Title: Examining a Common Error in Surgical Site Preparation of the Upper Extremity
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Introduction: Surgical site infections (SSI) are one of the most frequently occurring nosocomial infections and are associated with elevated healthcare costs and mortality rates. Most facilities have standardized protocols regarding surgical skin preparation, but they may be lacking in operation-specific details and/or staff adherence. Proper surgical skin preparation, particularly with a colored antiseptic material, can decrease the chances of SSI, indicating that visualization can be a crucial factor. We sought to determine which specific skin areas were most commonly missed and any potential compliance pitfalls that occur during preoperative antiseptic administration of the hand, wrist, and forearm.
Methods: We observed the skin preparation of the hand, wrist, and forearm prior to surgery by one upper extremity orthopedic surgeon over a 6-month period at a single outpatient surgical center. Standard, tinted chlorohexadine was applied by the nurse while holding or supporting the limb. The surgeon evaluated the limb once the nurse stated that prepping was complete. The adequacy of the prep and the order in which it was applied was recorded, as well as a generalization of the nurses' standing position. As a secondary follow-up study arm, a survey was conducted after 30 months with nursing staff, evaluating their knowledge of the surgical center's protocols and their familiarity with this project and its results.
Results: 156 procedures were included. In all cases, prepping began at the skin closest to the nurses' standing position (not at the incision), and concluded at the furthest. 32 limbs were noted to be inadequately prepped, having an area of skin without any applied tint. In all of these, the area missed was a longitudinal swath directly 180 degrees from the nurse's static, standing position (Figure 1). In the other 124 cases, the nurse was noted to have repositioned, and no spots were missed, although the order of prep was unchanged. The study was concluded prematurely at 6 months, as word of the observation spread, and staff began to reposition to prep the commonly missed area. Thereafter, no further missed areas were noted; however, the prepping order remained unchanged. Follow-up survey results (n=10): 60% admitted knowledge of this study; of those, 100% correctly identified the area commonly missed. 80% correctly stated that the incision was the starting site for prepping; however, none did so in practice. 40% and 30% stated they 'routinely' or 'sometimes' repositioned during prepping, respectfully. 90% of nurses were at least 'somewhat familiar' with the center's prepping protocol, yet varied where to begin skin prep. Those who were 'extremely familiar' (60%) all correctly identified the incision as the site to begin prepping.
Discussion: Care should be taken when preparing the upper extremity, particularly the area 180 degrees from the standing position of the personnel preparing the skin. This area is likely commonly missed merely because it is the furthest away and cannot be seen without repositioning. We recommend routinely repositioning to the opposite side during antiseptic administration when possible. Although the surgical center protocol specifies to start prepping "at the incision site", this lacks specific positioning instructions. The awareness of the study amongst staff, by both direct intervention by the practicing surgeon and likely word-of-mouth spread, served as a therapeutic intervention and caused the study to end early. Based on our findings, simple reminders may be all that is necessary to avoid missing these areas of skin when prepping, as staff were able to self-correct. Similarly, it is likely that peer-to-peer teaching led to the perpetuation of improved habits. Follow-up evaluation showed this self-correction to persist long term.
Significance/Clinical Relevance: When prepping in a static position, the area directly 180 degrees away is most commonly missed entirely, likely because it is not visible without repositioning. Through periodic re-training of protocols and encouragement to reposition, we have shown that staff are able to self-correct, decreasing this common error, with the effects persisting at least 30 months.


Figure 1