

# Preoperative hair removal carried out as skin preparation nursing essay

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Traditionally preoperative hair removal has been carried out as skin preparation method to reduce exposure to bacteria which may lead to surgical site infections (SSI) (Gottrup et al 2005). SSI's are defined by Centres for Disease Control (CDC) as superficial, deep incision and organ infection. According to Miller (2001) hair has been removed for such reason as wound asepsis, suitable placement of bandages, and access to operative site and accurate approximation of wound edges. Though preoperative hair removal has been in practice since 18th century its impact on the wound site has been under contention and therefore attracted the author's interest in seeking ways of hair removal without skin damage. However there are concerns that hair removal increases rather than reduces infection, in a study carried out by Astegnau et al (2001) to identify mortality and morbidity related to surgical site infection suggested that shaving increased the risk of infection by facilitating colonisation of bacteria in the operating site. Many organisations, Association of Perioperative Registered Nurses (AORN2006) and Association for Perioperative Practise (AFPP2007) have moved away from hair removal.

There is no clarity in literature as to the origin of preoperative hair removal, but researchers conclude to the fact that the surgeons of the time believed that wounds might heal more quickly if hair could be prevented from becoming entangled in the sutures and wound during closure (Miller et al 2001). Shaving with a razor substantiated the emergence of preoperative hair removal in a systematic literature review by Kjonnsken et al (2002) as an established practice based on assumption of preventing surgical site

infection. Some other methods, electric clipping and depilatory creams have been highlighted as having lower postoperative wound infection rates.

**Hair is associated with poor hygiene habits because it harbours bacteria and removing it is thought to reduce surgical infections (Kumar 2002). Hair removal is done by shaving with either a razor or a clipper which are believed to cause both visible and microscopic injuries (Briggs1997). The damage caused by a razor or a clipper can release flora-providing access to serous exudates on which micro organisms may grow (Small 1996). Skin is always a hunting ground for microbes. Once the skin's protective barrier is diminished primarily by a surgeons incision, microbes can potentially contaminate the wound. Loius Pasteur in confirmation of the existing understanding into the world of infection hypothesized in his germ theory that invisible bacteria could cause surgical infection if they gained entry through the broken skin (Fogg 2003).**

A national audit in 2004 suggests that surgical site infections increases patients' hospital stay, and increases health care cost by delaying wound healing, this causes major physical limitations and reduced quality of life (Whitehouse et al 2002). If occurring after discharge the patient is likely to be readmitted which is a burden to the patient and can even cause death (Plowman 2000). Surgical site infections occurs within 30 days after surgery, exudes pus and shows one of the following symptoms pain, localised swelling and redness according to the Centre for Disease Control (1999).

While once accepted as a standard practise for surgical procedures, hair removal is now being considered in great depth in the research. This essay

will review the role of hair removal in the perioperative setting and its impact on surgical site infections. The author will discuss research regarding nurses and doctors knowledge on recommended guidelines on hair removal methods, comparison and timing of hair removal methods and their relationship to incidences of surgical site infections.

Keywords used for the search are preoperative skin preparation, hair removal, preoperative razor shaving, electric clipping, depilatory creams and surgical site infections. The databases utilised were CINAHL, Cochraine database of systematic reviews, Health Source Nursing and Allied Health Science. The studies were done in USA, UK, Canada and Turkey.

## **Hair Removal Methods**

Razor shaving is the cheapest and most commonly used hair removal method (Tanner et al. 2007). Using a sharp blade held with the head of the razor that is drawn to the patients' skin to cut hair close to the skin surface. Razor shaving increases bacterial infection rates (Basevi & Lavender 2001). Another method entails the use of clipper that uses fine teeth to remove hair close to the skin leaving stubble of usually one millimetre in length. Heads are disposable and handles are disinfected between patients to minimise risk of cross infection (Tanner et al. 2006). A further method is the use of depilatory creams that utilises chemicals, which dissolves the patient's hair. Cream has to be in contact with the hair for between 5-20 minutes. A patch test should be done 24 hours before using the cream as some patients can develop allergic reactions and some have sensitive skins (Kjonniskien et al . 2002).

