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PREOPERATIVE HAIR REMOVAL: IMPACT ON SURGICAL SITE INFECTIONS

MINI-VIGNETTE

Ms. CG is the circulating nurse assigned to operating room (OR) # 3 today, where Dr. Jones has three orthopedic cases (all of which are total joint replacements) scheduled. The first case is a right total knee arthroplasty on a 57-year-old man, Mr. SK. As Ms. CG greets Mr. SK in the preoperative holding area to do her initial assessment and chart review, he informs her that he shaved his right leg last night at home since his cousin had the same surgery last month and told him that he needed to shave his leg the night before surgery. He adds that he didn't have a new blade in his razor, so it was "a little rough." Ms. CG asks Mr. SK what instructions he received from Dr. Jones regarding preoperative preparation; he replies that he recalls that he was given a sheet with instructions, but somehow had misplaced it at home as he prepared for the procedure. Ms. CG assesses Mr. SK's right leg and notices that the skin immediately surrounding the knee area is red and also that there are multiple nicks and abrasions on the surface of the skin; she proceeds to page Dr. Jones to let him know about the condition of Mr. SK's skin at the operative site.

SURGICAL SITE INFECTIONS

Perioperative Patient Implications

Preventing the development of a surgical site infection is a goal of every member of the perioperative team. The Perioperative Nursing Data Set (PNDS) includes, "The patient is free from signs and symptoms of infection" as one of the expected perioperative patient outcomes.¹ For the surgical patient, there are numerous factors that may increase his/her risk for the development of a surgical site infection (SSI). One area that has gained increased recognition in recent years is that of preoperative hair removal. While once accepted as the standard of practice for the majority of surgical procedures, hair removal is now being reconsidered with regard to research findings. This study guide will review the impact of surgical site infections (SSIs) and the role of preoperative hair removal as an infection prevention strategy.

Surgical site infections remain a significant source of patient morbidity and mortality, extended hospital stays, and increased healthcare costs. In the United States, of the estimated 27 million patients who undergo surgical procedures annually, approximately 500,000 will suffer an SSI; additionally, 10,000 deaths are associated with SSIs on an annual basis.² SSIs are the third most frequently reported healthcare-associated infection (HAI), accounting for 14% to 16% of all HAIs among hospitalized patients.³ Surgical site infections may result in as many as 3.7 million extra hospital days and increased health care costs of more than \$1.6 billion per year.⁴ An estimated 40% to 60% of SSIs are preventable.⁵ By implementing projects to reduce SSIs, hospitals could

recognize a savings of \$3,152 and a reduction in extended length of stay by seven days for each patient who avoids an infection.⁶

Definitions of Surgical Site Infections

For the purpose of standardized reporting, SSIs have been classified and defined by the Centers for Disease Control and Prevention's (CDC) and the National Healthcare Safety Network (NHSN) as superficial incisional SSIs, deep incisional SSIs, and organ/space SSIs. These definitions are detailed in Table 1.

Table 1 - Definitions of SSIs⁷

Superficial Incisional SSI

- Infection occurs within 30 days of the operation.
- Infection involves only skin or subcutaneous tissue.
- At least 1 of the following:
 - Purulent drainage
 - Positive culture from the incision
 - At least 1 symptom of infection (pain or tenderness, localized swelling, redness, heat) and incision is opened by surgeon, unless incision is culture-negative
 - Diagnosis of SSI by surgeon or attending physician

Deep Incisional SSI

- Infection within 30 days of the operation if no implant is left in place or within 1 year if implant is in place and the infection appears to be related to the operation.
- Infection involves deep soft tissues.
- At least 1 of the following:
 - Purulent drainage from the deep incision but not from organs/spaces associated with the surgical site
 - Spontaneous dehiscence of deep incision or deliberate opening by a surgeon when the patient has at least 1 symptom of infection (fever, localized pain, or tenderness), unless site is culture-negative
 - Abscess or other evidence of infection involving the deep incision found on direct examination, during reoperation, or by histopathology or radiography
 - Diagnosis of SSI by surgeon or attending physician

Organ/Space SSI

- Infection within 30 days of the operation if no implant is left in place or within 1 year if implant is in place and the infection appears to be related to the operation.
- Infection involves any part of the body, excluding the skin incision, fascia, or muscle layers that are opened or manipulated during the operative procedure.
- At least 1 of the following:
 - Purulent drainage from drain placed into the organ/space
 - Positive culture of fluid or tissue from the organ/space
 - Abscess or other evidence of infection involving the deep incision found on direct examination, during reoperation, or by histopathology or radiography
 - Diagnosis of SSI by surgeon or attending physician

Causes of Surgical Site Infections

The two primary groups of microorganisms found on the skin are:

- resident flora – those microorganisms that normally reside in the superficial layers of the skin
- transient flora - the microorganisms that reside temporarily on the skin

For any given individual and location on the body, the resident flora are relatively stable in both number and composition. They do, however, vary in type and population among various body locations. Resident flora reside primarily in the stratum corneum and in the outermost layers of the epidermis; they are consistently cultured from the skin of all people. Transient flora lie on the surface of the skin, come from exogenous sources, and vary widely in type and population.

