SHARPS INJURIES AMONG MEDICAL TRAINEES

MASSACHUSETTS SHARPS INJURY SURVEILLANCE SYSTEM DATA 2002

Occupational Health Surveillance Program, Massachusetts Department of Public Health

DATA HIGHLIGHTS

- A total of 1,088 sharps injuries among physicians working in Massachusetts hospitals were reported for the period from January 1 to December 31, 2002.
- Medical students and medical trainees accounted for more than half of all sharps injuries to physicians (54%).
- There was a declining trend over the academic year (July-June) in the frequency of sharps injuries to medical trainees. The greatest frequency was observed during the initial three months of academic medical year (July – September).
- Injuries to medical trainees occurred most frequently in operating/procedure rooms (45%), followed by intensive care (12%) and inpatient units (11%).
- Suturing procedures accounted for the greatest percentage of injuries to medical trainees (40%).
- In comparison to attending physicians, medical trainees sustained proportionately:
  - More sharps injuries in the intensive care unit (12% v. 6%) and inpatient units (11% v. 7%).
  - Fewer sharps injuries in the operating and procedure rooms (45% v. 62%).
  - More sharps injuries while manipulating needle in patient during injections (40% v. 23%).
- Recapping the needles after injections accounted for 13% of sharps injuries to medical trainees and 12% of injuries to attending physicians.
- The great majority (79%) of the sharps injuries to medical trainees involved conventional devices. These were most commonly suture needles and scalpels. After excluding injuries due to suture needles and scalpels, 70% (189) of the remaining injuries (240) involved conventional devices, predominantly hypodermic needles (50%, 94 of 189).

INTRODUCTION:

One of the most serious occupational health hazards that medical students and physicians face during their clinical training is the risk of exposure to blood borne pathogens. Various studies have documented high prevalence of sharps injuries in these groups.[1-6] There is also evidence that medical trainees are at higher risk than more experienced physicians. In this report, data from the new Massachusetts Surveillance Injury Surveillance System are used to describe sharps injuries to medical trainees sustained in Massachusetts hospitals during 2002.

BACKGROUND:

Epidemiology of Sharps Injuries among Medical Trainees

Since the early 1990s, there have been several epidemiological investigations into the risk of sharps injuries to medical students and physicians in training. Surveys of housestaff reveal that between 56-74% reported at least one needlestick during their training.[1,2] In surveys of medical students, the proportion of students reporting a needlestick injury in either their third or fourth year clerkships ranged from 4-48%.[3,4,5]

A survey of 221 medical and surgical housestaff in an urban teaching hospital, completed in 1990, revealed that 74% reported at least one needlestick injury with a suture or hollow-bore needle.[1] Similarly, a survey of graduating fourth year medical students published in 1995 demonstrated that nearly half of all graduating students reported at least one exposure to potentially infectious bodily fluids, with more than half secondary to skin punctures.[3]

Studies have also documented the relative increased risk to students and physicians in training during surgical clerkships.[3-6] A survey conducted in 1992 of 370 residents and 3rd and 4th year medical students at the University of Southern California Medical Center illustrated that surgical residents had an almost 9 fold increased risk of needlestick injuries in comparison to their internal medicine counterparts.[6]

Investigations have suggested that inexperience may play a role in explaining the high risk of sharps injuries during medical training. A study conducted of third year medical students during their surgical rotation found that the risk of injury during the first quarter was significantly greater than that in the final quarter of the academic year (3.4 v. 1 exposure per student), as they presumably had a better knowledge of universal precautions and were more comfortable performing procedures by the end of the academic year.[4]

Another factor that has been investigated as a potential explanation is that of fatigue and the disruption of circadian rhythms experienced by those in medical training. In 2000, Parks et al. reported the results of their retrospective review aimed at studying the day-night pattern of exposure to bloodborne pathogens during medical training. They reported that medical residents had a 1.5 times greater risk of sustaining a bloodborne pathogen exposure working nights in comparison to working days.[7]

Under-reporting of Sharps Injuries

Several studies have addressed the issue of under-reporting of sharps injuries among physicians.[1,8,9] One study compared emergency room physicians to emergency room nurses and emergency medical technicians, and found that physicians reported one eighth of their exposures compared with nurses and EMTs, who each reported 2/3 of their exposures. The most powerful predictor of low reporting rate was the health care worker's own perception of risk.[8]

