Guest Editor

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Cloth hats: (W)Hat's the issue

Abstract

Introduction

The aim of this discussion paper is to consider three issues regarding perioperative attire:

1. whether cloth hats or disposable hats are better for reducing patient risk of acquiring a surgical site infection (SSI)
2. whether the risk of infection is different for the bouffant style of hat compared to the skullcap style of hat
3. whether there is enough evidence available to support a statement that cloth hats are safe to wear in the operating suite.

Background

Hats have been routinely worn in operating suites since the 1950s. The intention of covering the hair has been to reduce the risk of the patient developing an SSI from bacteria that may be shed from the hair and skin of health care workers.

Discussion

A literature search was conducted yielding limited results (five), primarily controlled trials and case studies. Australian Standards dictate how cloth hats must be made and laundered. These standards are referenced in ACORN's *Standards for Perioperative Nursing in Australia* (the ACORN Standards) and should aid health care professionals in appropriate manufacture and laundering of personal perioperative attire. Studies obtained from the literature did not conclusively prove that cloth hats posed an increased risk to patients. However, the literature cites risks to staff when non-hospital laundering has occurred. There was also no evidence-based research suggesting that the incidence of SSIs was influenced by either bouffant or skullcap style hats.

Regulation

If we choose to allow staff to wear cloth hats, the biggest challenge is ensuring that they are changed daily and meet the Australian standards for manufacture and laundering. While cloth hats may look clean, microscopic blood contamination may not be visible.

Recommendation

Audits illustrating contamination could be used to educate staff about cleanliness. Education about Australian standards and the risks of infection associated with home laundering must be provided.

Conclusion

Ultimately, there is not enough research available to indisputably state whether disposable hats or cloth hats pose a greater risk of our patients developing a surgical site infection due to contamination from health care workers. There is also not enough evidence to determine whether the risk of infection is different for the bouffant style of hat compared to the skullcap

style. The facility should decide whether they will ban cloth hats, based on the evidence or standards of best practice that are available, or whether they will set up appropriate hospital laundering for staff member's scrub attire. The evidence indicates that the risk from contaminated cloth hats is not a risk to patients but to health care workers and their cohabitants through home laundering of contaminated attire.

Keywords: perioperative attire, cloth hats, bouffant hats, skull caps, disposable hats

Introduction

The operating theatre is a busy place with perioperative staff, students, surgeons, anaesthetists and company representatives/personnel entering the environment each day and all possibly adding to the microbial load. To enter this restricted area, correct perioperative or surgical attire must be worn[1]. Theatre attire comprises theatre scrubs, including headwear which is the focus of this discussion paper.

While some staff don a bouffant style or skullcap style disposable hat provided by the facility, others elect to wear a personally owned cloth hat. This discussion aims to answer three questions:

1. Is one type of headwear, disposable hats or cloth hats, better than another?
2. Is the bouffant style or skullcap style of hat preferable?
3. Is there enough evidence available to support a statement that cloth hats are safe to wear in the operating suite?

In practice, staff have questioned management regarding the appropriateness of wearing personal cloth hats, asking for clarification on their usage. This desire for a definitive answer appears to be common among the wider profession and is acknowledged by the Australian College of Perioperative Nurses (ACORN). In May 2018 ACORN released a position statement as a result of professional 'queries, comments and feedback regarding the use of cloth headwear in the operating theatre environment'[2]. ACORN's recommendations will be discussed in this paper.

Background

A review of historical photographic records revealed that surgical headwear has been worn since 1896 but has only been worn routinely in operating suite environments from 1958[3]. Hats were initially worn simply as part of the nurses uniform[3]; however, they are now worn as a method of potentially reducing the chance of surgical site infections from contamination of the sterile field by bacteria shed from hair and skin[4]. There are three main type of hats worn in theatre: disposable bouffant style hats, disposable skullcaps and cloth hats. The first two types are disposed of each time they are removed while the third type are potentially not changed or laundered daily.

Discussion

As nurses, we strive to perform evidence-based practice[5]. Ordinarily this is achieved through an extensive literature search and review conducted on a large quantity of articles[6]. When researching the matter of headwear, there was minimal high-level evidence available to review[7]. Therefore, available evidence (controlled trials, case studies and guidelines) will be presented in this discussion with the view to inspire further discussion that may lead to future research being conducted on this subject.