Microbial contamination of the surgical site is a prerequisite for an SSI; the risk of an SSI increases with the dose of bacterial contamination and the virulence of the bacteria.⁸ The source of microbial contamination of the surgical site may be either the endogenous microorganisms (as noted above, the bacteria from the patient's own skin, mucous membranes, or hollow viscera) or exogenous microorganisms (as noted, the microorganisms from healthcare personnel, the environment, surgical instruments and other materials); most SSIs are caused by the patient's own bacterial flora.⁹ When introduced into body tissues by surgery or through medical devices such as intravenous catheters, the pathogenic potential of endogenous microorganisms increases.

The development of a surgical site infection in a patient depends on the types, numbers, and virulence of the microorganisms contaminating the wound, and on the resistance of the patient. It has been shown that the risk of an SSI increases significantly if a surgical

site is contaminated with greater than 10^5 (100,000) microorganisms, but the dose required for an infection may be considerably lower if a foreign material (for example, sutures) is present at the surgical site.¹⁰ In general, the risk of an SSI is defined as:¹¹

$$\frac{\text{Dose of bacterial contamination} \times \text{virulence}}{\text{Resistance of the host patient}} = \text{Risk of surgical site infection}$$

NATIONAL INITIATIVES, PATIENT SAFETY GOALS, AND RECOMMENDED PRACTICES

In response to these staggering statistics, several national agencies and organizations have promulgated infection prevention initiatives, patient safety goals, and updated recommended practices. Several of these, specific to preoperative hair removal, are outlined in greater detail below.

Compendium of Strategies to Prevent Healthcare Acquired Infections (HAI's) in Acute Care Hospitals

To assist acute care hospitals in focusing on prioritizing efforts to implement evidence based practices for prevention of HAI's, the Society for Healthcare Epidemiology of American and the Infections Diseases Society of America and Practice Guidelines Committee appointed a task force to create a concise compendium of recommendations for the prevention of HAI's. These recommendations are in a practical, concise format designed to help hospitals prioritize their HAI prevention efforts.

The compendium recommends in the section for Preventing SSI's to:

- Do not remove hair at the operative site unless the presence of hair will interfere with the operation, do not use razors (A-II)

The following table was designed to show the strength and quality of every recommendation, referenced above, so the clipping recommendation is a well supported strong recommendation that's easy to implement.¹²

Table 2. Strength of Recommendation and Quality of Evidence

Category/grade	Definition
Strength of recommendation	
A	Good evidence to support a recommendation for use
B	Moderate evidence to support a recommendation for use
C	Poor evidence to support a recommendation
Quality of evidence	
I	Evidence from ≥ 1 properly randomized, controlled trial
II	Evidence from ≥ 1 well-designed clinical trial, without randomization; from cohort or case-control analytic studies (preferably from >1 center); from multiple time series; or from dramatic results from uncontrolled experiments
III	Evidence from opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees

Surgical Care Improvement Project: CMS/CDC

One of these national initiatives is the Surgical Care Improvement Project (SCIP), which is co-sponsored by the Centers for Medicare and Medicaid Services (CMS) and the CDC. The primary goal of SCIP is to reduce the incidence of surgical complications by 25% by the year 2010.¹³ One entire section of the SCIP protocol is dedicated to prevention of surgical site infections. Surgery patients with appropriate hair removal (SCIP INF 6) is one area of focus outlined in the SCIP protocol.¹⁴

Guideline for Prevention of SSI: CDC/HICPAC

In 1999, the CDC's Hospital Infection Control Practices Advisory Committee (HICPAC) published its Guideline for Prevention of Surgical Site Infection. This guideline remains the definitive work on evidence-based practice for the prevention of SSI. The CDC recommendations for preoperative patient preparation in regard to hair removal are:¹⁵

- Do not remove hair preoperatively unless the hair at or around the incision site will interfere with the operation (Category IA – strongly recommended, due to support from well-designed experimental, clinical, or epidemiological studies).
- If hair is removed, remove immediately before the operation, preferably with electric clippers. (Category IA).

5 Million Lives Campaign: IHI

Another important national initiative is the Institute for Healthcare Improvement's (IHI) 5 Million Lives Campaign. This is a voluntary program designed to protect patients from five million incidents of medical harm from December 2006 to December 2008; it targets a reduction in surgical complications by reliably implementing all of the changes in care recommended by SCIP.¹⁶ This campaign encourages hospitals to implement four key interventions for preventing SSIs, one of which is appropriate hair removal.¹⁷ Specific to appropriate hair removal, IHI recommends collecting baseline information on use of razors within their institutions in order to determine current practice, as the use of razors preoperatively increases the incidence of wound infection in comparison to clipping, depilatory use, or no hair removal.¹⁸ As hospital teams develop and test process and system changes to improve performance on the measure for appropriate hair removal, some of the changes that will result in improvement include:¹⁹

- Remove all razors from the entire facility;
- Work with the purchasing department so that razors are no longer purchased in the facility;
- Educate patients not to self-shave preoperatively; and
- Use signs and/or posters as reminders.

