ORIGINAL ARTICLES

Does a one hour educational class improve compliance of chlorhexidine gluconate baths prior to operation?

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ABSTRACT

Background: Surgical site infections (SSIs) continue to be a major contributor to morbidity and mortality post-operatively. One of the treatments used to prevent such infections is chlorhexidine gluconate (CHG) baths prior to surgery. An obstacle to using CHG as a pre-operative preventative measure to infection has been the low patient compliance rates. Our study aimed to analyze whether an educational class explaining the proper usage of CHG prior to the surgery date will improve patient compliance.

Methods: We evaluated two different groups. One group consisted of patients who were scheduled for total joint arthroplasty (TJA) and attended an educational class in addition to receiving the standard preoperative protocol explaining the proper application of CHG. A second group consisted of subjects undergoing any other type of surgery but was not offered the additional educational class.

Results: Subjects undergoing TJA had a higher compliance rate than all other surgeries (95.8% and 77.8% respectively; $p < .001$). Interestingly, throughout time, the effectiveness of the educational class to improve compliance also improved (from 90.9% in the first month to 100% in the final month; $p < .001$).

Discussion: The addition of an educational class to the standard preoperative educational protocol significantly improved patient compliance to the preoperative application of CHG in TJA Patients, and increasingly so overtime. This suggests the importance of proper patient education in the prevention of costly comorbidities such as infection.

Conclusions: The use of instructional classes may be useful for improving compliance to patient protocols prior to undergoing surgery. Further research is needed to fully assess the benefits of educational classes and their correlation to patient compliance.

Key Words: Chlorhexidine bathing, Infection prevention, Patient compliance, Patient education, Total joint arthroplasty, Quality improvement

1. INTRODUCTION

Surgical site infections (SSIs) are a major contributor to morbidity and mortality in postsurgical care.[1] Although there has been an increase in awareness of the risk of perioperative infections, SSIs remain one of the most common perioperative complications.[2] SSI's are known to complicate up to 10%-20% of surgical operations in general,[3] and up to 25% of orthopedic surgeries.[2] Despite being a common and highly successful surgical procedure, total joint arthroplasty (TJA) is a known risk factor for perioperative SSI,[4] which occur in 1%-2% of these procedures.[5–7]

This problem is compounded by the fact that TJA procedures are predicted to increase by 673% (3.48 million) and 174% (572,000) for total knee arthroplasty (TKA) and total hip arthroplasty (THA), respectively, over the next decade.[8] Given the prevalence of SSIs in TJA, these complications

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will continue to be a major financial burden to our healthcare system. According to the Center for Disease Control and Prevention (CDC) and Consumer price index (CPI), it is believed that SSI's currently account for $3.5 billion to $10 billion a year in healthcare expenditures.[9]

One common method of preventing SSI's is the use of chlorhexidine gluconate (CHG) baths. CHG is a topical antiseptic used to limit the risk of SSI's and healthcare-associated infections (HAIs) by disinfecting the skin of patients before surgery.[10,11] CHG is considered an affordable option with minimal side effects. Except for rare cases of anaphylaxes, side effects are typically limited to localized skin irritations and reactions.[12] Unfortunately, as CHG use is practiced in an outpatient setting, low compliance is a common problem.[13] This stems from a number of different reasons: the improper monitoring of CHG protocols, failure of patients to remember to apply the prescribed CHG treatment, and patients' lack of understanding regarding the proper use and medical benefits of using CHG.[12]

Patient education and opportunities for patients to play a larger role in their own care has historically shown to improve compliance to preoperative protocols.[12] However, there is uncertainty with respect to the optimal methods of implementing such measures. As such, the aim of our study is to examine the effect of an educational class in improving patient CHG compliance. Specifically, we compared patients who attended an educational class regarding the proper use of CHG prior to their TJA compared to patients who had surgery, but did not attend this educational class. We hypothesize that the addition of this educational class will have a significant increase in patient compliance to CHG use.

2. METHODS AND MATERIALS

2.1 Study design

This is an observational retrospective cohort study, which was conducted as part of a quality improvement initiative at an urban, academic, tertiary care center. Given that this was a quality control study; it was exempt by the Institutional Review Board (IRB). Using the data provided from the hospital, we studied the difference in patient compliance to CHG use between two groups: patients scheduled for THA or TKA, who attended an educational class prior to surgery, versus patient who did not attend an educational class prior to any surgery.

All patients included in this study were given a package containing one 4-ounce bottle of 4% CHG all-purpose soap (Ecolab, St. Paul, Minneapolis) and verbal instructions for its use. The patient obtained this instruction set and was verbally instructed, by a nurse, on the proper use of the CHG soap during a scheduled meeting that occurred 2 to 8 weeks before the surgery date. In addition, patients having THA/TKA were asked to attend a supplementary one-hour educational class, which included proper use of CHG soap. This class occurred between their initial scheduling visit and the patient's surgery date. As an additional component of the class, the joint replacement patients received instructions and were reminded of the importance of proper application during the patient's preoperative evaluation by the joint replacement preoperative clinic staff. Patients from the other cohort, which included any type of non-arthroplasty procedure, did not attend this class, or receive any additional instruction.

2.2 Inclusion criteria/exclusion

All patients having scheduled elective surgery from July 2013 to February 2014 were surveyed about their use of CHG soap upon their arrival at the hospital the day of their surgery. Patients were excluded for one of four reasons: (1) trauma and/or emergency cases, (2) Patients that were transferred to the operating room directly from a unit of the hospital, none elective surgery, (3) patients who experienced an allergic reaction or adverse skin reaction, (4) patients who did not take at least three consecutive showers with CHG soap just prior to their surgery date, which was a requirement per the preoperative protocol, were considered noncompliant and treated the same as patients who reported complete noncompliance.

2.3 Statistical analysis

Descriptive statistics were used to quantify compliance rates and interventions implemented. A chi-squared analysis was used to determine if there was a significant difference between compliance rates of each group. All data was collected and statistical analysis was performed using Excel software (Microsoft Corporation; Richmond, WA, USA).

3. RESULTS

From July 2013 to February 2014, we surveyed 4,181 patients who underwent elective surgical procedures. Two groups were involved in this study: (1) 138 TKA or THA candidates, (2) 4,043 patients who were scheduled for a surgical procedure other than THA or TKA.

3,792 patients had surgery once during this time period; 342 patients had surgery twice during this time period; 49 patients had surgery three or more times during this time period – the maximum number of surgeries for a single patient in this time period was 5 (see Table 1). Two patients had a hip or knee arthroplasty as well as an unrelated surgery during this time period. 138 patients had total or revision hip or knee arthroplasty for a total of 168 procedures. 4,043 patients had any other type of surgery for a total of 4,525 cases (see Table 1).

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Table 1. Number and type of procedures per patient during the study period

Procedure Type	1 Procedure	2 Procedures	> 3	*p*-value
Hip or Knee Arthroplasty	120	17	1	.176
Other Surgery	3,672	324	47	
Total	3,792	341	48	

Table 2. Compliance rate by procedure type/educational class attendance

Type of surgery	Compliant	Non-Compliant	Total	*p*-value
Hip or Knee Arthroplasty	161	7	168	< .0001
Any other type of Surgery	3,519	1,006	4,525	
Total	3,680	1,013	4,693	< .0001

Patients from Cohort 1 reported a compliance rate of 95.8% (161/168 procedures) compared to the 77.8% (3,519/4,525 procedures) rate reported in Cohort 2 ($p < .001$) as an average rate over the 8-month period (see Table 2). Eighteen (0.4%) patients reported either a CHG allergy or an adverse skin condition, and thus discontinued use prior to completion of the protocol. Over the 8-month course that the study took place, compliance rates were consistently high in the TKA and THA group, while rates steadily increased in the "Other" group over time (see Figure 1). An upward trend was observed in the "Other" group which showed an increase from 64.0% total compliance in the first month to 87.1% by the last month. Compliance rates in Cohort 1 improved from 90.9% during the first month to 100% compliance by the final month.

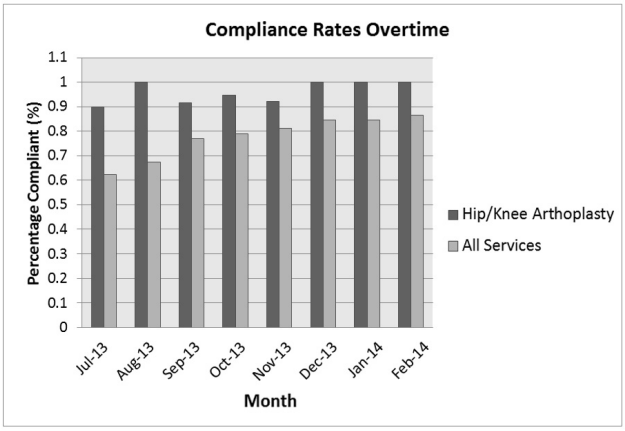

Figure 1. Chlorohexidine gluconate shower compliance rate over the study period

4. DISCUSSION

CHG baths are a commonly prescribed method to safely decrease the rate of infection in surgical procedures.[13–15] There have been varying reports in the literature regarding the effectiveness of preoperative CHG use in reducing infection amongst the TJA population.[16–18] A study by Leaper et al. supported that the use of 2% CHG as a preoperative deterrence of SSIs. The study showed a reduction of SSI's in all classes of surgery where there were no wound guards in place, and where diathermy skin incision techniques were not used.[3] A study conducted by Eiselt et al. found that the rate of SSI was reduced by half in orthopedic patients undergoing TJA when using a 2% CHG no-rinse cloths when compared to the use of Betadine.[19]

Other studies have attempted to explain the low compliance rates observed with CHG use. Edminston et al. cited apathy, lack of interest, or the lack of patient understanding on the importance of applying the soap.[13] In another study, focusing on Emergency Department communication between the physician and the patient, Karin Rhodes proposes that the limited time spent during provider-patient encounters did not allow for sufficient patient education to be delivered.[20] Future studies should asses the details of the patient-provider relationship and how this affects patient compliance on various preoperative protocol requirements.

A study by Edminston et al. proposed that failure to provide patients with an easy to follow system when applying CHG treatment is responsible for the following issues faced by patients: failure to understand administrative instructions, physical limitations (e.g., pain, restricted range of motion), use of unfamiliar medical jargon, social isolation, language barriers, low educational levels/illiteracy, and socioeconomic status.[21] This suggests that patients require more information about the importance of applying CHG preoperatively. This was corroborated by a study, conducted by Machoki et al.,[22] which analyzed whether patient education, patient counseling, or a mixture of the two would increase compliance rates for patients prescribed tuberculosis treatment. The study found that education and/or counseling may increase compliance; however, compliance rates may vary according to the level of intervention.[22] Overall, studies which have

observed the relationship between educational classes and compliance have found a small increase in compliancy with regards to the implementation of an additional educational class.

These findings from previous studies partially support the current study's results. As suggested by these previous studies, lesser degrees of education received by patients from their care providers may contribute to poor patient compliance to preoperative protocols. In a way, the current study supports these findings as a correlation between higher compliance rates in patients who attended a one-hour class was observed (95.9% versus 77.8%; $p < .001$). Furthermore, we found that the effectiveness of the educational class increased as time went along (from 90.9% compliance during the first month to 100% compliance in the final month). This increase in compliance may indicate improvement in teaching methods overtime, supporting the notion that "how" rather than "what" is taught in these educational classes may be the most important indicator of the effectiveness of this educational class. Interestingly, however, although the absolute compliance rates were not as robust in the cohort that did not attend the educational class, they experienced a greater increase in compliance rates over the course of the study compared to the educational class cohort (see Figure 1). One possible explanation could be that we didn't control for changes in the existing preoperative work-up in the cohort, and the study did not account for. This may have come in the form of surgeons simply putting more emphasis on the importance of CHG application during preoperative clinic visits. Nevertheless, this phenomenon complicates the question regarding just how much of an impact an educational class has in improving compliance rates. This has led the authors to suspect that deeper underlying factors pertinent to both cohorts may be the cause of the improvements observed.

There were a few limitations to this study. First, patients were not controlled for the type of procedure they were receiving. All patients who attended the educational class were also total knee and hip arthroplasty patients, while those that did not attend had other procedures. This is a potential confounding factor. Furthermore, subjects were assessed for their compliance rates but the reason for their compliance or lack thereof was not recorded. Such information could have allowed us to evaluate the relationship between the educational class and its direct influence on SSI's. The study also did not account for outside resources that patients may have referenced regarding CHG use, whether it be from literature online, or from an individual outside of our facilities. These extra resources may have affected the patient's perspective on CHG, and was a variable that we did no control for. Another source of limitation is that this study relied on patient self-reports on their CHG usage, which may have led to an over-estimation of compliance. The intention of this study was to be a quality improvement project. As such, we did not obtain the IRB approval to view individualized patient information (e.g., linking which patients attended the educational class to which patients were compliant to CHG application), but rather obtained compliance rates of each cohort as a whole. This is a limitation of the study as it prevented us from completing more complex statistical analyses such as odds ratios, which would have helped assess the role the educational class had in affecting compliance rates. Finally, the study did not account for patients who had already used CHG in a prior procedure. These particular patients have had experience with applying the CHG in the past, thus improving their knowledge on the proper application and importance of its use, ultimately affecting compliance within this group of patients. A secondary exposure to the use of CHG may have allowed for a better understanding for those specific patients and may have effected their compliance.

5. Conclusions

In conclusion, we found that there is an association between the attendance of an educational class and improved compliance to CHG application prior to surgery. Based on similar studies, this notion is supported and the addition of patient education plays a vital role in increasing patient compliance. However, we cannot separate the fact that all patients who received this class were TKA and THA patients. Therefore, while we feel that educational classes are beneficial to improving the compliance rates to preoperative instructions, additional research is needed to further evaluate the details that are directly responsible for this improvement.

Conflicts of Interest Disclosure

The authors declare they have no conflict of interest.

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