SHARPS INJURIES in the OPERATING ROOM

MASSACHUSETTS SHARPS INJURY SURVEILLANCE SYSTEM DATA, 2004

Occupational Health Surveillance Program, Massachusetts Department of Public Health

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DATA HIGHLIGHTS

- In 2004, 32% (1,038) of sharps injuries reported by Massachusetts hospitals occurred in the Operating Room (OR).
- Devices without safety features accounted for more than 78% (812) of sharps injuries in Massachusetts ORs in 2004. Of these, 54% (440) were identified as suture needle devices.
- Many suture needle (53%) and scalpel injuries (67%) in the OR were among non-physician personnel including: nurses, physician assistants, medical students, and nurses' aides.
- Up to 27% of sharps injuries in the OR occur in situations that have strong potential for primary prevention. These injuries occur during handling or passing equipment, cleanup, and improper sharps disposal or procedure methods.

INTRODUCTION:

Operating rooms present special challenges in reducing the risk and number of sharps injuries and bloodborne pathogen exposures[1]. The degree of risk is directly related to a number of factors including the inherent nature of peri-operative work, routine and concentrated use of various types of sharp instruments and exposure to large amounts of blood, body fluids and tissue[2, 3, 4, 5, 6, 7]. Protective equipment, such as masks and face shields, required for the purpose of patient and provider protection, can add to exposure risk as it creates greater difficulties in communicating. Limited space and visibility within operative fields, under-staffing, emergent patient care situations, pace of work, distractions and ambient noise may increase the risk of sharps injuries and bloodborne pathogen exposures[5, 6].

BACKGROUND:

Epidemiology of Sharps Injuries in the Operating Room

Several studies have examined the risk of bloodborne pathogen exposure in operating rooms. A large seroprevalence study conducted in 1995 in a New York City teaching hospital found that 16.7% of major surgery patients aged 25 to 44 were infected with one or more of the three viruses Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV) or Hepatitis C Virus (HCV)[8]. Observational studies have demonstrated that sharps injuries occur in 2-19% of all surgeries, depending on the type of surgery and other factors[3, 5, 7, 9, 10, 11].

A 15-month, six-hospital study of OR exposures conducted jointly by the International Health Care Worker Safety Center and the Association of periOperative Registered Nurses revealed a number of patterns related to Sharps injuries. During the surveillance period, 386 percutaneous injuries were reported. The highest proportion of injuries (33%) occurred within the operative field; the surgical site ranked second with 25%. Three types of devices caused 75.9% of injuries: suture needles (51.0%), hollow-bore needles (13.2%), and scalpel blades (11.7%)[5].

Underreporting of Sharps Injuries

Several studies have demonstrated that there is significant underreporting of sharps injuries among healthcare workers. One study reported that as many as 70% of surgeons never or rarely report percutaneous exposures[12]. Factors contributing to low reporting rates include: healthcare workers' perception of risk, occupation[13], length of service[14], lack of time, and poor follow-up care[15].

The Massachusetts Sharps Injury Surveillance System

In 2001, pursuant to the Massachusetts law, An Act Relative to Needlestick Injury Prevention (MGL Chapter 111 §53D), the Massachusetts Department of Public Health (MDPH) promulgated regulations requiring annual reporting of data on sharps injuries among healthcare workers by hospitals. Since that time, MDPH has collected data for seven surveillance periods. The initial surveillance period occurred between October 1, 2001 and December 31, 2001. Subsequent surveillance periods follow the calendar year. For all periods, data were submitted by all MDPH licensed facilities.

As an ongoing effort to utilize these data to enhance statewide efforts by hospitals to reduce the number of sharps injuries among their workers, the MDPH Occupational Health Surveillance Program is issuing this special report. This report includes a description of the nature and circumstances of sharps injuries (SI) among healthcare workers in Massachusetts operating rooms based on 2004 data, and recommendations for reducing these injuries in the future.

There are indications, based on the above-mentioned studies and 2004 Massachusetts data, that opportunities exist for reducing sharps injuries within operating rooms around the state. As sharps data are presented, it is always important to emphasize that underreporting remains a significant issue that varies according to occupation and hospital. It is reasonable to assume, therefore, that these data represent an underestimate of the problem.