A visual aid that was developed to remind and educate caregivers, staff, patients, and families as part of this initiative is "CATS" interventions to decrease surgical site infections:²⁰

- **C:** Clippers – remove hair appropriately
- **A:** Antibiotics - use prophylactic antibiotics appropriately
- **T:** Temperature – maintain normothermia
- **S:** Sugar – maintain glucose control

National Patient Safety Goals: The Joint Commission

Goal 7 of the 2008 Joint Commission National Patient Safety Goals is: Reduce the risk of healthcare-associated infections.²¹ This includes managing as sentinel events all identified cases of unanticipated death or major permanent loss of function associated with a healthcare-associated infection. Specifically related to skin preparation, one of the National Hospital Quality Measures/The Joint Commission Core Measures includes "Surgery patients with appropriate hair removal" as one of the SCIP measures.²²

Recommended Practices for Preoperative Skin Antisepsis: 2008 AORN

With regard to the impact of SSIs and the need for effective infection prevention strategies, the Association of periOperative Registered Nurses' (AORN) Recommended Practices for Preoperative Patient Skin Antisepsis was recently updated. These recommended practices provide guidance for achieving skin preparation of the surgical

site in order to achieve the goal of reducing the risk of postoperative surgical site infection by:²³

- Removing soil and transient microorganisms from the skin;
- Reducing the resident microbial count to subpathogenic levels in a short period of time and with the least amount of tissue irritation; and
- Inhibiting rapid, rebound growth of microorganisms.

Specific to hair removal, recommendation III.e.1 states: The presence of excessive hair that may interfere with the surgical procedure should be identified. Recommendation IV states: Hair at the surgical site should be left in place (i.e., not removed) whenever possible.²⁴ Key points outlined in this recommendation are summarized below.²⁵

Research studies have demonstrated that preoperative shaving of the surgical site increases the risk of surgical site infection and also results in higher surgical site infection rates than using a depilatory cream or clipping.^{26,27,28} Hair has been left in place successfully for neurosurgery procedures without an increase in the risk of surgical site infection.^{29,30} The patient should therefore be instructed *not* to shave or use a depilatory on the surgical site before surgery. Removing hair at the surgical site abrades the skin surface and consequently enhances microbial growth. Shaving has been found to increase the risk of surgical site infection. Depilatory creams may cause skin reactions in some individuals, which could result in cancellation of surgery. Alternatives to hair removal for head and neck surgery are braiding the hair or using a nonflammable gel to keep the hair away from the incision.

If the presence of hair will interfere with the surgical procedure and its removal is in the best interest of the patient, the following precautions should be taken:

- Hair removal should be performed the day of surgery, in a location outside of the operating or procedure room.
- Only hair that will interfere with the surgical procedure should be removed.
- Hair should be clipped using a single-use electric or battery-operated clipper, or a clipper with a reusable head that can be disinfected between patients.

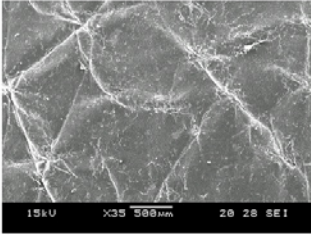
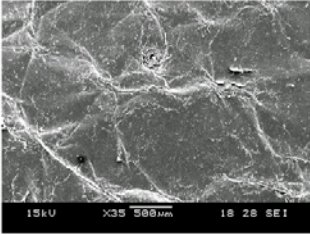
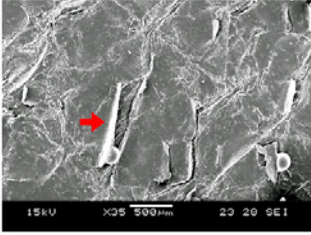
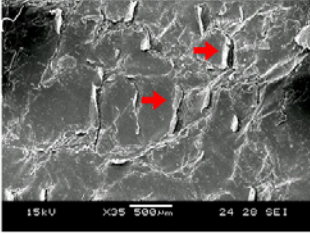
Clipping hair the morning of surgery has resulted in fewer surgical site infections than shaving or clipping the day before surgery. Limiting the amount of clipping minimizes the risk of microscopic nicks. Clipping the hair outside of the operating room minimizes the dispersal of loose hair and therefore the potential for contamination of the sterile field and/or the surgical wound. During use, the clipper handle is contaminated with the patient's skin flora. The clipper head may also become contaminated with microscopic blood or body fluids; therefore, decontamination for bloodborne pathogens is necessary to prevent transmission.