Research on reporting behaviors among medical students and physicians in training, consistently indicates that under-reporting is a common practice. Studies investigating reporting behaviors reveal that 70-90% of sharps injuries sustained by residents and interns go unreported. The most common reasons given include lack of time, perception of incidents as "low-risk," concerns over confidentiality, and not knowing the reporting procedure. This behavior is also noted among

medical students. A survey of 180 medical students and 370 residents at the Los Angeles County-University of Southern California Medical Center, found that medical students failed to report 86% and residents failed to report 93% of exposures to bloodborne pathogens.[6]

The Massachusetts Sharps Injury Surveillance System

In 2000, Massachusetts enacted legislation regarding needlestick injury surveillance and prevention (MGL Chapter 111 §53D). Licensed hospitals are required to use devices with sharps injury prevention technology (safety devices), develop exposure control plans, maintain logs of worker injuries with contaminated sharps, and report data from these logs annually to the Massachusetts Department of Public Health (MDPH). Data reported to the MDPH Sharps Injury Surveillance System are compiled and published annually to guide state efforts to prevent sharps injuries and promote action at the local level. The surveillance system provides information about occupations at risk and devices, procedures and departments associated with sharps injuries that need to be addressed. It also serves as a vehicle for hospitals and health care workers in Massachusetts to share information about prevention strategies.

METHODS:

All health care 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, are included in the population under surveillance. Reportable incidents are 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 MPDH report *Sharps Injuries among Hospital Workers in Massachusetts, 2002,* for a more detailed description of the surveillance system and methods.

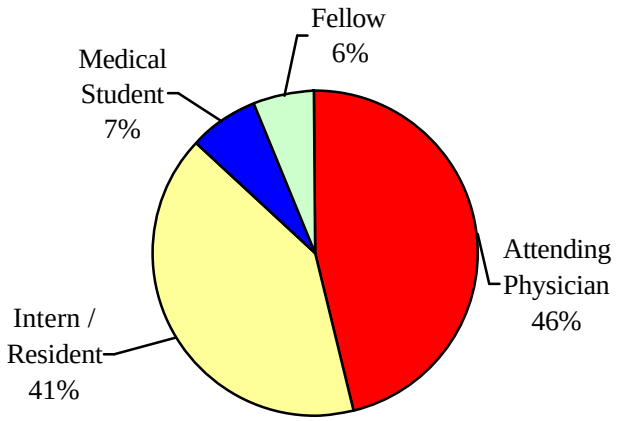
This special topic report is based on data from 2002, the first complete year of data collected by the surveillance system. All licensed hospitals (101) submitted Annual Sharps Injury Reports for 2002 to MDPH. A total of 3,413 injuries among all hospital workers were reported. Of these, 1,088 were sustained by physicians. Physicians were further divided into two groups: 1) medical trainees, which included medical students, interns, residents and fellows, and 2) attending physicians, which included all other physicians. Injuries among medical trainees were analyzed and compared to those among attending physicians

LIMITATIONS:

A number of limitations need to be taken into account when interpreting the sharps injury data presented here. Optimally, sharps injury rates would be calculated using information on the total number of hours worked, sharps devices used, or procedures performed as the rate denominators. However, such information was not available, thus precluding the calculation of sharps injury rates and comparative estimates of injury risk per hour worked or procedure performed. As noted previously, underreporting of sharps injuries on the part of health care workers, particularly medical trainees, is quite likely. Small numbers of injuries in some categories highlighted in this report make results less stable and make interpretation somewhat problematic. Finally, this report represents data collected early in the surveillance system. It reflects the distribution of sharps injuries among physicians in training in the period immediately following changes to federal and state laws. This distribution may have changed in the years since these data were collected.

FIGURE 1. SHARPS INJURIES AMONG PHYSICIANS N=1,088

Medical trainees accounted for 54% of all reported sharps injuries to physicians. Of the trainees, the highest number of reported injuries were to interns and residents. The majority of medical trainee injuries (92%) occurred in teaching hospitals. Of the 835 injuries occurring among physicians in teaching hospitals, 540 (65%) occurred to medical trainees.

