

Comparative effect on skin bacterial counts of three surgical skin preparations

Chlorhexidine Gluconate 2% v 70% alcohol v a 5th generation SiQuat.

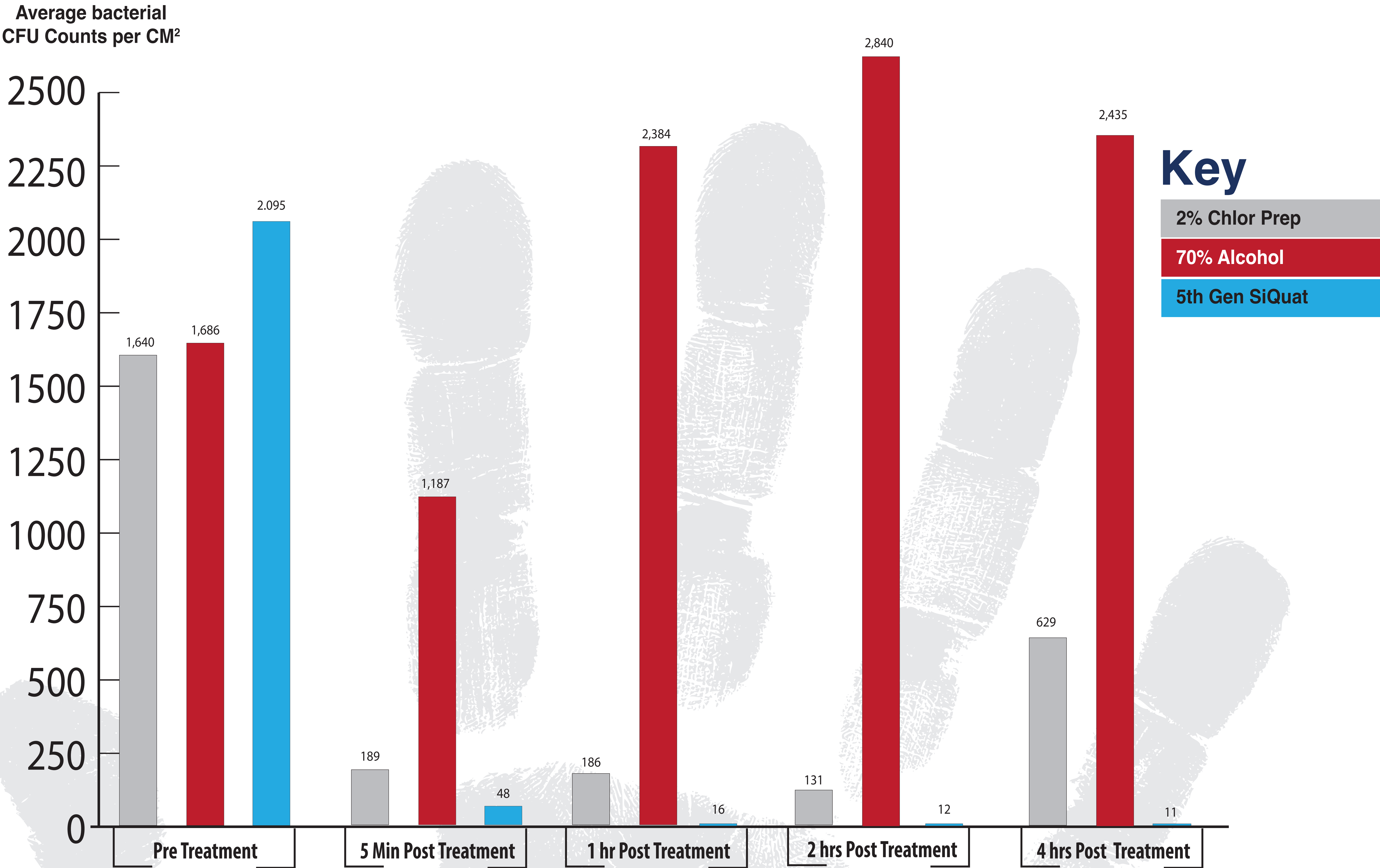
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Introduction