METHODS:

For the year 2004, 99 facilities submitted Annual Sharps Injury Reports to MDPH. All healthcare workers in acute and non-acute care hospitals licensed by MDPH, as well as any satellite units (e.g., community health centers, ambulatory care centers) operating under a hospital license, were included in the population under surveillance. Reportable incidents were exposures to blood or other potentially infectious materials as a result of events that pierce the skin or mucous membranes during the performance of an employee's duties. See the MDPH report *Sharps Injuries among Hospital Workers in Massachusetts, 2004*[16] for a more detailed description of the surveillance system and methods.

This special topic report is based on data from 2004, the third complete year of data collected by the surveillance system, during which 3,279 sharps injuries among all hospital workers were reported. Massachusetts ORs accounted for 1,038 (32%) of the reported sharps injuries, making it the hospital area with the highest number of injuries, followed by inpatient rooms at 22%.

LIMITATIONS:

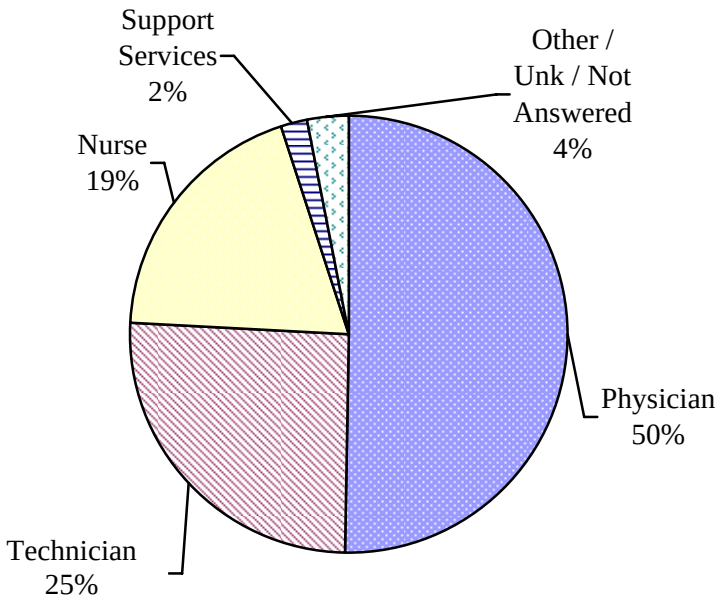
A number of data limitations need to be taken into account when interpreting the sharps injuries presented here. Optimally, sharps injury rates would be calculated using information on the total number of hours worked, sharps devices purchased or used, or procedures performed as the rate denominator. However, such information is not available, thus preventing the calculation of rate data. Given what is known about underreporting of sharps injuries, the number of sharps injuries in the operating room presented in this report is likely to be an underestimate of the true number of injuries. And finally, the presence of small cell sizes in certain cross tabulations of data highlighted in this report can make results less stable and make interpretation somewhat problematic.

FINDINGS IN MASSACHUSETTS:

FIGURE 1. OPERATING ROOM SHARPS INJURIES BY OCCUPATION **N=1,038**

- Physicians sustained the greatest number of injuries (50%), followed by technicians (25%), including surgical technicians, and nurses (19%).

- Further breakdown of physician categories reveals attending physicians and surgeons accounted for 20% of all injuries, whereas surgical interns and residents, fellows, and anesthesiologists accounted for 20%, 2.3%, and 0.7% respectively. Medical and other students accounted for 6% of the injuries.