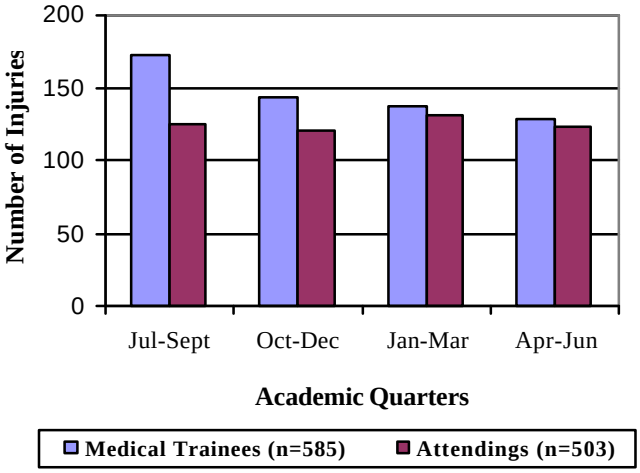


Data Source: Annual Summary of Sharps Injuries, 2002

FIGURE 2. SHARPS INJURIES BY ACADEMIC YEAR QUARTERS MEDICAL TRAINEES V. ATTENDING PHYSICIANS N=1,088

Medical trainees showed a steady decline in the number of reported sharps injuries as they progressed through the academic year.

Attending physicians had a fairly constant number of injuries throughout the year.

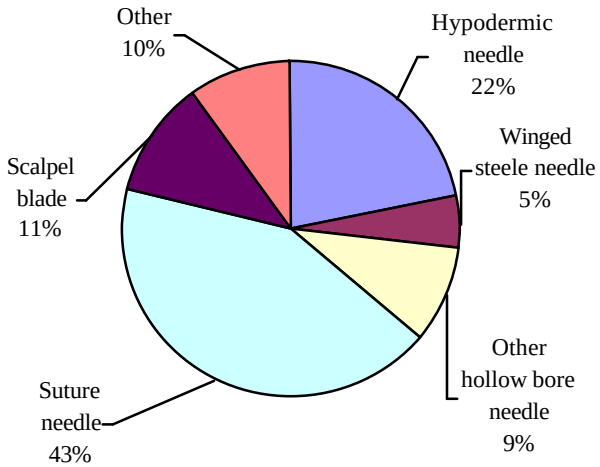


Data Source: Annual Summary of Sharps Injuries, 2002

FIGURE 3. SHARPS INJURIES AMONG MEDICAL TRAINEES BY DEVICE N=585

Most medical trainee injuries (43%) were caused by suture needles, followed by hypodermic needles (22%).

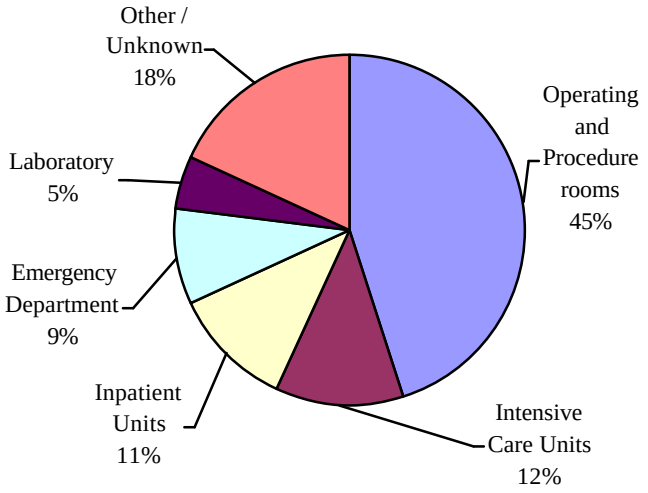
Hollow bore needles as a group accounted for 36% of injuries to medical trainees.



Data Source: Annual Summary of Sharps Injuries, 2002

FIGURE 4. SHARPS INJURIES AMONG MEDICAL TRAINEES BY DEPARTMENT **N=585**

The majority of injuries to medical trainees occurred in operating and procedure rooms, followed by intensive care units and outpatient areas. This contrasted with the distribution of injuries among attending physicians. More than half (62%) of injuries to attending physicians occurred in operating and procedure rooms, 6% occurred in intensive care units, 7% occurred in inpatient units; 8% in emergency departments, and 4% in laboratories.