Depilatories may be used for hair removal if skin testing has been performed without tissue irritation. However, the use of depilatories does increase the risk of hypersensitivity reactions. The manufacturers' written instructions regarding skin testing and the use of chemical depilatories should be followed.

PREOPERATIVE HAIR REMOVAL: CONTEMPORARY DATA

Besides all the recommendations and studies that exist, there is very simple and effective evidence out there to support using an electrical clipper vs. a prep razor, if there is a need for hair removal.

Looking at the picture below, the micro abrasions that are caused by a razor are very evident. These abrasions lead to an increased risk of an infection as micro organisms flourish in the environment that is created by these cuts.

Use	Skin magnified photo after two time shaving		Result
E l e c t r i c a l			No skin irritation and damage
P r e p R a z o r			Skin irritation and damage can be seen (→)

Research conducted over the last 30 years has demonstrated that preoperative shaving with the use of safety razors is a risk factor for the development of SSIs.³¹ Below is a summary of the most recent studies/articles with outcomes and examples of SSI reductions when hair was removed by clipping from the surgical site:

In 2008, Trussell et al concluded a 39 month study on 1,827 CABG procedures, where the protocol called for removal of the traditional shaving utensils and replacing them with electric clippers. (Trussell et al. Impact of patient care pathway protocol on surgical site infection rates in cardiothoracic surgery patients. Am J Surg 2008; 196, 883-889) An in-service was conducted to teach the nursing staff about the potential harm of skin shaving preoperatively, instructing them to use clippers whenever hair removal was warranted. Hair removal, when deemed necessary, was done immediately before the procedure as per the CDC guidelines. In the post-intervention period, the use of shaving decreased from 60% to 20% (P = .001). Because of the intervention of clipping, using timely antibiotic administration and tighter blood glucose control, the rate of sternal infections fell from 3.5% to 1.5% (P = .001). It was also noted that replacing shaving utensils with

electric clippers in the surgical pre-op and OR's and instructing the staff not to shave the skin, adds no cost, time, or difficulty to the surgical preparation process.

The body of knowledge supporting leaving hair at the surgical site continues to grow. Some of these research findings are summarized below.

In 2007, a review of eleven randomized controlled trials was conducted by Tanner et al. to determine if routine preoperative hair removal results in fewer surgical site infections than not removing hair.³² These authors concluded that there is insufficient evidence to state whether removing hair impacts surgical site infection or when is the best time to remove hair; however, if it is necessary to remove hair, then both clipping and depilatory creams result in fewer SSIs than shaving using a razor. Three trials involving 3193 people compared shaving with clipping and found that there were statistically significantly more SSI's when people were shaved rather than clipped (RR 2.02, 95%CI 1.21 to 3.36).

Celik and Kara, in 2007, conducted a prospective randomized clinical study to determine whether shaving the incision site before spinal surgery causes postoperative infection.³³ While spine surgeons usually shave the skin of the incision site immediately before surgery is performed, evidence from some surgical series has suggested that preoperative shaving may increase the postoperative infection rate. A total of 789 patients scheduled to undergo spinal surgery were randomly assigned to two groups: those whose surgical site was shaved immediately before surgery (shaved group: 371 patients) and those whose surgical site was not shaved preoperatively (unshaved group: 418 patients). The mean duration of anesthesia and the infection rates in both groups were recorded and compared. The duration of anesthesia did not differ in the two groups; a postoperative infection developed in four patients in the shaved group and in one patient in the nonshaved group. The authors concluded that shaving of the incision site immediately before spinal surgery may increase the rate of postoperative infection.

Orsi, Ferraro, and Franchi conducted a systematic literature review in 2005 about the opportunity, the modality and the risks associated with preoperative hair removal.³⁴ The frequency of surgical site infection is influenced by several risk factors, including perioperative hair removal; it is traditionally part of the procedures carried out preoperatively. Although preoperative shaving is widely used in many hospitals, its use should be re-evaluated. The authors found first, that preoperative shaving (with a razor) is associated with a significantly higher surgical site infection risk; second, when hair removal is considered necessary by the surgeon, it should be carried out by means of a clipper or depilatory cream. Furthermore, hair removal should be performed immediately before surgery and not in advance, to avoid an increased risk of surgical site infection.

Recently, a hospital collaborative was established to examine practices to decrease surgical site infections.³⁵ Fifty-six hospitals volunteered to redesign their systems as part of the National Surgical Infection Prevention Collaborative (a one-year demonstration project sponsored by CMS).

Collaboratives emphasize the application of existing knowledge gained from clinical research and other methods, but are clearly not designed as research to test the efficacy of proven clinical processes. The focus of activities in Collaboratives is the Model

for Improvement – a methodology that emphasizes small tests of change repeatedly conducted within short time frames, the result of each test informing the design of the next. Initially, Collaboratives focus on system changes within small components of systems with the plan to spread successful changes throughout a larger system. The following goals were addressed during this Collaborative:

- Timeliness of antibiotics
- Appropriate selection of antibiotics
- Correct duration of antibiotics
- Prevent hyperglycemia
- Maintain normothermia
- Optimize oxygen tension
- Avoid shaving the surgical site (see Table 3)

Table 3 – Description of the Collaborative Framework – Appropriate Hair Removal

Concept	Process Measure	Rationale
Avoid shaving the surgical site	Percent of surgical cases with appropriate hair removal	Shaving the surgical site increases the rate of surgical site infection and particularly when it is done earlier than immediately prior to the operation.

Each hospital identified a limited set of surgical procedures in which to begin implementing and monitoring these quality improvement initiatives; monthly clinical process measure data were reported. Forty-four hospitals reported data on over 35,000 surgical cases. The hospitals improved measures related to appropriate antimicrobial agent selection, timing and duration; normothermia; oxygenation; euglycemia; and appropriate hair removal. The infection rate decreased 27%, from 2.3% to 1.7% in the first versus last three months. These authors concluded that the Collaborative demonstrated improvement in processes known to be associated with a reduced risk of surgical site infections.

Menendez Lopez, et al. used a randomized control study to assess the effects of preoperative shaving of the pubic region on postoperative bacteriuria after endoscopic urological surgery.³⁶ In one group, the pubic region was shaved according to the standard techniques while the other group was not shaved; the rest of the preparation was the same for both groups. Urine samples were collected for culture before the administration of the prophylactic antibiotic and one week after the removal of the foley catheter (no postoperative antibiotics had been administered). Special attention was paid to the postoperative incidence of infections. Of 300 patients who remained in the study, 149 were shaved and 151 were not. In the group of unshaved patients, 19.5% developed

postoperative bacteriuria compared to 16.6% in the shaved group; the difference was not statistically significant. The authors concluded that there is no increase in postoperative bacteriuria in unshaved patients undergoing endoscopic urological surgery as compared with the group of patients who were shaved.

Ratanalert, et al compared the surgical infection rate of non-emergency cranial neurosurgical patients with two different scalp preparations: shaved or nonshaved.

³⁷ Patients were entered in the nonshaved group using the following exclusion criteria: immunocompromised host, presence of infectious diseases, surgery with foreign material insertion, multiple operations within one month, and the presence of a traumatic wound around the operative site. Patients who survived less than one month postoperatively were excluded, except in cases where death resulted from intracranial infection. During the 29-month period, 225 of 1,244 cranial neurosurgical procedures were selected for study; the patients' ages ranged from 4 to 86 years; brain tumors were encountered in 57%. In the nonshaved group, there were 89 procedures (80 cases), compared with 136 procedures (123 cases) in the shaved group; surgical infection rates were 3.37% and 5.88%, respectively. The authors concluded that nonshaved scalp preparation is recommended for non-emergency cranial neurosurgical procedures.

PREOPERATIVE HAIR REMOVAL: CHANGING PRACTICE TO PROMOTE POSITIVE OUTCOMES

Despite the existing and emerging research related to preoperative hair removal, effecting a change in practice may still be a challenge. However, some healthcare facilities have been successful in eliminating preoperative shaving. Key strategies for changing practice regarding appropriate hair removal include:³⁸

- **Remove all razors from operating suites and surrounding patient support areas, or eliminate razors from surgical prep kits;**
- Institute a policy to avoid shaving surgical sites, or if hair removal is necessary, perform hair removal only with clippers right before surgery;
- Gain support from chief of surgery;
- Send letters to surgeons and staff regarding the change from razors to clippers, including a timeline;
- Institute the placement of electric clippers throughout the areas where hair removal is likely to occur;
- Educate surgeons and clinical staff on appropriate hair removal techniques, and purchasing personnel on appropriate supplies;
- Implement “No Shave Zone” posters throughout the hospital;
- Standardize documentation of hair removal technique in the preoperative/operative record to include “no hair removal, clipper, depilatory,” eliminating the razor/shaving option; and

-
- Educate patients to not shave the surgical site before surgery or develop patient education materials on proper hair removal.

One healthcare facility recently conducted a “razor roundup” to kick off its surgical site infection quality improvement process.³⁹ The goal of the project was to minimize preoperative hair removal and disturbance of skin integrity; the method was to perform indicated hair removal with clippers immediately prior to surgical skin preparation. Prior to the initial meeting, the supply techs conducted an inventory and started the “razor roundup” by pulling back on the numbers of razors in stock. To gain the support of the staff, the project team asked the staff to select the style of clippers they wanted; the staff also planned where the clippers would be stored. “Clipper tenders” were assigned to keep the clippers in place where they belonged. Once the clippers were stocked in the ORs, the next step was to make it less convenient for surgeons to obtain razors. The razors were gathered and moved onto supply carts in the hallways. When a surgeon asked for a razor, the staff had a scripted response: “I will be happy to get that for you. It is out on the supply cart. In the meantime, I have these clippers.” Next, the razors were moved a step further, into the supply room. The staff continued using the scripted response, but now telling the surgeons they would gladly get a razor, but would need to get it from the supply room. To continue to drive the change, the team recruited two respected surgeons. On a prearranged day, the team asked the two surgeons to refuse to start their cases until clippers were used to shave their patients. When this happened, word traveled quickly. This helped to quiet the voices of those who said using clippers would never work. From that point on, when a staff member objected to using clippers, the staff member could reply, “Oh, but Dr. So-and-So wants to use them.” One overall benefit of the project was to decrease the amount of hair removal over time. Over the first year, the percentage of cases with no hair removal rose from 66% to 77%.

In another hospital system, the change concept of avoiding shaving of the surgical site was tested for one month.⁴⁰ A multidisciplinary team of nurses from the OR, preop, and postanesthesia care, plus an anesthesiologist, planned the implementation of the no-razor practice. The circulating nurses talked up the plan, and the director of inpatient surgical services discussed the plan at staff meetings. The project began with hysterectomies performed by two surgeons and colon procedures performed by one surgeon. The team proposed that the surgeon champion the use of clippers for one day on his patients. He liked the clippers and was interested in seeing the statistics on infection risks with razors. He then shared the information with his partners, and they also began using clippers. After just two months, all of the surgeons were using clippers on all procedures in all four of the hospital system’s surgical facilities.

One hospital has seen the use of clippers increase from 25% to 96% in a one year period.⁴¹ A major impetus for this change was the hospital's participation in the state's surgical infection prevention collaborative. Previous efforts had been unsuccessful, but this time, the change went smoothly. The success was attributed to support from administration, the surgeons, and the perioperative nursing staff. The key was enlisting staff support and providing education; both the staff and surgeons were interested in learning about the research that supported clipping. A series of one-hour educational programs with continuing education credit were provided for over 90 employees. The perioperative division care manager reviewed the information about the mandatory use of clippers and also asked for the staff's input regarding the problems with razors. Most staff responded by saying, "Clippers are never available" and "The surgeons don't want to wait for the staff to find clippers." The clipper heads weren't being stocked appropriately and the clippers were disappearing. The department negotiated with the vendor for new clippers for the 15 ORs. Having the clippers readily available solved the delay problems expressed by the surgeons. The staff accepted the clippers so well that they persuaded the surgeons to use the clippers instead of razors. In addition, "No shave zone" posters were displayed above the scrub sinks and in all the rooms.

Nurses and all members of the surgical team serve as the patient's advocate; in this role, they must internalize the belief that engaging in any practice that may cause harm to a patient or increase the risk for a surgical site infection could be considered a breach of professional standards of care.⁴² Nurses and other team members can use the following strategies to maximize their advocacy role in regard to preoperative hair removal:⁴³

- Work with staff in infection control, risk management, supply management, and perioperative departments to **eliminate the use of safety razors** for hair removal.
- Post, in a prominent location, a list of researchers who recommend that safety razors not be used – the list can include author names and publication dates as a reference list and tool to educate other perioperative team members.
- If clippers are used, nurses can ensure that there are adequate units and supplies based on the daily OR schedule; in addition, nurses can ensure that the clipper units are fully charged and stored in a convenient location.
- If depilatories are used, nurses must remember to assess the patient's allergies, test the products on a small area, and keep the products away from the patient's eyes and genitalia.

ADVANCES IN HAIR REMOVAL DEVICE TECHNOLOGY: IMPROVING COMPLIANCE AND PATIENT SAFETY

Whenever hair is removed preoperatively, it should be done by skillful personnel, taking great care to avoid scratching, nicking, or cutting the skin; the method of hair removal and the condition of the skin before and after removal should be documented.⁴⁴ As noted above, whenever hair is to be removed preoperatively, both the CDC and AORN recommendations state that it should be done immediately before the operation, outside of the OR, and preferably with electric clippers. The AORN recommended practices further specify that the hair should be clipped using a single-use electric or battery-operated clipper, or a clipper with a reusable head that can be disinfected between patients. Clipping, immediately before surgery, is the simplest and least irritating method of hair removal.⁴⁵

In the practice setting, the criteria for evaluating surgical clippers include, but are not limited to:⁴⁶

- Safety, performance, quality, and improved efficiency
- Purpose and use
- Ease of use
- Impact on quality patient care and clinical outcomes
- Efficacy
- Cost/value analysis

After selection and implementation, surgical clippers should be monitored to assess performance; data on compliance and ease of use as reported by the staff, as well as the impact on surgical site infection, should be collected and analyzed.