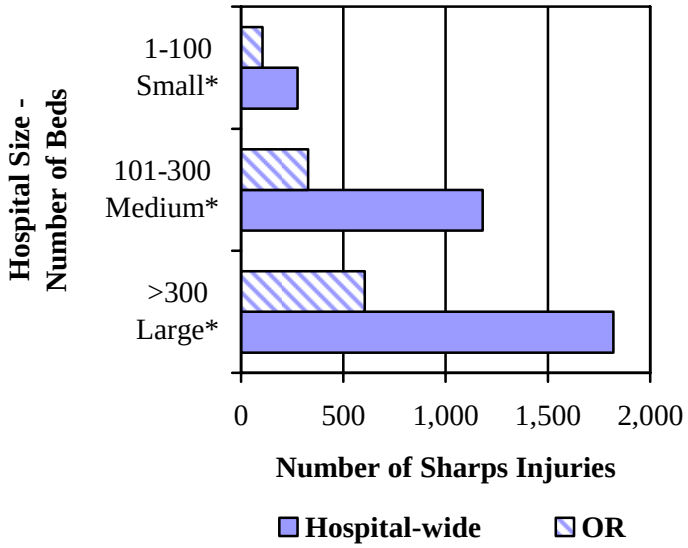


Data Source: Annual Summary of Sharps Injuries, 2004

FIGURE 2. OPERATING ROOM SHARPS INJURIES BY HOSPITAL SIZE N=1,038

• The majority (58%) of operating room sharps injuries took place in hospitals with more than 300 beds. This is consistent with the distribution of injuries in all hospital areas, with large hospitals accounting for 56% of injuries in 2004.

• While small hospitals had the least number of sharps injuries, sharps injuries in the OR as a percentage of sharps injuries hospital-wide (38%) were greatest among small hospitals.



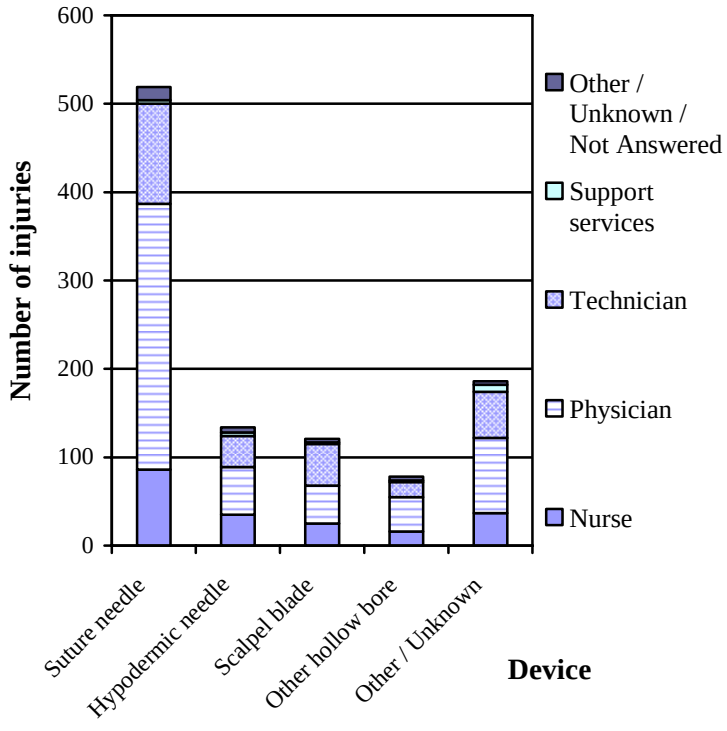
*Number of hospitals: Small – 32; Medium – 51; Large 16.
Data Source: Annual Summary of Sharps Injuries, 2004

FIGURE 3. OPERATING ROOM SHARPS INJURIES BY DEVICE AND OCCUPATION N=1,038

• Occupational groups with the greatest number of suture needle-related injuries in the operating room were attending physicians (58%, 301), RNs and LPNs (17%, 86), and technicians (22%, 113).

• Hypodermic needles accounted for 13% of OR sharps injuries. Physicians sustained the highest number of injuries with hypodermic needles (54), followed by nurses and technicians at 35 each.

• Scalpel blades accounted for 12% of OR sharps injuries. Technicians sustained the highest number of scalpel injuries (47), while physicians and nurses and accounted for 43 and 25 respectively.



