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Title

Reducing Exposure Risk in the Operating Room

Authors

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Purpose

The purpose of this article is to evaluate and recommend current best practices related to safe handling of sharp instruments in reducing transmission of blood borne pathogens, specifically HIV, in the operating suite.

Objectives

- 1) To identify the risk of exposure to bloodborne pathogens from sharps in the OR suite.
- 2) To identify practices to reduce the risk of exposure to bloodborne pathogens in the OR suite.

Introduction

A danger concerning health care workers today is the risk of exposure to HIV via percutaneous sharps injuries, mucous membranes, or non-intact skin. “The average risk of HIV transmission after percutaneous exposure is estimated to be approximately 0.3%” and “mucous-membrane exposure is estimated to be 0.09%” (CDC, 2004, p.5). The Centers for Disease Control and Prevention (CDC) estimate health care workers experience 385,000 sharps injuries per year, twenty-five per cent of which occur in the operating room. Studies indicate that up to 15% of surgical procedures result in a percutaneous injury (AORN, 2005; Berguer & Heller, 2005). “As the transmission risk increases with the severity of the injury, this finding is relevant both to the bloodborne pathogen transmission risk of the injured health worker and also to the patient’s risk of being inoculated with the blood of the health care worker” (Jagger et al., 1998, p.989). The question posed was: would the use of personal protective equipment, safety instruments, and/or hands-free techniques reduce the exposures to HIV in the operating room? In the following pages, the authors will present evidence-based practices and recommendations to answer this question with an emphatic yes!

Methodology

The information in this paper was synthesized from a literature review and key informant interviews. The literature review consisted of a search in the Cumulative Index of Nursing and Allied Health Literature (CINAHL) database and the Highwire Press database of peer-reviewed scientific journals using keywords such as “operating room,” “prevent,” “protect,” “HIV,” “sharps injuries,” as well as categories such as “occupational exposure prevention and control.” More than five hundred articles were found in the databases searched. Abstracts from approximately seventy-five journal articles were reviewed. From these articles, five studies were

chosen for review and rated on the strength of their evidence using the levels identified by Melnyk and Fineout-Overholt (2005) with level I being the strongest level of evidence. See Table 1, Rating System for Hierarchy of Evidence.

Table 1

*Rating System for the Hierarchy of Evidence
Melnyk & Fineout-Overholt, 2005, p.589 & 590.*

Level I	Evidence that is generated from systematic reviews or meta-analyses of all relevant randomized controlled trials or evidence-based clinical practice guidelines based on systematic review of randomized controlled trials.
Level II	Evidence generated from at least one well-designed randomized clinical trial.
Level III	Evidence obtained from well-designed controlled trials without randomization.
Level IV	Evidence from well-designed case-control and cohort studies.
Level V	Evidence from systematic reviews of descriptive and qualitative studies.
Level VI	Evidence from a single descriptive or qualitative study.
Level VII	Evidence from the opinion of authorities and/or reports of expert committees.

Interviews of key informants were conducted for a local perspective on current practice and compliance with prevention protocols.

Literature Review

Jagger, Bentley and Tereskerz (1998) conducted a surveillance study that was designed to “build a descriptive multicenter database to be used as a foundation for identifying the causes of exposure to bloodborne pathogens and promoting successful prevention measures in the surgical setting” (p.979). The Jagger study recognized the value of the Exposure Prevention Information Network (EPINet/OR) as “a useful tool for understanding the causes of blood exposures in the surgical setting and for identifying prevention priorities” (p.991), and identified “the prevention

that holds the greatest promise is to reduce the use of *sharp* [italics added] instruments to the maximum possible extent” (p.992), and their findings confirmed “those of previous studies that increased use of barrier precautions and improved liquid resistance of barrier materials are important factors in reducing mucocutaneous blood contact in the OR” (p.994). This study is rated a level VI because it was evidence from a single qualitative study.

