BRIEF REPORT: Needlestick Injury and Inadequate Post-Exposure Practice in Medical Students

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BACKGROUND: Medical students are at a particularly high risk for needlestick injury and its consequences because of their relative inexperience and lack of disability insurance.

OBJECTIVE: To determine the risk of needlestick injury and the use of post-exposure prophylaxis among medical students.

DESIGN: Internet-based survey.

PARTICIPANTS: The 2003 graduating medical school class at the University of Toronto.

MEASUREMENTS: Number of needlestick injuries, circumstances surrounding those incidents, and post-exposure actions.

RESULTS: The response rate was 88% (157/178). Over one third (55/157) of respondents suffered at least 1 needlestick injury. In more than half the high-risk injuries, the students continued working and did not seek medical advice. Six students who suffered a needlestick injury began prophylactic human immunodeficiency virus medications. Of those students who suffered an injury, 15% had purchased disability insurance prior to the incident.

CONCLUSIONS: Poor use of post-exposure procedures and a lack of disability insurance leave medical students at high risk for career and life-altering consequences from a needlestick injury.

KEY WORDS: needlestick injuries; medical students; universal precautions; education.
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Needlestick injuries pose a significant risk to health care workers.[1] Hospital-based surveillance estimates at least 590,000 percutaneous exposures to blood and body fluid yearly.[2] These data are worrisome, especially when one considers that the risk of transmission after parenteral exposure to human immunodeficiency virus (HIV)-infected blood is 0.3%, the risk of Hepatitis B virus (HBV) transmission is approximately 30%, and the risk of Hepatitis C virus (HCV) transmission is about 2%.[3,4]

Medical students are at a particularly high risk for needlestick injury because of their relative inexperience.[5] Occupational exposures during undergraduate medical school may involve between 11% and 50% of students.[6–13] Hepatitis B vaccination and adherence to recommended post-exposure practices are strategies that can influence the outcome and impact of needlestick injury.[5] While most medical schools require Hepatitis B immunization prior to enrollment, little data exist on the number of students that follow recommended post-exposure protocols.

The purpose of our study was: (1) to determine the prevalence of needlestick injuries in a large medical school class over 4 years of training and delineate the circumstances surrounding any incidents; and (2) study the use of post-exposure antiviral prophylaxis. An ancillary goal was to estimate the percentage of students with disability insurance. Our overall aim was to provide data that could inform medical school policy and promote the protection and well-being of medical students.

METHODS

Study Population

We conducted a survey of the 2003 graduating medical school class at the University of Toronto. During their final rotation, members of the class were invited to participate in an anonymous internet survey to determine the incidence of needlestick injury over the course of their training. We defined a needlestick injury according to the United States Public Health Service Guidelines (US PHSG) as an "injury with a device contaminated with blood or body fluids, which penetrates the skin or mucosa." A high-risk or severe injury, according to the US PHSG, and as we defined it in our study, is "an exposure to: a large-bore hollow needle, a deep puncture, a device with visible blood on it, or a needle used in a patient's artery or vein."[4]

Medical Curriculum

The University of Toronto has a 4-year program; 2 years are classroom based and comprise the pre-clerkship years, and the final 2 years are the formal clinical clerkship. Approximately 5 to 10 hours of training on occupational injuries is provided throughout the curriculum. Students are not discouraged from performing procedures on patients with known transferable diseases and needlestick safety devices are not in general use at our teaching hospitals.

Study Survey

We were interested in the proportion of students who suffered a percutaneous needlestick injury over 4 years of medical school, the circumstances surrounding the injury, the number of students who took post-exposure prophylaxis, and the proportion of students who had disability insurance at the time of the incident. The study was approved both by the St. Michael's Hospital and University of Toronto Research Ethics Boards.

RESULTS

The response rate for our survey was 88% (157/178 students). More than one third of respondents (55/157) reported at least 1

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needlestick injury and there were 65 injuries in total (Table 1). Of these students, 12% (8/65) suffered 2 needlestick injuries, and 1 student reported 3 separate injuries. The majority of injuries occurred while suturing (46%, 30/65) or assisting in procedures (25%, 16/65). The instrument most commonly resulting in injury was a solid needle (69%, 45/65). High-risk injuries (large-bore hollow needle, deep puncture, visible blood on device, or a needle used in a patient's artery or vein) accounted for 63% (41/65) of total injuries. In 6% (4/65) of cases, students were not wearing gloves when the injury occurred.

Rotation

One out of 65 injuries occurred during the pre-clerkship medical training. This occurred during cadaveric dissection in a first year anatomy course. All other injuries occurred during clinical clerkship. Surgery rotations and surgical electives accounted for 53% (35/65) of injuries. Of the exposures, 85% (55/65) occurred in 4 rotations: surgery, Obstetrics-Gynecology, Internal Medicine, and emergency medicine.

Post-Exposure Actions

Table 2 summarizes the post-exposure actions of students. In 54% (22/41) of high-risk injuries (large-bore needle, deep puncture, visible blood on device, or needle used in patient's artery or vein), the students continued working and did not seek medical advice. Reasons given for this fell into 2 categories: either the occupational health office was closed or the students were not encouraged to seek help by hospital personnel. Four of 10 students who reported to occupational health stated that the office was closed. All of the 5 students who reported to the emergency department were seen in 30 minutes or less. Despite 85% (35/41) of high-risk injuries being witnessed, only in 31% (13/41) of the injuries did the witnesses encourage the student to seek help. The patient's blood was drawn for infectious disease testing in 41% (17/41) of exposures. One patient had positive serology for HIV and HBV and 1 other patient was HCV positive. No students at the time of the survey seroconverted for any of these blood-borne infections.