The ACORN Standards guide Australian perioperative practice. The current ACORN recommendation to perioperative staff regarding headwear states 'Personnel have a duty to demonstrate that cloth head covers meet the relevant Australian Standards for perioperative attire textiles, labelling and laundering'[1]. The Australian Standards referred to in this statement relate to what fabric hats should be made from and how they should be laundered if being used in a health care environment where contamination is likely to occur. According to the ACORN Standards, if cloth hats are worn, they must be constructed from a specified fabric and meet manufacturing methods laid out in Australian Standard AS 3789.3:1994[8]. The hats must:

- not be made from 100 per cent cotton fabric[1]
- be made using specific materials – Gaberdine, polyviscose or polycotton[1]
- be manufactured using a specific sewing thread[1]
- be manufactured using a specific stitching method[1].

Along with the manufacturing standards, a laundering standard laid out in AS/NZS 4146: 2000[9] states that laundering must be 'undertaken at 65°C for 10 minutes or 71°C for 3 minutes'[10,11]. Hats must also have a means of being tracked as repeated laundering can have an effect in the structure of the fabric[1]. ACORN does not state the prohibition of cloth hats, but that cloth hats should meet

these standards to ensure the safety of staff and patients.

This conversation is not limited to Australian health professionals, as our American counterparts are having similar discussions with the American Association of Operating Room Nurses (AORN)[12,13]. AORN specifies that 'a clean surgical head cover or hood that confines all hair and completely covers the ears, scalp skin, sideburns and nape of the neck should be worn'[13]. AORN and the American College of Surgeons are at odds[12] as to what is the best headwear to meet this requirement. While some of the literature cited below may imply that head covering makes no difference to risk of developing an SSI, they tend to agree that wearing any head cover reduces the level of bacteria in the air and thus reduces the potential of the patient acquiring an SSI[14].

One study that is consistently referred to when researching this issue is 'Hats off: A study of different operating room headgear assessed by environmental quality indicators'[15]. This study recreated a theatre environment and looked at disposable bouffant hat, disposable skullcaps and newly laundered cloth hats[15]. Data gathered showed that there was a greater bacterial release in the air with disposable bouffant hats, possibly due to the pore size of the hats compared with the tighter woven fabric of the cloth hat[15]. The study found there is no reason to select disposable hats over cloth hats in relation to fears of a higher chance of acquiring a surgical site infection[15]. A second study conducted by Kothari et al. reviewed 1500 patient outcomes and found no statistical significance was seen between the SSI rate when the surgeon wore a bouffant style hat compared to the rate when a skullcap style hat was worn[16]. The authors of this study surmised that ultimately the hat selected should be based on personal preference as data cannot prove that one hat poses more of a risk than any other[16]. These findings were replicated in a similarly study design by Shallwani et al. [17]; however, the sample size was much larger. Their study looked at surgical site infection rates for 15 000 patients before and after a change in headwear. Even with a greater sample size no statistical significance was found as a result of this change[17], suggesting, the wearing of a skullcap style hat or bouffant style headwear had no direct effect on the rate of SSIs acquired.

To further assist in finding a conclusion to the question of whether cloth hats should be allowed in the perioperative environment, it may be hypothesised that a cloth hat, if not washed daily would carry similar bacterial content as a uniform. Studies on nurses' uniforms were considered as a means of reviewing the possible contamination of a non-disposable garment. While the evidence found did not specifically look at cloth hats, it did consider the bacterial growth on a nurse's uniform 48 hours following a shift[18]. The study surmised that uniforms 'can be vectors that spread infections not only within hospitals, but also potentially within communities'[18]. The wearer not only unknowingly posing a risk to patients and other health professionals but their family and community outside the health care facility[18].

This was proved in a case study that found contamination of patients directly linked back to a specific health care worker via their perioperative surgical attire[19,20,21]. Wright et al., in searching for the cause of three cardiac sternal wound infections, found the source to be a nurse anaesthetist with forearm dermatitis who carried *Gordonia bronchialis* on their surgical attire[20,21]. When the nurse anaesthetist's housemate also tested positive to the bacteria, further investigation found that the organism was traced to the washing machine in the health care worker's home following home laundering of surgical attire[21,22]. While most studies are concerned with the risk to patients of unclean hats, one must consider the possible risk that a contaminated piece of headwear may pose to staff or their families. Studies have shown that home laundering is less effective than industrial laundering so it should not be encouraged[22,23]. In the aforementioned instance the contamination event only ceased when the washing machine was replaced[21].

Regulating cloth hats

Unless a hat is visibly soiled it would be difficult to judge its cleanliness by 'visual appearance' alone and it is therefore challenging to assess cleanliness of cloth hats to ensure risks to patients are reduced. Spot audits could be conducted within a perioperative suite to assess the number of cloth hats worn and highlight any evidence of visible soiling. One method of auditing the invisible contamination of hats could be the use of luminol spray to detect blood particles, demonstrating to staff how attire can become contaminated even if it cannot be seen. The iron in blood catalyzes a reaction in the luminol spray that results in a luminescent glow[24]. This has been used on personal perioperative attire to highlight invisible contamination[24,25]. Demonstrating this contamination to staff would assist in their understanding the importance of adequately washing their cloth hats daily. The perioperative attire section of the ACORN Standards reiterates the responsibility of the facility in providing education to perioperative staff with regards to perioperative attire[1]. Facilities need to be aware

of this potential gap in knowledge about daily changes and laundering requirements of perioperative attire and address any educational deficits that are present.

Recommendations

Following spot audits, education needs can be assessed. If all staff are wearing cloth hats, presentations, posters, and in-service education about practice standards may be required. Placing statements that detail the specific laundering requirements needed to meet the ACORN Standards in theatre changing rooms could reach all roles within the department. The most sensible solution may be for hospitals to launder appropriately manufactured cloth hats themselves each day in a manner that complies with practice standards. Hospitals could invest in this as part of a staff and patient safety initiative that is gaining pace in operating theatres. This initiative allows the option of having names sewn onto the hats. One example of this is the theatre cap challenge[26]. Different methods of having a name and designation stitched into a cloth hat are a way of ensuring people know who staff are[26,27]. Hospitals embracing this initiative could ensure hats are laundered by their hospital laundry (possibly in a separate bag) to ensure cleanliness for the staff member and their family.

Conclusion

To conclude, one of the biggest challenges relating to the issue of perioperative headwear is changing culture and popular belief. If staff have an opinion in favour, or not in favour, of different types or styles of hats, it will take further evidence or education to the contrary to make them think otherwise. The problem is the lack in quantity and quality of research or evidence available to indisputably determine whether cloth hats pose a greater risk to the patient of acquiring SSI. However, the risk of patient and staff safety may be more concerning if cloth hats are not laundered daily in an appropriate fashion.

There is research to suggest that bouffant style disposable hats allow a greater shed of bacteria than a cloth hat due to the pore size. Markel et al. conducted the 'Hats off' study comparing bouffant style hats to skullcap style hats and found no difference in acquiring SSI[15]. There is also not enough evidence to suggest that one type of hat (cloth or disposable) is better than another in reducing risk to patients. Therefore, it could be concluded from the evidence that it is irrelevant what headwear is selected with regards to SSIs for patients; however, risk may be seen with home laundering.

Ultimately what is needed is a way to guarantee that cloth hats are made in a way that complies with Australian Standards and are laundered adequately. Surgical attire of any description can carry bacteria which could contaminate our patients or be carried to our home. The studies appear to focus on the risk of contaminated cloth hats to our patients when in fact it could be argued that the risk to yourself and those around you is greater. As compliance with practice standards is difficult to manage when dealing with personal attire brought into the theatre environment, I believe the only choice is to advocate for cloth hats not to be worn in theatres until compliance with daily changes, manufacturing and hospital laundering can be assured.

Conflict of interest

The author has no conflicts of interest to report.

Acknowledgement

This work was submitted to the University of Tasmania as a partial requirement in master's degree subject CNA803. The author would like to acknowledge Dr Paula Foran, unit co-ordinator and tutor, for her encouragement and direction in writing this discussion piece.

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