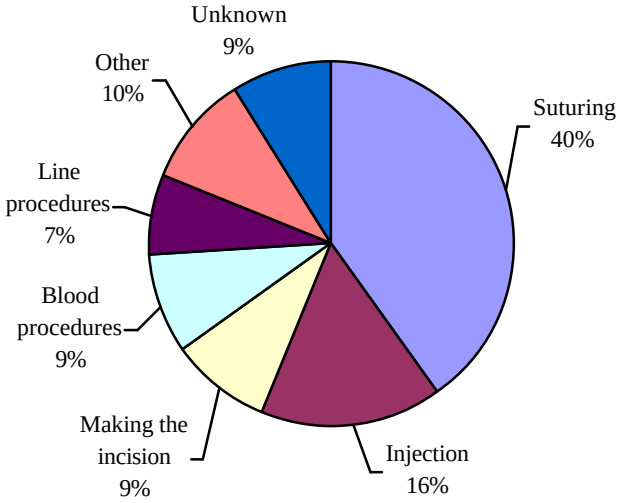


Data Source: Annual Summary of Sharps Injuries, 2002

FIGURE 5. PROCEDURE OR PURPOSE FOR WHICH SHARP WAS USED **N=585**

Medical trainees were most often injured performing suturing procedures, followed by administering injections.

The distribution of procedures involved in injuries among trainees was similar to that of attendings (not shown) for whom suturing accounted for 37% and injection 16% of injuries.

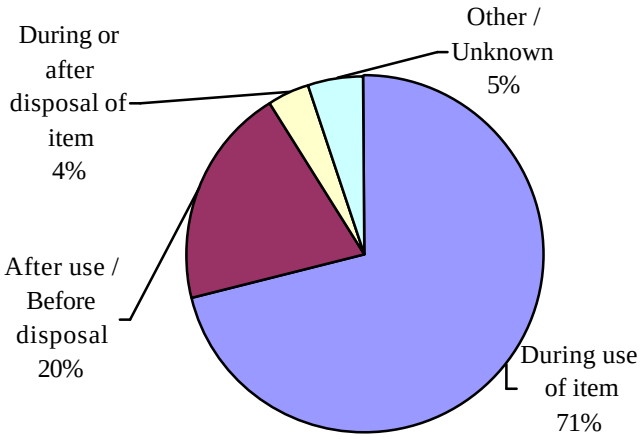


Data Source: Annual Summary of Sharps Injuries, 2002

FIGURE 6. SHARPS INJURIES AMONG MEDICAL TRAINEES BY WHEN THE INJURY OCCURRED (RELATIVE TO PROCEDURE) **N=585**

Most injuries to trainees occurred during use of the sharp item (71%). One out of 5 sharps injuries to medical trainees occurred "after use, before disposal" of the sharp.

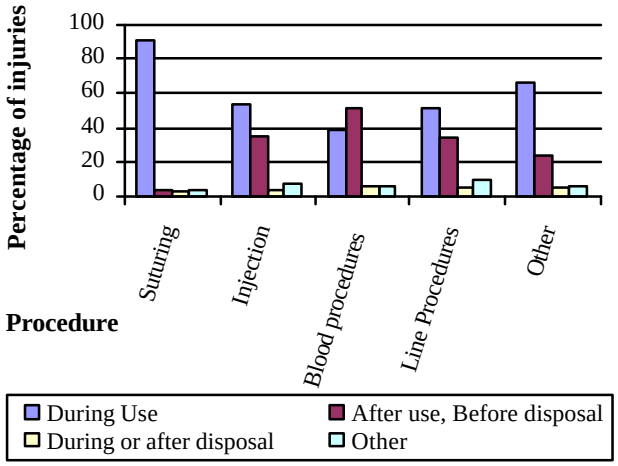
The distribution of this variable was similar to that of attending physicians (not shown) for whom "during use" injuries accounted for 69% and "after use, before disposal" injuries accounted for 19%.



Data Source: Annual Summary of Sharps Injuries, 2002

FIGURE 7. SHARPS INJURIES AMONG MEDICAL TRAINEES BY PROCEDURE AND WHEN INJURY OCCURRED (RELATIVE TO PROCEDURE) **N=585**

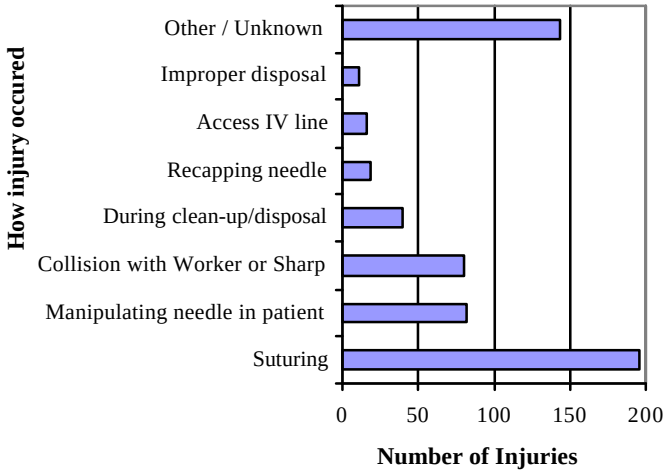
"After use, before disposal" injuries were proportionately greatest for blood procedures (51%), followed by injection (35%) and line procedures (34%).