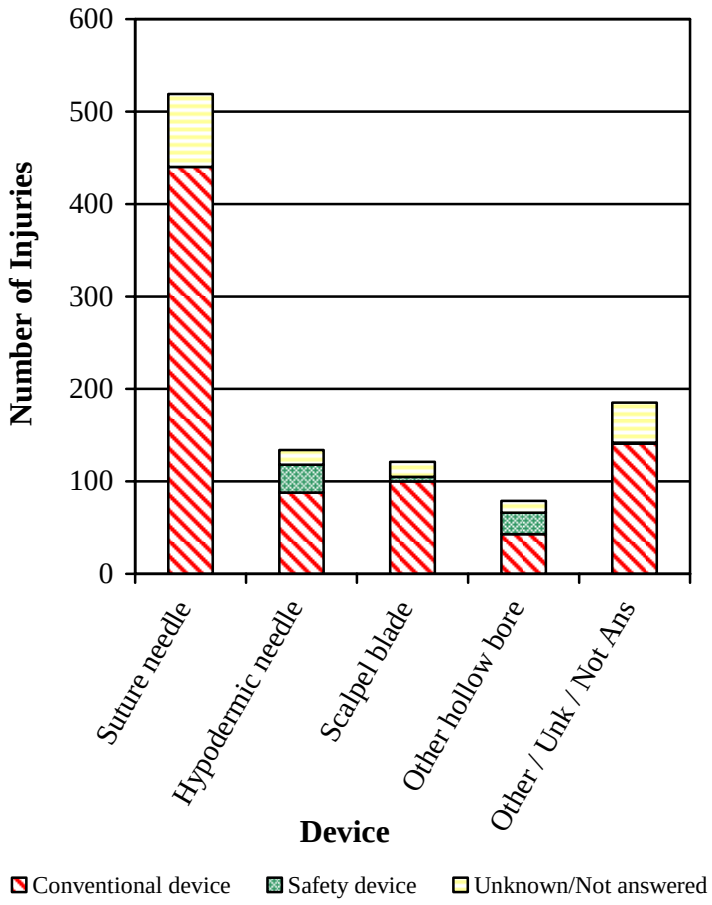
Data Source: Annual Summary of Sharps Injuries, 2004

Figure 4. OPERATING ROOM SHARPS INJURIES BY DEVICE: SAFETY VS CONVENTIONAL **N=1,038**

• Three categories of devices, suture needles, scalpels, and hypodermic needles, accounted for approximately 75% of all OR injuries in 2004.

• Suture needle devices accounted for the greatest overall proportion (50%) of injuries.

• Conventional devices accounted for 78% of OR injuries. Of those, 54% were suture needles. Twenty percent of conventional devices were hypodermic or other hollow-bore needles.



Data Source: Annual Summary of Sharps Injuries, 2004

- For 74% (384) of suture injuries, no information was provided regarding specific type of suture needle (curved vs. straight).

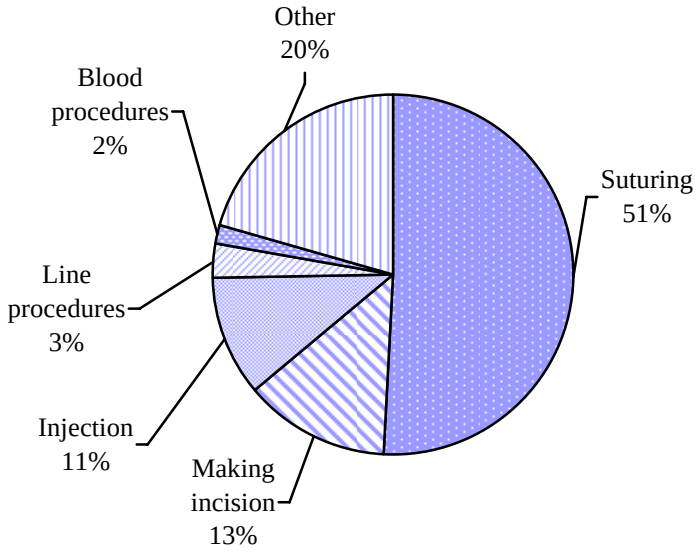
- Combined, suture needles and scalpels accounted for approximately 62% (640) of the devices involved in sharps injuries to OR hospital workers. A significant proportion of suture needle (53%) and scalpel injuries (67%) in the OR were accounted for by non-physician personnel including: nurses, physician assistants, medical students, and nurses' aides.

- Hollow-bore needles including hypodermic needles (excluding spinal/epidural needles and pre-filled syringes) accounted for 20% (212) of OR injuries.