Miller et al. (2001) conducted a retrospective study comparing all patients who underwent intracranial procedures in the last two and half years where hair was not shaved, to patients done three and half years back that were shaved, to determine whether no hair removal increase post operative infection rate. Results were documented as minor, moderate and severe. Of the 250 subjects used 150 patients were not shaved and 7% developed post operative wound infection compared to 6.6% infections in the shaved group. There was no statistical significance in these findings though the sample size is large for an organisational setting however the finding could not be generalised based on this number. An experimental study was performed on 82 patients who underwent abdominal surgery between November 30th – May 2005 to determine the effect of preoperative hair removal on post operative wound infection. Patients were told the aim of the study and they signed consents. Inclusion criteria were patients who had not been hospitalised within the last 30 days and didn't have infections while being admitted. Control group with 39 patients were razor shaved and on 43 for study group clippers were used. Patients were observed for signs of SSI two days post operatively and 7% of the study group developed SSI compared to 25.6% in the control group. The results are statistically significant but the sample size is small and the fact that abdominal surgeries are viewed dirtier than lower limbs makes findings hard to generalise however the length of time and the study design utilised would have enabled the establishment of rigor for the findings to be reliable. The study uptake therefore will be better with an increased sample size. Though the latest studies are endorsing hair

clipping (Tanner et al 2006). (Boyce & Pittet 2002), more studies need to be carried out.

A double-blind prospective study was carried out between 2000-2004 for all patients undergoing spinal surgery (Celik et al. 2007 ) to determine the effect of razor shaving and increased rate of postoperative site infection compared to no hair removal. The shaved group consisted of 371 subjects and the unshaved group comprised of 418 subjects. Patients were fully informed about the study and consents obtained. The subjects were randomly allocated according to pre-surgical shaving status. Exclusion criteria involved patients with skin conditions acne, furuncle and sebaceous cyst, patients with nutritional deficiency and medical conditions like diabetes and cancer. Same skin preparations were done in both groups. Both subjects received prophylactic antibiotics.

Postoperatively, both groups were observed for signs of infection redness swelling and purulent discharge and bloods taken to check erythrocyte sedimentation rate. Infection was higher in the shaved group ( $p=.01$ ) 4 patients in a shaved group (1.07%) developed infection and in only 1 patient in the unshaved group (0.23%). The findings suggest that preoperative hair removal increases postoperative infections. This study was ethically approved and both methodology and aim were clear and concise. These all confirm its reliability however giving antibiotics during procedures may mask the results causing the study to be unreliable.

A randomised control study was conducted by (Menendez et al. 2004) aiming to assess the effects of preoperative shaving of pubic hair on postoperative bacterium after urological surgery. A sample size of 300 patients was used. 149 patients were shaved and 151 were not shaved. In both groups urine samples were taken for culture before being given prophylactic antibiotic and again at one week before the catheter was removed. In the shaved group 19.5% developed infection as compared to 16.6% in the non-shaved group. The difference was found not to be statistically significant. The results were based on testing urine samples than in the wounds making the study invalid. There is no clarity about ethical considerations and if the aim and purpose of the study was explained to the subjects and whether the consent obtained was informed. The prophylactic administration of the antibiotics makes the study to be unreliable and not valid.

In Cochrane collaboration review data Tanner et al. (2007) conducted eleven randomised controlled trials to evaluate the effects of routine preoperative hair removal with razor as opposed to no hair removal in postoperative infection. The authors concluded that there is no sufficient evidence to prove that hair removal causes an increased risk of surgical site infections. However the study suggested the use of clippers or depilatory cream when necessary to remove hair with an idea that both methods results in fewer surgical site infections.

## **Comparison of hair removal methods**

Trussell et al. (2008) conducted a thirty nine month observational study where razor shaving utensils were removed and replaced with clippers. The

sample size consisted of one thousand eight hundred and twenty seven patients undergoing coronary bypass procedure. There was an in-service training for both nurses and doctors to teach them the effects of razor shaving, instructing them how to use electric clippers which is thought to be less traumatic to the skin when removing hair. The rate of sternal infections decreased from 3.5% to 1.5% ( $p = .001$ ) when using electric clippers. The qualitative method and the design of the above study suits the sample size, and neither observational bias nor antibiotic masking of the findings were introduced in the study resulting in a proper analysis of the data.

