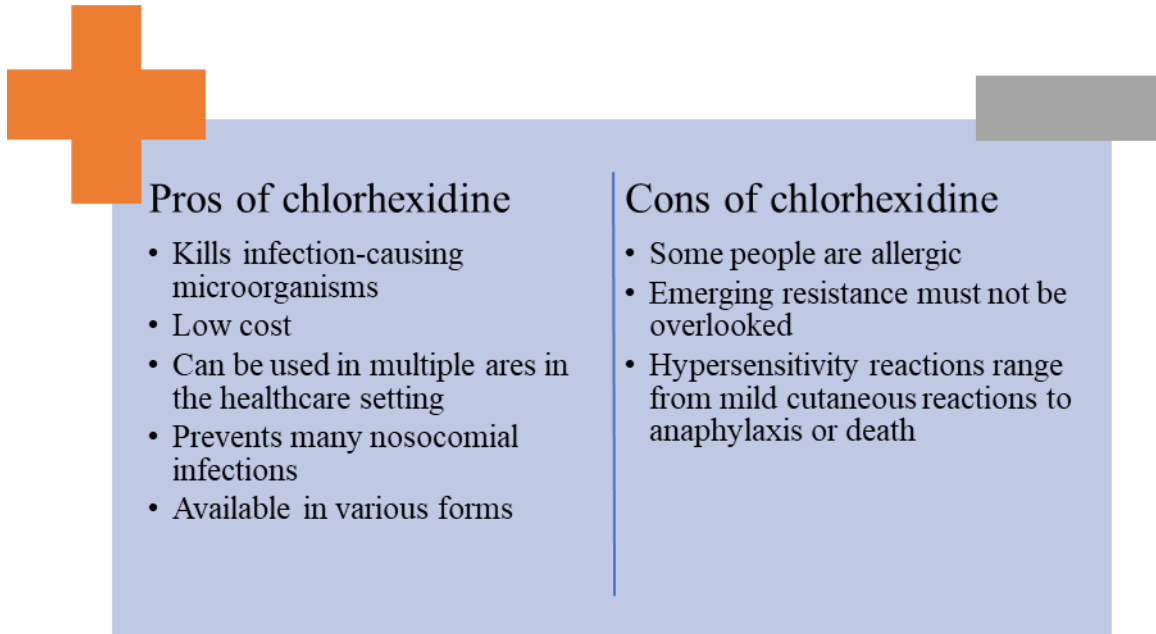
**Figure No. 5: The effectiveness of daily chlorhexidine hygiene in reducing future hospital-acquired infections for hospitalized patients**



## DISCUSSION

While performing the literature review, it became apparent that there were both strengths and weaknesses in the sources that were used. In addition, recommendations were found that could affect the care nurses provide going forward. A randomized controlled trial focused on clean intermittent catheterization for 23 children [18]. The study compared the use of chlorhexidine versus sterile water during cleanings of an intermittent catheter. The studies showed no significant differences in infection rates from those who used chlorhexidine compared to those who used sterile water to clean their catheter. This may indicate that chlorhexidine is not effective in every situation. In another study Abbas and Sastry [19] warned, with the widespread use of chlorhexidine as a disinfectant in the healthcare setting, emerging resistance must not be overlooked.

Nine studies suggest chlorhexidine is effective when used consistently. When daily chlorhexidine bathing is used, it is shown to decrease hospital-acquired infections by 52% [11]. Using chlorhexidine reduces the overall hospital-acquired infection rate when used consistently. Furthermore, research shows that the cost of chlorhexidine is worth the investment. Schumde *et al.* [7] discovered that the cost for their chlorhexidine hygiene program for those with urinary catheters costs between \$13-28 dollars per treatment. However, the cost of a catheter-associated urinary tract infection (CAUTI) cost over \$700. With this data, hospitals can justify the cost of using chlorhexidine as prophylaxis to avoid shelling out large sums of money needlessly for the treatment of hospital-acquired infections. From a cost-effectiveness point of view, we could recommend the routine use of chlorhexidine solution for patients in intensive care units [20]. The pros and cons of using chlorhexidine are shown in Figure 6.



**Figure No. 6: The pros and cons of using chlorhexidine**

Non-compliance with teachings on the importance of chlorhexidine bathing has led to an increase in infection. Knobloch *et al.* [21] study found that due to a lack of education on chlorhexidine bathing, healthcare providers were not giving chlorhexidine baths. This led to an increase in infections in the hospital setting. Consistency and solid patient education are needed for chlorhexidine to be effective or else it does not work. This may mean additional staff training to ensure that they are completing the appropriate chlorhexidine treatments and charting.

Many searches were performed to find the studies, and only the ones from the top four tiers were chosen. In addition, the meta-analyses had data that was researched over the last two decades and has been implemented as evidence-based practice in multiple hospitals. A variety of data were found to get a diverse amount of research. This included research done in different hospitals on a wide array of floors. Collecting data high on the hierarchy of evidence ensured that the data were as reliable and well-researched as possible.

## **RECOMMENDATIONS**

Based on this literature review, the recommendation would be that every hospital implements a chlorhexidine hygiene protocol for all patients without an allergy to chlorhexidine to prevent

infection. The cost of using chlorhexidine to prevent infection versus the hospital paying for the treatment of hospital-acquired infections is significant.

## CONCLUSION

The use of chlorhexidine in bathing techniques does reduce hospital-acquired infections. To reach the full potential of chlorhexidine, caregivers must be consistently using it in daily care. Chlorhexidine has also shown effectiveness in preventing ventilator-acquired pneumonia when used three times a day and when used in impregnated wound care dressings. Non-compliance with chlorhexidine and chlorhexidine education can lead to an increase in hospital-acquired infections. Therefore, healthcare workers should be educated on the importance of consistency and accurate use of chlorhexidine.

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