Figure 5. OPERATING ROOM SHARPS INJURIES BY PROCEDURE OR PURPOSE FOR WHICH SHARP WAS USED **N=1,038**

• Suturing, cutting, and administration of injections together accounted for 75% of the procedures during which sharps injuries occurred.

• Eighty-five percent (114) of injuries with devices used for cutting procedures involved scalpels. The remaining injuries involved bovies, scissors, trocars and other sharp devices.

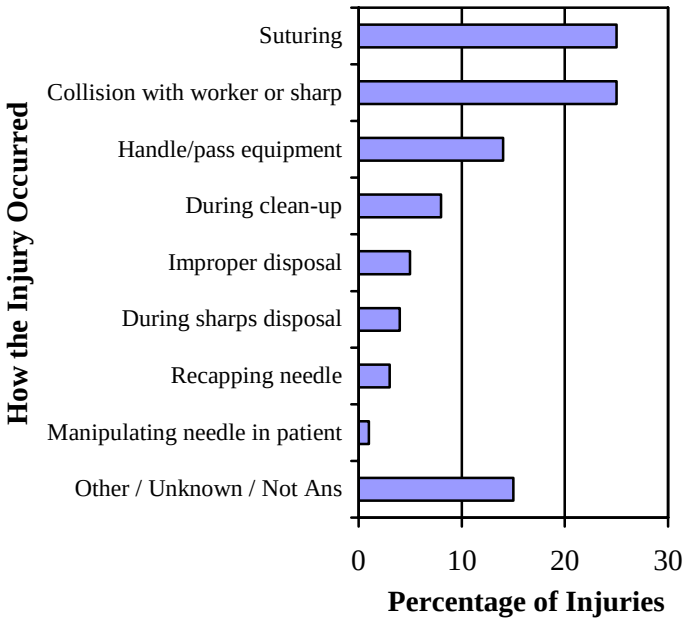


Data Source: Annual Summary of Sharps Injuries, 2004

Figure 6. OPERATING ROOM SHARPS INJURIES BY HOW INJURY OCCURRED **N=1,038**

• The top two categories of injury based on how the injury occurred include suturing (25%, 263) and collision with a sharp or coworker (25%, 256).

• Several categories indicate a strong potential for primary prevention of injuries in operating rooms including: handling equipment on a tray or stand (56), passing equipment (90), during clean-up (82), and improper sharps disposal (52). Combined, these injuries accounted for 27% of OR sharps injuries in 2004.



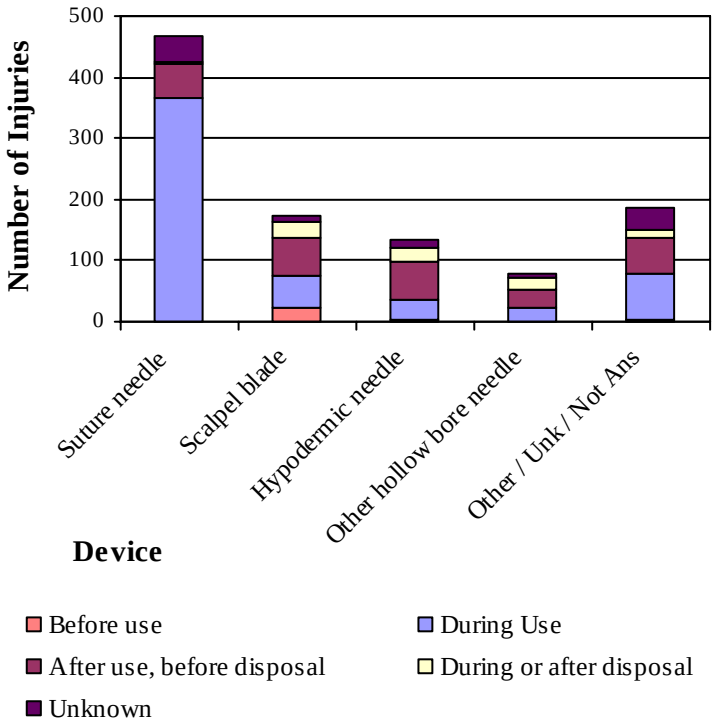
Data Source: Annual Summary of Sharps Injuries, 2004

FIGURE 7. OPERATING ROOM SHARPS INJURIES BY DEVICE AND WHEN INJURY OCCURRED (RELATIVE TO PROCEDURE) **N=1,038**

• Injuries during use occurred most often with suture needles (67%).