The results also showed that the removals of razors and staff education not to use them for shaving were cost effective, and time effective. Costs related to preoperative hair removal are associated with postoperative infection and longer stay of patients in the hospital.

A prospective report of Cruse and Ford (1980) cited in journals a-z Spine (2007 insert author here) with the objective to evaluate post operative clean surgical wounds in 3 groups. In a prospective observational study they compared patients shaved with razor, electric clippers and those with no hair removal. They did long term follow up on 62,339 patients. In this study the patients were not scrubbed with antiseptic solution. Their findings were that only 2.8% infections occurred in patients whose hair was removed by clippers compared to 3.2% in razor shaved patients and 0.9 in unshaved group. The sample size is good, the method and aim is clearly explained this makes the study reliable and rigorous. The results of a similar study carried by Zetner et al cited in spine (2007 insert author here) for patients who



underwent craniotomy found that infection rate was lower in patients whose hair was removed with clippers observational studies favoured clipping.

## **Shaving Versus Depilatory Cream**

A randomised controlled study conducted by Kjonnsken et al. (2002) included 400 subjects for abdominal surgery divided in three groups. In shaved group 12.4% develop infection, 7.9% in the depilatory group and 7.8% in non shaved group. The results are unreliable proof of effects of hair removal because the use of antiseptic solutions and giving antibiotics during the operation has affected the validity of the study. The study design being suitable for a quantitative method of study could be considered unfruitful due to poor detailed explanation of the randomisation method.

Seven trials involving 1213 subjects were included which consisted of mixed surgical procedures in 1 trial. There was a variation in times of outcome assessments ranging from 2 to 28 days. Overall results 10% (65/670) patients developed surgical site infection in the shaved group compared to 7% (38/543) who were in a group of cream hair removal. The results of this study are not reliable because 3 of the trials did not report at what period the assessment was carried out. Observational studies showed more significant effect when using depilatory cream, although creams reported adverse effects such as skin allergies and reactions.

## **TIME AND PLACE**

Another phenomenon evident in literature in relation to hair removal methods causing postoperative surgical site infections is time and place of

hair removal. There is evidence that the adverse effect of bacterial access and growth produced by razor and clippers is worsened by the interval between shaving injury and surgery. The timing of hair removal has been determined according to health workers schedule rather than in response to scientific evidence.

Tanner et al. (2006) argued that there is little evidence that supports the assumption that removing hair as close to time of surgery minimises the time of bacteria to colonise the cuts caused by shaving. Surveys have found that a majority of hospitals have policies to remove surgical site hair the evening before surgery. A randomised study of 1, 013 patients cited in *Advanced journal of nursing* 2006 (who is the author) showed no significant difference in numbers of surgical site infections when skin was shaved the evening before or day of the operation ( $p= 0. 69$ ). One trial of 531 patients found that 5. 1% of patients shaved the day before surgery developed surgical site infections compared to 6. 5% of patients shaved on the day of surgery (where is the ref.). This seems to oppose hair removal close to the time of surgery. The same study compared using clippers on the night before surgery and on the morning just before surgery. Results were in favour of clipping in the morning before surgery ( $p. 0. 027$  on discharge). This was maintained at a 30-day follow up ( $p= 0. 006$ )( what is the meaning of this.) One prospective observational study conducted by Alexander 2003 cited in (Joanna Briggs systematic literature review 2007) with sample size of 536 patients found that patients shaved 12 hours before surgery had lower risk

of surgical site infections than patients shaved less than 2 hour prior to surgery. ( why is this so)

A survey was carried out on 589 surgeons in Canada comparing their practises to recommendations of evidence based guidelines on preventing surgical site infection. A list was generated using the database of College of Physicians and Surgeons currently practising in the province. The study was approved by the Health Research Ethics Board. Surveys were emailed to the participants and only 242 were returned by mail without return address with 63% showing non compliance with the recommendations. Compared with general surgeons, gynaecological and plastic surgeons used razors than clippers,  $p = .004$ . (why are these hanging)

A questionnaire-based survey was conducted between February and April 2005 to assess the opinions and practices of surgeons and ward staff with regard to patients' hair removal. The answers suggested that they were not up to date with the literature and its effect on postoperative wound infections. If attitudes are to change, the surgeons need to develop a protocol with clear guidelines as to when and by what technique they need hair removal to be performed.