Table 1. Characteristics of Needlestick Injuries

Factor	Number of Injuries, *N* (%)
Total respondents	157 (88)
Total people injured	55 (35)
Total injuries*	65 (41)
Instrument*	
Solid needle	45 (69)
Hollow bore needle	14 (22)
Scalpel	5 (78)
Sharp cauterizer	1 (2)
Procedure*	
Suturing	30 (46)
Assisting	16 (25)
Injection of drugs i.m./i.v./s.c.	5 (8)
Cleaning up after surgery	2 (3)
Venipuncture	3 (5)
Arterial puncture (ABG, i.v. access)	4 (6)
Other	
Lancing a wart	1 (2)
Diluting drugs	1 (2)
Dissecting in anatomy	1 (2)
Cleaning scalpel post pathologic dissection	1 (2)
Wearing gloves at time of injury*	61 (94)
Blood on instrument	41 (63)
Injured by*	
Self	34 (52)
Resident	15 (23)
Staff	14 (22)
Nurse	1 (2)
Other medical student	1 (2)
Bodily location*	
Hand	63 (97)
Arm	2 (3)

**Some categories add to greater than the number of students injured because of multiple injuries in the same person.*

Table 2. Post-Exposure Actions

	Frequency of Event, *N* (%)
Total number of high-risk exposures*	41
Immediate action	
Continued working	22 (53.7)
Reported to the emergency department	5 (12.2)
Reported to occupational health	10 (24.4)
Called someone with no other action	2 (4.9)
Occupational health and the emergency department	1 (2.4)
Washed wound	36 (87.0)
Event witnessed	35 (85.4)
Witnesses encouraged student to seek help	11 (31.4)
Consent to draw patient's blood sought	18 (43.9)
Patient's blood was drawn for infectious disease testing	17 (41.5)
Student's blood was drawn for infectious disease testing	18 (43.9)

**Injuries involving a large-bore hollow needle, a deep puncture, a device with visible blood on it, or a needle used in a patient's artery or vein.*

HIV Prophylaxis

Six students who suffered a needlestick injury began prophylactic HIV medications. In 67% (4/6), prophylaxis was started more than 2 hours after the injury.

Disability Insurance

Fifteen percent (8/55) of students who suffered a needlestick injury had purchased disability insurance prior to the incident but about one third of the students (55/157) had disability insurance prior to medical school graduation.

DISCUSSION

We conducted a survey of the 2003 graduating medical class at the University of Toronto. More than one third of the graduating class in our survey had suffered a needlestick injury. In more than half the high-risk injuries, the students continued working and did not seek medical advice.

The high proportion of students who suffered a high-risk injury and did not pursue medical advice or infectious disease testing of the patient's blood is worrisome. Experts consider infectious disease testing of the patient's blood to be "a prerequisite to the provision of optimal post-exposure care."[3] It can also direct further management and provide reassurance

in case of a negative screening. Moreover, contact with occupational health practitioners can provide needed support to the injured student.[3]

Our results are similar to previous studies in which between 11% and 50% of medical students were involved in occupational injuries.[6–13] A 7-year longitudinal study at the University of California in San Francisco reported that 11.7% of students suffered a needlestick injury during their training.[10] This large prospective study relied on students self-reporting to a needlestick hotline. Our study, while retrospective, suggests that students may often underreport occupational injuries. Koenig and Chu[13] surveyed graduating medical students and found that 48% of students suffered at least 1 needlestick injury during the final 2 years of training.[13] This study did not assess post-exposure practice. We are unaware of any study which has assessed the use of post-exposure HIV prophylaxis, and the prevalence of disability insurance in medical students.

Our study has several limitations. A retrospective survey is subject to recall and participation bias. However, a needlestick injury is a distressing event that is expected to be well remembered at such an early stage in the career of a medical student. Our high response rate of 88% minimizes the effects of participation bias. Furthermore, if we assume that all of the non-responders did not experience a needlestick injury, the prevalence of needlestick injury would be similar and would not alter our conclusions.

One strategy to minimize long-term consequences of needlestick injuries is to improve medical student awareness about occupational health. Assessing the risk of an exposure, management protocols, and understanding the role and risk of anti-retroviral prophylaxis are important concepts to teach.

The high prevalence of needlestick injuries and percentage of students who did not report high-risk injuries clearly argue for a re-evaluation of current medical school policy. A high-profile lawsuit between Yale University School of Medicine and a former intern who contracted HIV from a needlestick injury in the late 1980s highlights the devastating consequences of occupational exposures.[14] Indeed, permanent disability, acquired through events such as a needlestick injury, can lead to devastating and career-threatening outcomes. One way to protect medical students is to provide them with mandatory disability insurance similar to those provided by most post-graduate training programs.[15] The large proportion of students who did not report high-risk injuries in our study perhaps points to a need for increased education in the management of occupational injuries. It may also suggest that there are cultural and practical barriers to medical students seeking help after an injury. Both these findings could be explored in future studies. Medical students are a valuable resource. Focusing on the risks and protection strategies germane to them could provide a similar degree of protection afforded to other members of the health care team.

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