• Injuries occurring after use and before disposal were almost evenly distributed among hypodermic needles (24%), suture needles (20%) and scalpel blades (23%).

• Injuries during or after disposal most frequently involved scalpel blades (30%).



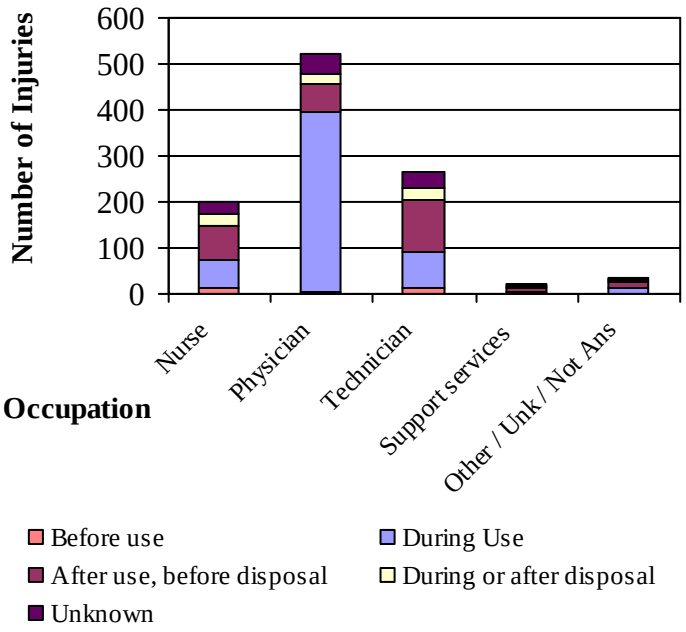
Data Source: Annual Summary of Sharps Injuries, 2004

FIGURE 8. OPERATING ROOM SHARPS INJURIES BY OCCUPATION AND WHEN THE INJURY OCCURRED (RELATIVE TO PROCEDURE) **N=1,038**

• A total of 548 (53%) injuries occurred during use of the item. Physicians sustained the greatest proportion (72%) of injuries during use.

• "After use, before disposal" injuries accounted for 26% of OR injuries. Nurses and technicians sustained 70% of these injuries.

• Injuries occurring during or after disposal accounted for 9% of injuries. Nurses and technicians sustained 61% of the injuries in this category.



Data Source: Annual Summary of Sharps Injuries, 2004

DISCUSSION:
Sharps injuries are common, preventable hazards faced by medical personnel in the operating room. The potential consequence of such injuries includes transmission of bloodborne pathogens and detrimental effects on personal and professional lives.

The proportion of injuries occurring in the operating room is similar to that contained in a 2003 Exposure Prevention Information Network (EPINet) report released by the International Healthcare Worker Safety Center, in which operating rooms accounted for a significant percentage of injuries (29%), ranking second only to patient rooms (32%)[17].

Massachusetts OR data indicate that of 1,038 reported injuries in 2004, 519 (50%) were caused by suture needles, 134 (13%) by hypodermic needles and 121 (12%) by scalpel blades. A non-safety device was involved in 85% of the suture needle-related injuries. Only 43 of 200 (22%) reports of injuries caused by a hypodermic or other hollow-bore needle indicated that the needle involved was a safety device. Sixteen percent (167) of the injury reports contained no information to indicate whether the sharps device involved was a safety device.

A number of studies indicate the potential to reduce the number of injuries in ORs, based on introduction of changes within the work environment and substitution of safety devices for pre-defined surgical procedures. Use of blunt suture needles in fascia and muscle closure[5, 9, 11, 18, 19] and designated neutral zones[1, 6, 20] are two strategies that have demonstrated their effectiveness in randomized clinical trials. Researchers who conducted a multi-center surveillance study of occupational exposures and percutaneous injuries reported that 59% of suture needle injuries were caused by needles used to suture fascia or muscle, and estimated that use of blunt suture needles alone could have reduced suture needle injuries by as much as 30%[5]. Review of these studies and the Massachusetts data presented here have resulted in the following recommendations to prevent sharps injuries in Massachusetts' operating rooms.