In addition to the clinical advantages of clippers, they are also cost-effective. One study estimated a cost savings of **\$270,000 per 1,000 patients when shaving was replaced with clipping**.⁴⁷ A study that compared both the clinical and cost outcomes of shaving and clipping found an initial moderate increase in hospital cost when converting from razors to clippers, but then concluded that substantial long-term cost savings could be anticipated due to a reduction in the incidence of postoperative wound infections; further, this study recommended discontinuing razor shaving because of its associated risk of infection.⁴⁸

Surgical clippers available today offer advancements in device technology and design to provide perioperative practitioners with devices that improve compliance with professional recommendations and also promote patient safety. Wider blades clip hair smoothly and closely, thereby avoiding infection-causing nicks and cuts. Disposable, single-use blades help to prevent cross contamination. Devices specifically designed for clipping hair in sensitive areas (i.e., for urologic, gynecologic, and obstetric procedures) are also available. These devices promote patient safety by providing:

- A specially tapered head – this allows the practitioner to reach tight areas.
- A very narrow blade – this provides ease and maneuverability when clipping in tight, sensitive areas.
- Uniquely designed cutting blade geometry – this design adds protection when clipping loose skin or especially sensitive areas.

Clippers should also be able to effectively clip fine or coarse hair, wet or dry. Other design features that promote staff compliance and patient safety include:

- Cordless, rechargeable operation
- Ergonomic, non-slip handle that fits comfortably in the user's hand
- High performance clipping ability
- Ability to effectively disinfect the clipper handle between patients
- Handles that can be cleaned quickly and easily; for example, those that are waterproof and submersible for thorough cleaning and disinfecting

SUMMARY

Every patient expects that his/her surgical experience will be uneventful. The development of a surgical site infection is an inherent risk for any patient entering the operating room. Every surgical site infection results in additional postoperative hospital days, thousands of dollars in extra charges, and increased patient discomfort. Both the clinical and economic implications of surgical site infections are of greater significance in today's dynamic healthcare environment. As the patient's advocate, every member of the surgical team plays an important role in reducing the incidence of surgical site infections by implementing effective infection prevention strategies throughout the patient's surgical journey. Through an understanding of the concepts and research findings related to the risks of removing hair from the surgical site, as well as their implications for prevention of surgical site infections, the surgical team can implement effective hair removal practices. Awareness of the advancements in technology that provide safe and effective hair removal devices is also important in establishing best practices. Through these efforts, the surgical team can provide the safest possible environment for surgical intervention, reduce the risk for the development of a surgical site infection, and ultimately promote positive outcomes for all surgical patients.

Case Studies

Case Study 1 – Ms. MC

Ms. MC is a 21-year-old female scheduled for a craniotomy for a glioblastoma. Both the diagnosis of the tumor and the proposed surgery have been very stressful for Ms. MC and her parents. Ms. MC has long, black hair and is quite upset at the prospect of having it shaved for her surgery. During the preadmission testing appointment, Ms. MC asks about having her head shaved and begins to cry uncontrollably. Ms. VT, the preadmission clinic nurse, informs Ms. MC and her parents that the hospital's policy is *not* to shave the hair for patients undergoing neurosurgical procedures since Dr. Reeves, who had been at a large research facility, started practicing at the hospital. They are surprised and ask Ms. VT why this is possible.

Points to Consider:

1. What is the rationale for leaving hair in place for neurosurgical procedures?
2. What are some alternatives to hair removal for craniotomy procedures?

Discussion of Points to Consider:

1. What is the rationale for leaving hair in place for neurosurgical procedures?
 - Research studies have demonstrated that shaving of the surgical site increases the risk of surgical site infection.
 - Research findings have also shown that hair has successfully been left in place for neurosurgery without increasing the risk for surgical site infection.
 - Based on this knowledge, not shaving the hair will also provide some emotional support for Ms. MC and her family.
2. What are some alternatives to hair removal for craniotomy procedures?
 - Braiding the hair
 - Use of a nonflammable gel to keep the hair away from the incision site

Case Study 2 – Mr. RH

Mr. RH is a 28-year-old male scheduled for a right inguinal herniorrhaphy for a sports-related injury. Ms. BJ is the circulating nurse assigned to Mr. RH. As she is performing her initial assessment in the holding room, she notices curly chest hair that is not contained within the top of his surgical gown. She proceeds to inspect the surgical site, where she observes quite a bit of coarse hair in the groin area. While the facility policy is to *not* remove hair at the surgical site, Ms. BJ is concerned that the amount of hair could interfere with the surgical procedure. She asks the surgeon to assess the area as well. He does so and then orders that the hair at the surgical site be removed.

Points to Consider:

1. What considerations were taken into account to order the shave prep?
2. What precautions should be taken for the hair removal?

Discussion of Points to Consider:

1. What considerations were taken into account to order the shave prep?
 - The significant amount of hair would interfere with the surgical procedure.
 - Hair removal in this case is in the best interest of the patient.
2. What precautions should be taken for hair removal?
 - Only the hair that interferes with the surgical procedure should be removed.
 - The hair should be removed in the holding room, as it is located outside of the OR.
 - The hair should be removed with clippers - use either a single-use electric or battery-operated clipper, or a clipper with a reusable head that can be disinfected in between patients.

Case Study 3 – The Product Evaluation Committee Meeting

Ms. GV is the Administrative Director of Perioperative Services at Smith Regional Medical Center.

She was notified by the Infection Control Practitioner that there had been a slight increase in their surgical site infection rate for the last quarter and that they must actively look for appropriate infection prevention strategies to reduce the infection rate. Ms. GV is preparing for the next Product Evaluation Committee Meeting, at which the topic of switching to surgical clippers instead of safety razors for preoperative hair removal is on the agenda. Ms. GV was approached after the last meeting by Dr. Zwick, Chief of Surgery, who said that the facility needed to reevaluate its policy and procedure on preoperative hair removal. He had just returned from a continuing medical education meeting and attended a session on current techniques in preoperative skin antisepsis, at which preoperative hair removal was discussed. In addition, one of the staff RNs, Ms. SR, who is on a travel assignment, had mentioned to Ms. GV that most hospitals have changed their policy and procedure regarding preoperative hair removal; she had attended an inservice program during her last assignment where the research findings on the benefits of *not* removing hair preoperatively were presented. Ms. SR offered to bring the information in for Ms. GV to review.

Points to Consider:

1. What resources are available to Ms. GV as she prepares for the meeting?
2. What steps should Ms. GV take to ensure success with the new policy and procedure?

Discussion of Points to Consider:

1. What resources are available to Ms. GV as she prepares for the meeting?
 - Current research findings on the risks associated with preoperative hair removal.
 - Networking with colleagues at other institutions regarding their policy on preoperative hair removal.
 - Support from the Chief of Surgery and staff in recognizing the need for a change in practice and also with driving the change.
 - Expertise of infection control and risk management personnel to develop and support the new policy and procedure.
 - Product information on clippers available on-line and from vendors.

2. What steps should Ms. GV take to ensure success with the new policy and procedure?

- Present the concept to the staff – educate them on the research findings regarding preoperative hair removal as well as the risks associated with shaving.
- Present a draft policy that outlines not shaving surgical sites, and if hair removal is necessary, perform hair removal only with clippers immediately prior to surgery.
- Develop a proposed timeline for the change in practice from razors to clippers – communicate this with surgeons and staff.
- Select clippers for evaluation based on:
 - product research regarding safety, performance, quality, ease of use, impact on quality patient care and outcomes, product efficacy, and cost analysis
 - input from the staff and surgeons

GLOSSARY OF TERMS

Bacteriuria	The presence of bacteria in the urine.
Clean Wounds	Uninfected operative wounds in which no inflammation is encountered and the respiratory, alimentary, genital, or uninfected urinary tract is not entered.
Contaminated Wounds	Open, fresh, accidental wounds; operations with major breaks in sterile technique (e.g., open cardiac massage) or gross spillage from the gastrointestinal tract, and incisions in which acute, nonpurulent inflammation is encountered.
Contamination	The presence of pathogenic microorganisms, organic debris, and dirt; generally refers to a specific object, substance, or tissue that contains microorganisms, especially disease-producing microorganisms.
Deep Incisional SSI	An infection involving deep soft tissue, fascia, and muscle.
Depilatory	Topical chemical agent used to remove hair from the patient's skin.
Endogenous	Produced within or caused by factors within the organism.
Euglycemia	Normal blood sugar level.
Exogenous	Originating outside or caused by factors outside the organism.
Flammable	Capable of being easily ignited and burning rapidly.
Healthcare-Associated Infection (HAI)	An infection acquired by patients during hospitalization, with confirmation of diagnosis by clinical or laboratory evidence. The infective agents may originate from endogenous or exogenous sources. HAIs, which have been known as nosocomial infections, may not become apparent until the patient has been discharged from the hospital.

Infection	The invasion and multiplication of microorganisms in body tissues that cause cellular injury and clinical symptoms.
Microorganism	An organism that is too small to be seen with the naked eye and may be viewed using a microscope. Bacteria, viruses, fungi, and protozoa are generally identified as microorganisms.
Normothermia	Core body temperature between 36°C – 38° C (96.8°F – 100.4°F).
Organ or Space SSI	An infection involving any part of the body, excluding the skin incision, fascia, or muscle layers that are opened or manipulated during the operative procedure.
Pathogen	A microorganism that causes disease.
Resident Microorganisms	Microorganisms persistently isolated from most people's skin. These microorganisms are considered to be permanent residents of the skin and are not readily removed by mechanical friction.
Stratum Corneum	The outermost layer of the epidermis. These cells are rough and jagged, and contain innumerable niches in which bacteria live.
Superficial SSI	An infection involving the skin and subcutaneous tissue as opposed to deep tissue.
Surgical Site Infection (SSI)	An infection occurring at the site of a surgical incision. The infection may be superficial, deep, or may extend to organs. Specific criteria are used to define levels of surgical site infections.
Surgical Site Infection (SSI) Risk Index	Measure of the likelihood that a patient will suffer an SSI.

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