Data Source: Annual Summary of Sharps Injuries, 2002

FIGURE 8. SHARPS INJURIES AMONG MEDICAL TRAINEES BY HOW THE INJURY OCCURRED **N=585**

Suturing accounted for the majority of how the injuries occurred to medical trainees (34%), followed by "manipulating the needle in a patient" (14%) and "collision with a worker or sharp" (14%).



Data Source: Annual Summary of Sharps Injuries, 2002

FIGURE 9. SHARPS INJURIES TO MEDICAL TRAINEES DURING INJECTION PROCEDURES BY HOW THE INJURY OCCURRED **N=94**

When performing injection procedures, medical trainees were most likely to get hurt while manipulating the needles in the patients (40%).

Recapping the needle accounted for 13% of injuries associated with injection procedures.

Activating the safety feature accounted for 1% of all of injection related injuries.

Data Source: Annual Summary of Sharps Injuries, 2002

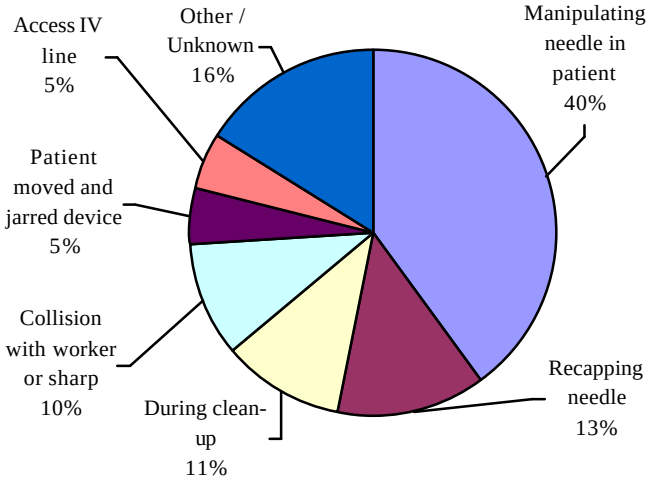
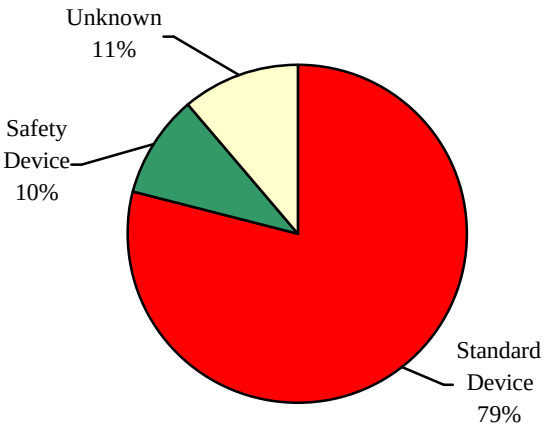


FIGURE 10. SHARPS INJURIES BY SAFETY DEVICE

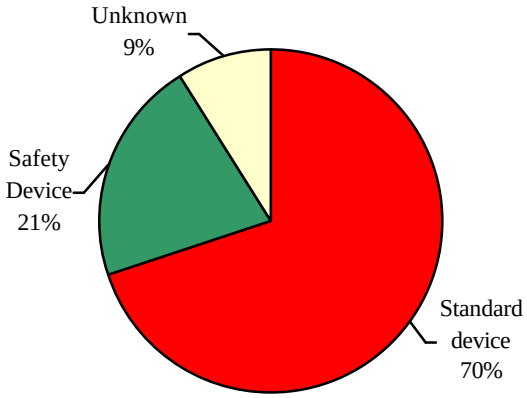
Sharps Injuries to Medical Trainees by Safety Device Status (n=585)



The majority of injuries (79%) among medical trainees involved the use of conventional devices. More than 50% of the conventional devices were suture needles and scalpels.