Recommendations to Prevent Sharps Injuries in Massachusetts Operating Rooms:

<u>Convene a multi-disciplinary team to identify and facilitate needed change.</u>
Change takes time and successful change requires cooperation and commitment from every member of the team. Quality improvement efforts should promote buy-in and active participation of all members of the team including senior leadership, nursing staff, surgeons, anesthesiologists, physician assistants, technicians, students and housekeeping. An inclusive, systematic approach is integral to the processes of device selection and evaluation and initiation of work practice controls[21, 22, 23, 24].

<u>Modify work practices that create avoidable injury hazards.</u>
Reinforce policies on disposal and recapping of sharps.
This category of injury represents an important focus for primary prevention activities. Modifying work practices can eliminate injuries due to improper disposal or handling of sharps and recapping. Seven percent of sharps injuries in Massachusetts operating rooms in 2004 resulted from improper handling or disposal of sharps[16]. The Occupational Safety and Health Administration prohibits recapping as a general practice. If absolutely necessary due to

intermittent medication dosing, only a single-handed technique should be used when recapping a needle[23, 25].

Avoid hand-to-hand passing of sharps equipment as often as possible
A significant proportion of suture needle (53%) and scalpel injuries (67%) in the OR were reported by non-physician personnel. Use of a neutral or safety zone, whereby a designated area, device or field is used to place sharps for transfer, to eliminate simultaneous handling of sharps by two people, has demonstrated its value in preventing injuries and should be considered as one approach to reducing injuries for all OR personnel[1, 5, 6, 26]. The purpose of a neutral or safety zone is to reduce the hand-to-hand transfer of sharps that account for a significant percentage of injuries within ORs. Exceptions to use of neutral or safety zones involve surgeons' discretion for situations when he or she cannot avert eyes from the surgical field or when positioning precludes the ability to reach the designated area[1].

Examine non-safety device inventories and substitute devices with sharps injury prevention features where clinically appropriate.
NIOSH [23] and OSHA[25] have identified engineering and work practice controls as the primary means by which sharps injuries should be reduced. Eliminate unnecessary sharps where possible. Some OR items including scalpels, surgical scissors, pick-ups and towel clips don't always need sharp points to effectively serve their purpose[5, 27]. For other categories of conventional sharps, including phlebotomy and hypodermic needles, there are a wide variety of safety devices available. More than 70% of sharps injuries in Massachusetts hospital operating rooms in 2004 caused by hollow-bore needles involved non-safety devices[16]. It is reasonable at this point in time to expect that, with the exception of pediatric or neonatal devices, a majority of hollow-bore needles are available with engineered sharps injury prevention features. Certain devices, such as those used in pediatrics and neonatology, have yet to be developed with integral safety features.

Use blunt suture needles where clinically feasible and appropriate.
Based on limited procedural data, the extent to which the potential exists for preventing sharps injuries through the use of blunt suture needles is unclear. There is evidence based on randomized clinical trials, however, to support use of these needles under particular circumstances such as in the closure of muscle and fascia[9, 11, 18, 19, 27]. In 2007, OSHA and NIOSH issued a joint safety and health information bulletin on the use of blunt suture needles as a means to reduce sharps injuries among healthcare workers[28]. The bulletin reinforces the OSHA requirements for the use of engineering controls and identifies blunt suture needles as one type of engineering control in the prevention of sharps injuries.

The Massachusetts Sharps Injury Surveillance System is a collaborative effort between the MDPH, hospitals, professional associations and community advocates. The success of the program in collecting data is a direct result of this collaboration. MDPH will continue to work with these groups to conduct surveillance, review exposure control activities in hospitals, and facilitate the exchange and dissemination of information among hospitals about successful prevention strategies.

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This report is dedicated to the memory of Dr. James Ryan, Occupational Medicine Physician, for his passionate work to protect the health and safety of workers, particularly those in the healthcare field.