In March 2007, the National Institute for Occupational Safety and Health (NIOSH) issued a report which is rated a level V because it is evidence obtained from systematic reviews of descriptive studies:

...to describe the hazard of sharp-tip suture needles as a source of percutaneous injuries to surgical personnel; to present evidence of the effectiveness of blunt-tip suture needles in decreasing percutaneous injuries to surgical personnel, particularly when used to suture muscle and fascia; and to emphasize OSHA’s requirement to use safer medical devices- in this case- blunt-tip suture needles where clinically appropriate (p.1).

Accompanying this report were NIOSH recommendations which “strongly encourage the use of blunt-tip suture needles, whenever feasible and appropriate, to decrease the percutaneous injuries to surgical personnel” (p.3), and

...employers in the workplace that use suture needles have the responsibility under the Bloodborne Pathogens standard to evaluate the use of blunt-tip suture needles as well as appropriate safer medical devices, and the introduction of any device must include training of staff in its proper use and follow-up to ensure a successful transition from conventional to safer devices” (p.3).

Stringer and Haines (2006) designed a random control to study the effectiveness of hands-free techniques (HFT) in the reduction of occupational bloodborne risk during surgery. “About a 60% risk reduction was seen when HFT was used 75% or more of the time in surgeries with substantial blood loss” (p.5). This study is rated a level II because it is from a well designed randomized clinical trial.

Tarantola, Golliot, L’Heriteau, Lebascle, and Farret (2006) published results of a survey conducted in 20 hospitals in northern France. This study found that a great majority of surgical percutaneous injuries and mucocutaneous exposures went unreported and that needle sticks occurred significantly less frequently when blunt-tipped needles had been used. A very important point made in the study is that when a needle stick injury occurs, the patient is being exposed to bloodborne pathogen transmission. It is the responsibility of the medical facility to intervene appropriately when a preventable exposure is identified. This study is rated at a level VI because it is a single descriptive study.

Berguer and Heller (2005) conducted a meta-analysis, in which they looked for reasons why sharps injuries continue to occur in light of universal precautions. Their review of random control trials indicated that needlestick injuries were decreased or eliminated with the use of blunt-tip suture needles. This study is rated a level I because the evidence is generated from a meta-analysis of randomized control trials.

Local Practice

Interviews were conducted and questions posed about specific practices. Answers confirmed nation wide trends related to the use of double gloving, use of blunt rather than sharp needles, and the consistent use of neutral zones by operating room personal. Personal preference by some surgeons drove the final set up in some suites. Using any unapproved, non-safety device

required the surgeon to document the reason for the device or practice that is considered prohibited. Physician preference and cost were the two most frequently cited reasons for not consistently following established guidelines.

Sample Cost Analysis

During a surgical procedure, the number of people scrubbing in varies, as does the number of scalpels and suture needles used. For demonstration purposes, a cost comparison was conducted for a figurative procedure that involves four (4) surgical personnel, two (2) disposable scalpels, and six (6) suture needles. The price for one pair of latex surgical gloves is \$2.45 (The Medical Supply Company, Inc.), one disposable #22 non-safety scalpel is \$1.01 and one disposable #22 safety scalpel is \$1.29 (MedicalMailOrder), one regular (sharp) half-circle suture needle is \$1.13 and one blunt-tip half-circle suture needle is \$2.38 (Anchor Products). Doing the math; using safety equipment and double gloving would cost \$17.86 more (See Figure 1.). If over the course of a year, one of these procedures were performed every day, the surgical budget would bear an additional \$6,518.90 burden by using the 2 pairs of gloves per person (4), using two (2) safety scalpels, and using six (6) blunt tipped needles.

Berguer and Heller (2005) reported that up to 15% of surgical procedures result in percutaneous injuries; in the afore mentioned scenario there would have been 55 injuries. According to the CDC, prophylactic treatment costs from \$500 to \$3000 per injury (CDC, 2004). Employee health would need to budget \$27,500 to \$165,000 for these treatments (See Table 2.). The financial burden for additional equipment cost is far offset by the potential savings in reduced treatment costs to injured workers.

Table 2.

Cost comparison of safety and non-safety equipment for sample cost analysis.