Data Source: Annual Summary of Sharps Injuries, 2002

Sharps Injuries to Medical Trainees by Device Safety Status - Excluding Sutures and Scalpels (n=270)



After accounting for suture needles and scalpels, the use of conventional devices still accounted for 70% of the injuries to medical trainees. Approximately 50% of these were hypodermic needles, devices for which safer alternatives exist.

DISCUSSION:

Sharps injuries are common preventable hazards faced by medical students and physicians during the course of their training. The consequences of such injuries include the potential transmission of bloodborne pathogens and associated detrimental effects on their personal and professional lives. This is an issue which must be addressed to ensure a safe workplace for medical trainees. Preventing such exposure will require concerted efforts on behalf of medical schools, hospitals, government agencies, equipment manufacturers and the trainees themselves.

The findings of this review highlight specifics that need to be addressed to protect healthcare workers, particularly medical trainees.

Non-Safety Devices

The majority of reported sharps injuries (79%) among trainees involved conventional devices (non-safety). This underscores the need to substitute non-safety devices with devices with engineered sharps injury prevention features and provide training in their proper use and disposal. The development of an inventory of devices as well as an evaluation of devices used within a facility is a key step in the process of converting to devices with engineered sharps injury prevention features. Conducting a review in a systematic fashion, on at least an annual basis, will aid in compliance with federal OSHA Bloodborne Pathogens regulations (29 CFR 1910.1030).

High-risk Practices

Twenty percent of reported sharps injuries in medical trainees occurred "after use, and before disposal," indicating a delay or difficulty in prompt, efficient disposal of used sharps. Availability and placement of sharps containers may be a factor. Timing of injuries also varied by the type of procedure being performed, with injuries relating to blood procedures occurring most often after use and before disposal. In contrast, suture related injuries occurred most often during the procedure. Based on these results, prevention measures regarding blood procedures should focus on devices used, training in the use of safety features and identifying barriers to the appropriate use of safety features. For suture related injuries, elimination of the hazard and substitution of devices through the use of alternative methods of closure (e.g. glues) and blunt suture needles where appropriate are feasible prevention methods.

"Recapping the needle" accounted for 13% of injection related sharps injuries reported among medical trainees. This is a practice which should not be performed, unless it is done with the one-handed method, as outlined in the OSHA Bloodborne Pathogen Standard. Appropriate use of sharps injury prevention features and availability of disposal containers will help to reduce these types of injuries.

Prevention strategies should be directed towards identifying differences in the handling of sharps in different departments and for varying procedures. Prevention strategies should also target sharps disposal containers (both fixed and portable), ensuring that they are available in adequate numbers, placed in appropriate locations, with protocols for replacing the containers when full.

Inexperience

Medical trainees reported more sharps injuries during the first quarter of the academic year. The frequency of sharps injuries declined throughout the academic year, approaching that of attending physicians. While increased proficiency with various procedures over time is a likely explanation, changes in job tasks or decreased reporting by medical trainees over the course of the year may also be factors. Medical trainees reported proportionately more sharps injuries during injection procedures secondary to "manipulating the needle in the patient." Prevention strategies include targeted training seminars for medical students and residents/fellows to increase their experience in handling sharps for various procedures. These should be mandatory and repeated throughout training at regularly scheduled intervals.

Under-reporting

As cited in the literature, medical students and physicians in training vastly under-report sharps injuries. The most common reasons center on aspects of self risk assessment and an under-appreciation of the value of following devised protocols. Lack of experience and judgment performing potentially high risk procedures may place them at increased risk for exposure. This lack of experience and judgment may also contribute to improper risk assessment and a failure to report the exposure incident. Choosing not to report an exposure incident prevents timely and appropriate post exposure management. The importance of under-reporting and follow-up must be addressed and emphasized in training/education seminars geared towards medical trainees. This information should be included in medical school curriculum as well as during hospital specific orientations.

Fatigue

While not addressed in this study, the literature has demonstrated the possibility of fatigue as a modifier of the risk of sharps injury among trainees. To further evaluate this issue, we encourage hospitals to collect data on work hours during medical training and document such information on incident reports.

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. Findings in this report are based on one year of data. MDPH will continue to monitor percutaneous exposures among medical trainees over time. Changes have been made in the data collection process to allow for more detailed analysis in the future.

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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.