## **Recommendations and Implications to Practice**

As patients advocates nurses need to play an important role in reducing the incidences of surgical site infections. Nursing procedures that are harmful to the patients may breach codes of professional standards. Alongside the nurses ethical duty to protect their patient it is important that nurses are

aware they may be held legally accountable for their actions. Most hospital acquired infections can be prevented by implementing effective, preventive strategies throughout the patient's surgical journey. Nurses have to develop patient's education materials on proper hair removal. Whenever hair is to be removed it should be done by someone who has knowledge of appropriate technique and is skilful to the procedure. Through continued staff educational programmes and in-service education on the use of clippers to improve compliance with professional recommendations and promote patients safety. Nurses need to assess patient's skin prior to hair removal to identify any potential risk of cuts. They must keep abreast with research findings incorporating resulting guidelines into practice. To maximize their advocacy role with regards to preoperative hair removal, nurses must work together with infection control staff, supply management and risk management to minimise the risk of infections.(why). The research into preventing surgical site infections found that preoperative hair removal is not necessary to reduce the risk of infection and should be avoided.

The studies reviewed show there is a relationship between shaving with razor and increased surgical site infection rates. Different hair removal practises are recommended by organisations that set guidelines and standards for practice (Guidelines for Centre for DISEASE CONTROL and AORN 2007 (Recommended practice for skin preparation) states that hair removal is not necessary unless it interferes with the incision, draping and putting dressings. If hair needs to be removed they recommend using clippers instead of razor, for they are safe and easy to use. Norwegian centre

for health technology assessment argues that there is no strong evidence in favour of or against hair removal, and recommend not to avoid preoperative hair removal.

Although evidence is limited on the timing of clipping, it's recommended it has to be done as close to the time of surgery preferable two hours before. They further specify that hair should be clipped using a single use electric clipper with a reusable head that can be sterilized between patients.

However the author's opinion is that clippers with disposable heads should be utilised since it is more cost effective and time saving when compared to sterilisation. They recommend hair clipping outside the operating room to minimise the dispersal of hair which have potential of contaminating the sterile field and surgical wound (Mews 2000). Hospital infection society working party guidelines recommend using cream a day before surgery. Depilatories may be used if skin testing has been done following the manufacturer instruction, without tissue irritation. Since creams can be messy patients may be advised to use them before turning up for admission. Some hospitals still continue routine hair removal long after dissemination of recommendations against it. The author believes that it is an indication to audit hair removal procedures and adhere to the recommended guidelines and policies.

In addition to the clinical advantages, clippers are also cost effective. One study by Trussell et al (2008) estimated a cost saving of \$270, 000 per 1000 patients when shaving was replaced with clipping. The study also concluded that long-term savings should be considered due to reduction of the

incidences of postoperative wound infections. Other studies reported cost comparisons between wet razors shave and use of cream finding cream to be expensive. This cost saving was limited, covering only minimal direct costs rather than full range of direct and indirect costs of shaving items compared with the cost of depilatory cream. The use of depilatory cream was also found to be effective, though there are limitations to its use due to time factor.

## **Conclusion**

Surgical site infection is one of the commonest health associated infections. Surgical site infections can occur in 10% of patients each year resulting in delayed wound healing, increased hospital stay, unnecessary pain, readmission and even death.

Seemingly there is no scientific basis of preoperative skin shaving. Studies illustrates that preoperative hair removal methods have been found to be the causes of surgical site infections, because of the cuts they cause on the skin making it to be colonised by microbes. Hair clipping is considered the favoured method of hair removal but it's not without error. Preoperative hair clipping protocol was developed in 2003 (by who) and literature reviews have proven that these policies are still relevant. Studies have also reinforced the importance of staff education which will help to strengthen the use of electric clippers. Nurses must keep abreast of research findings to be able to support their rationale for change when championing this crusade to their medical colleagues. Through these efforts the surgical team can provide the safest environment to reduce the risk for the development of

surgical site infections, promoting positive outcomes for all surgical patients. Future research will determine the effectiveness and success of clippers which improves patients' safety against surgical site infections.