1 pair latex gloves	2.45	2 pairs latex gloves	4.90	
Disposable #22 non-safety scalpel	1.01	Disposable #22 safety scalpel	1.29	
Regular ½ circle suture needle	1.13	Blunt tip ½ circle suture needle	2.38	
Total	4.59	Total	8.57	
<i>Equipment</i>	<i>For 4 Staff</i>	<i>Using 2 scalpels</i>	<i>Using 6 needles</i>	<i>Total cost per case</i>
Safety	19.60 gloves	2.58	14.28	36.46
Non-safety	9.80 gloves	2.02	6.78	18.60

(Difference of \$17.86/ case)

Blunt-Tip Suture Needles

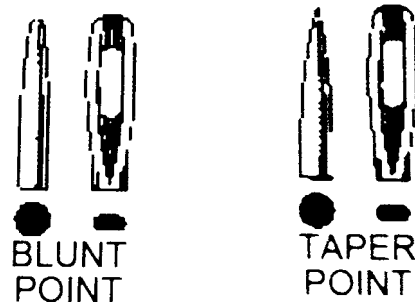
NIOSH has identified sharp-tip suture needles as not only "the leading source of percutaneous injuries to surgical personnel, ... but also ... a risk to patients from potential exposure to injured staff's blood" (March 23, 2007, p.2). Referring to Occupational Safety and Health Administration (OSHA) requirements, the NIOSH publication advises:

As an alternative to sharp-tip suture needles, blunt-tip suture needles can be used to suture less-dense tissue such as muscle and fascia. Conventional sharp-tip suture needles may be needed to suture skin, bowel, and blood vessels, although suture-less techniques for these procedures are available for use at the discretion of the surgeon. In addition, use of these devices resulted in minimal clinically apparent adverse effects on patient care...

(p.2,3). See Figure 1.

Figure 1.

Illustration of round (sharp) versus blunt tip needles.



From Anchor Surgical. Available at www.anchorurgical.com/ANCHOR_Catalog.pdf

Double Gloving

Accompanying blunt-tip suture needle engineering control interventions are suggestions for double gloving during surgery. According to Berguer and Heller (2005):

Double gloving reduces the risk of exposure to patient blood by as much as 87% when the outer glove is punctured. While the puncture of the outer glove remains common, corresponding punctures of both the inner and outer gloves are rare. Additionally, the volume of blood on a solid (blunt) suture needle is reduced by as much as 95% when passing through two glove layers, thereby reducing the viral load in the event of a contaminated percutaneous injury (p.18-23).

While these barrier items have demonstrated reduced risk of exposure to blood and body fluids, surgeons are hesitant to change their current procedures citing loss of sensitivity and dexterity when double gloving (Berguer & Heller, 2005), and extra gear adding to body heat and making the wearer uncomfortable (Fry, 2005). Studies have shown that there is an adaptation

period when switching from single to double gloving, but after that period there is no significant difference in sensitivity or dexterity (Berguer & Heller, 2005).

Hands-Free Neutral Zones

Neutral zones are recommended to avoid direct exchange of sharps, but surgeons express concern about taking their eyes away from the surgical field to find the designated neutral zone. Investigators argue that proper training and adaptation time can quell the fears of the surgeons (Stringer & Haines, 2006).

The neutral or safe zone is a designated area on the sterile field where a sharp can be placed and then picked up by the user. The ideal device for a neutral zone should be large enough to hold sharps, not easily tipped over, and preferably mobile. Only one sharp should be in the neutral zone at a time. Kidney basins tend to be dangerous when used to pass instruments as fingers wind up inside the basin next to the sharp. The person passing the sharp can announce "sharp" when moving the instrument (Sharps Care, 2005, p.2). See Figure 2.

Figure 2.

Illustration of device for establishing hands-free neutral zone.



From International Sharps Injury Prevention Society. Available at www.isips.org/products/Graphics/trocars.jpg

Conclusion

The OSHA (January 1, 2007) and the NIOSH (2007) have issued recommendations for using blunt tipped suture needles, using hands free technique when handling suture needles, using blunt or round-tipped scalpels, and effectuating a neutral zone to avoid hand-to-hand passing of instruments. With all these recommended preventive measures available, why do we still have so many exposures in the operating room?