The significance of skin flora around surgical wounds and its direct/ indirect effect as a cause of Surgical site infections (SSI's) have been well documented and recommendations made by agencies such as the US CDC and NICE in the UK. There have been several papers claiming significant reductions in the rates of surgical site infections by changing from the CDC recommended 0.5% Chlorhexidine (CHG) or Povidone Iodine (PI) solution to a 2 % Chlorhexidine in alcohol solution. The patient outcome results of these studies have recently been brought into question. This study of bacterial colony counts on surgical sites includes, Chlorhexidine 2% in alcohol (ChloraPrep), a 5th generation long acting Silane Quaternary compound (SiQuat) and a 70% alcohol solution with no other active ingredient.

Comparison of 3 types of surgical skin prep solution



Each group had 100 test sites and an average CFU count was taken from each group

Method

The authors chose the commonly used area of the longitudinal mid line incision of the abdomen as the area to sample. This area has also been used for many studies looking at levels of bacterial contamination. Comparison studies into bacterial colony counts have already been undertaken showing 2% CHG to be more effective than either 0.5% CHG or PI, therefore the authors felt any study should use 2% CHG as the gold standard. The authors considered the most relevant times for sampling of bacteria counts during a surgical procedure to be after 5 mins, 1hr post, 2 hours post and 4 hours post. The reason for these times is that aside from the emergency operating theatre, it is highly unlikely that if surgical skin prep is used correctly, “knife to skin” will take place within 5 mins of the skin prep being applied. This means that the most relevant time to test initial effectiveness is approximately 5 mins post application. As most orthopaedic primary joint replacements take from between 45 mins to 1 hour 15 mins, it was determined that 1 hour would be the optimal time to sample. Although 2 hours post application is not necessarily a critical time in respect to wound infection rates, it was chosen to determine if there could be a predictable curve for any increase in bacterial counts. According to the US CDC, CHG remains active for 4 hours on the skin.

Patients were separated into 3 groups of 100. A total of 300 samples were taken from areas of abdominal skin 2 cm x 1 cm along the mid line running superior to inferior using a sterile technique. These areas were marked to ensure that further samples were taken from the same areas. A sample from each area was taken prior to any skin prep being used and a surface count recorded using a rapid metabolic live bacteria specific assay. All areas were prepared for surgery using one of the chosen skin antimicrobial preparations. Due to colour variations in the liquid preparations, it was impossible to blind the study. No patients in the study used a specific antibacterial shower preparation prior to the surgical skin preparation.

Results

The results showed that the long acting SiQuat not only killed more quickly than the Chlorhexidine Gluconate 2%, it continued to do so more effectively for each of the time periods up to and including 4 hours after application. Alcohol although effective initially had a negative impact compared to the chlorhexidine solution over time, a phenomenon also seen in a recent study comparing hand sanitizers. Chlorhexidine 2% solution showed loss of efficacy at 4 hours.

Conclusion

These results demonstrate that 70% alcohol on its own should now be considered an inadequate surgical skin preparation. For operative procedures of 2 hours or more in duration, 2% CHG in alcohol may now also be considered to be inadequate as a surgical skin preparation. The surgical skin preparation that was shown to be most effective at every measuring point from application over the course of 4 hours is the 5th generation SiQuat.

Discussion

The results of this study further questions the validity of the conclusions that simply changing the concentration of a CHG solution could have had the effect on patient outcome reported in the previous studies. The results of this study also bring into question the value of patient outcome studies relating to infection control and in particular surgical site infections. We should now question how valuable patient outcome studies are in determining the most effective infection control products to use? A much relevant question now therefore is “what kind of evidence should clinicians be using as acceptable proof of product efficacy, and how does that relate to reducing infection rates post-surgery?”