Distraction and carelessness are cited as causes for percutaneous injury and exposure and must be addressed. Attitudes, behaviors, and willingness to change must be examined in order to educate health care workers about the best practice for reducing their risk of HIV exposure. Holodnick and Barkauskas (2000) state that "...seroconversion rates of health care workers remain low, possibly instilling a false sense of security" (p.470) which may contribute to under reporting injuries. "Infectious disease exposure underreporting is a major barrier to understanding the risks and factors associated with occupational exposures" (Holodnick & Barkauskas, p.462).

Changing attitudes and behaviors of healthcare workers is an arduous task in the ongoing challenge of preventing sharps injuries in the operating room. The literature supports the concept of new employee education, initial education upon receiving a new device, continuing educating throughout the year, frequent evaluation, and awareness activities to increase compliance with current recommendations.

Many learning modalities can be used to entrench the importance of following safety recommendations deeply in the minds of healthcare workers. These modalities include, but are not limited to hands-on training with new instruments demonstrated by trained instructors; video instruction followed by discussion; and visual aids posted near scrub sinks, in staff lounges and operating rooms reminding healthcare workers to use appropriate Personal Protective Equipment (PPE), safety instruments and techniques.

Review of policies and procedures should occur routinely during staff meetings. The hospital must establish a core group of personnel responsible for acquiring information about new safety recommendations, for becoming proficient in the use of the recommended instrument or technique, and for disseminating this information. Nurses as patient advocates must insist on the use of safe practices.

Evaluation of these methods can include interviews with healthcare workers, post-training surveys, periodic questionnaires, and random surveillance in the operating room. Healthcare workers should be encouraged to provide feedback for administrative entities to gain insight on training methods that are more effective and to make suggestions for providing a safer work environment.

Fostering the concept of reporting every exposure immediately is imperative. According to OSHA's Compliance Directive (OSHA, 1998), a collaborative study between the CDC and six

hospitals indicated that 46% of injuries went unreported by healthcare workers, these findings were supported by yet another study by the Exposure Prevention Information Network (EPINet) hospitals disclosed that 39% of exposure incidents were not reported...and results of yet another study conducted in one hospital indicated that 59% of injuries were not reported...” (Injury rates section, para. 2).

Tools such as Exposure Prevention Information Network (EPINet/OR) and National Surveillance System for Healthcare Workers (NaSH) facilitate reporting of exposures leading to a better understanding of the circumstances surrounding the incidents. These tools contain detailed questions about the type of surgical procedure, surgical instruments being used, whether the instruments had safety features, when the injury occurred, location of the injury, depth of the injury and PPE used at the time of injury. Reporting exposures contributes to a safer environment and ensures that the healthcare worker will receive the proper prophylactic treatment. Initial training and review of procedures for reporting exposures should be included with new employee orientation education and continuing education throughout the year.

The issue of safety should overcome the reluctance of healthcare workers to try new techniques and safety should prevail over the material cost of safety instruments. No monetary value can be affixed to the health and well being of the healthcare worker or the patient.

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III. EVALUATION Use the following rating scale for the questions below:
 4=Excellent 3=Average 2=Fair 1=Poor N=Not Applicable

TO WHAT EXTENT HAVE YOU ACHIEVED EACH OBJECTIVE?					
1. A. To identify the risk of exposure to bloodborne pathogens from sharps in the OR suite.	4	3	2	1	N
B. To identify practices to reduce the risk of exposure to bloodborne pathogens in the OR suite.	4	3	2	1	N
2. To what extent did the objectives relate to the overall purpose/goal of the activity? The purpose of this article is to evaluate and recommend current best practices related to safe handling of sharp instruments in reducing transmission of blood borne pathogens, specifically HIV, in the operating suite.	4	3	2	1	N
3. To what extent were the teaching/learning resources appropriate and used effectively?	4	3	2	1	N
4. How would you rate your knowledge of this content <i>before</i> reading this article?	4	3	2	1	N
5. How would you rate your knowledge of this content <i>after</i> reading this article?	4	3	2	1	N
6. How long did it take you to complete this activity? _____ Minutes					

7. Please print your name as you would like it to appear on your certificate of successful completion:

8. COMMENTS FOR IMPROVEMENTS OR FUTURE CONTINUING EDUCATION: