Contaminated Sharps Injuries Among Healthcare Workers in Texas: 2010

Rick Perry, Governor

David L. Lakey, M.D., Commissioner, Department of State Health Services

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Table of Contents

Background

Occupational Sharps Injuries

Healthcare workers (HCWs) are at risk of infection with bloodborne pathogens (BBP) such as hepatitis B virus (HBV), hepatitis C virus (HCV), and the human immunodeficiency virus (HIV), due to occupational exposure to blood, body fluids and other potentially infectious materials (National Institute for Occupational Safety and Health 1999). This exposure typically occurs through percutaneous injuries from needles and other sharp medical devices or instruments (sharps) during or after their use in a medical procedure (National Institute for Occupational Safety and Health 1999). There are an estimated 400,000 to 800,000 occupational sharps injuries occurring annually in the US (Fisman 2002). The treatment and evaluation of these injuries costs $500 million dollars annually (Fisman 2002). While the injury sustained during these exposures is often minor, such as a finger stick, these injuries are known to result in serious infections.

Bloodborne Pathogen Transmission Risk

Depending on viral load, HBV has a high transmission rate following a single needle stick exposure (Aylward 1995). The injection of the virus into the bloodstream is the most effective mode of transmission, followed by sexual transmission and amniotic fluid exposure (Murray 2009). The HBV transmission rate is estimated to be between 6% and 30%, compared to just 0.3% percent for HIV and 1.8% for HCV (National Institute for Occupational Safety and Health 1999). The incidence of new HBV infections in the US has declined by as much as 80% since 1987. This decline is attributed to successful HBV vaccination programs and universal safer needle use (Kim 2009). The prevalence of chronic HBV infections in the US is estimated to be at 0.4% or about 1.2 million persons (Kim 2009). This prevalence varies among population groups, especially between US and foreign-born residents. Among foreign-born residents from Asia, particularly China, the prevalence can reach 15% or higher (Kim 2009). Worldwide an

estimated 350 million persons have chronic HBV infections (World Health Organization 2011).

Hepatitis C virus is the most common bloodborne pathogen in the US. The estimated prevalence of chronic HCV infection in the US is 1.3% or 3.2 million persons (Armstrong 2006). Recipients of blood products and organ or tissue transplants prior to 1992 are known to be at increased infection risk (Alter 1999; Lashley 2007). Injection drug use is the strongest single risk factor for HCV infection. A history of injection drug use was reported in 48.4% of anti-HCV-positive individuals (Armstrong 2006). Currently, intravenous drug users and perhaps sex workers along with recipients of tattoos done under unhygienic conditions e.g. street and jailhouse tattoos, are the most at-risk groups (Lashley 2007). Worldwide there are an estimated 170 million chronic HCV infections (World Health Organization 2011). Contaminated medical procedures, particularly injections, are a leading risk factor for these infections (Simonsen 1999; Frank 2000).

HIV is transmitted through blood and other body fluids; thus, its most common modes of transmission are sexual activity and unsafe injections, such as those among intravenous drug users (Aylward 1995; Murray 2009). In the United States an estimated 1-1.2 million persons are living with HIV/AIDS, and approximately 21% percent of them are undiagnosed (Lashley 2007; Centers for Disease Control and Prevention 2011). HIV is an expanding epidemic worldwide, with especially high rates of infection in the developing world – countries in sub-Saharan-Africa and Asia are especially affected (Murray 2009). In 2009 there were an estimated 34 million persons infected with HIV worldwide (World Health Organization 2011).

Although the prevalence of bloodborne pathogens in the U.S. population is relatively low compared to many developing countries, HCW's in clinical settings remain at elevated risk. The higher prevalence of bloodborne pathogens found in certain patient populations, such as immigrants, sex workers and injection drug users, combined with

increased exposure to blood and other potentially infectious materials makes the risk of infection substantially higher than for the general population. Among surgery patients in an urban U.S. hospital the prevalence of HIV can be as high as 26% and that for HCV may reach 35% (Weiss 2005).

Sharps Injury Prevention Measures

As of 2004, more than half of hollow bore needles, phlebotomy needles, and IV catheter stylets in use were safety-engineered (Jagger 2008). Correlated with these data are rapidly falling sharps injury rates (Tuma S. 2006; Jagger 2008). Minimum injury rates will be achieved with maximum safety-engineered device use (Jagger 2008; Occupational Safety and Health Administration 2011). However, clinical judgment should always be a significant part of evaluation and selection of devices used in a patient care setting. In some situations an engineered device may not be considered optimal for patient safety and care. Also, safety-engineered devices will be most effective when accompanied with appropriate training in their use (Tuma S. 2006; Jagger 2008; Occupational Safety and Health Administration 2011).

Two devices account for the highest rates of injury reduction, phlebotomy needles and I.V. catheter stylets. Safer phlebotomy needles have led to a 59% reduction in injuries and safety-engineered I.V. catheter stylets, which can now be made completely needleless, resulted in a 53% decrease in injury rates (Jagger 2008). Since the passage of the Needlestick Safety and Prevention Act in 2000 the largest decrease in injury rates among health care occupations occurred for nurses - nearly a 71% reduction (Jagger 2008).

It is important to note that safety-engineered devices do not completely eliminate the risk of occupational injury (National Institute for Occupational Safety and Health 1999; Occupational Safety and Health Administration 2011). The needle can be dislodged during the procedure, before the safety feature is activated, injuring the worker. Injury can also occur during incorrect activation, or due to the complete failure of the safety feature. Understanding these limitations of safety technology is import for further

improving the safety features and the training in their use (National Institute for Occupational Safety and Health 1999). Safer work practices in healthcare requires surveillance, oversight, enforcement, and continuing education (Pugliese 2010). Engineered solutions alone are not sufficient to eliminate all sharps injuries.

Culture of Safety

The culture of safety is a commitment at all levels of an organization to minimize adverse events, such as sharps injuries, while performing complex and hazardous work duties (Agency for Healthcare Research and Quality 2011). The U.S. Department of Health and Human Services recommends that a commitment to a culture of safety involve the following key features:

- acknowledgment of the high-risk nature of an organization's activities and the determination to achieve consistently safe operations
- a blame-free environment where individuals are able to report errors or near misses without fear of reprimand or punishment
- encouragement of collaboration across ranks and disciplines to seek solutions to patient safety problems
- organizational commitment of resources to address safety concerns

The culture of safety is assessed through surveys and reportedly varies at different occupational levels in the healthcare field. “The underlying reasons for the underdeveloped health care safety culture are complex, with poor teamwork and communication, a "culture of low expectations," and authority gradients all playing a role.” (Agency for Healthcare Research and Quality 2011). Sharps injuries are an important barometer of how well the culture of safety permeates a healthcare facility.

Costs of Sharps Injury

The immediate direct costs of an occupational sharps injury arise from follow-up laboratory testing of the exposed healthcare worker and the source patient, post-exposure prophylaxis (PEP) or other treatment, as well medical evaluation, including counseling, that the injured HCW may need (Centers for Disease Control and Prevention 2008). HIV PEP is the most common prophylaxis administered, however hepatitis B immune globulin is sometimes given as well (Centers for Disease Control and Prevention 2008).

Annually, the direct medical costs associated with the testing and treatment of these injuries is estimated to be $500 million (Fisman 2002). The cost of evaluating and treating a single injury ranges between $71 and $4,838, depending on the circumstances (O'Malley 2007). Post-exposure prophylaxis accounts for the upper limit of this range. These are immediate costs and do not include the price of treating lifelong chronic illness which can amount to hundreds of thousands of dollars.

Additionally, these cost estimates do not take into account intangible factors such as personal distress. The fear and anxiety associated with the risk of acquiring a potentially life-threatening chronic illness raises the price of a single injury even if ultimately no transmission occurred. One study found healthcare workers hypothetically willing to pay, based on perceived risk, $850 – $1,270 out of pocket to avoid a sharps injury all together (Fisman 2002). This value is higher than the median cost estimate for medical evaluation of a sharps injury.

Other indirect costs include a loss of productivity during follow-up and treatment, as well as healthcare provider time to evaluate and treat both the injured HCW and the source patient. These activities divert time and resources away from normal administrative and clinical duties (Centers for Disease Control and Prevention 2008). All these factors must be considered when comparing the cost of conventional devices to that of safety engineered devices (Jagger 2008).

Methods

Case Definition

An incident is considered reportable if a percutaneous injury occurred from a sharp that was contaminated or possibly contaminated with blood or other potentially infectious materials. An injury is considered occupational if it was sustained by an employee while performing work related duties or on location at the work site.

Study Population

The study population consisted of 1309 occupational sharps injury reports from governmental entities in Texas for the year of 2010. Uncontaminated sharps injuries that occurred before the sharp was used for its intended purpose are not included. Such an incident does not pose a bloodborne pathogen transmission risk.

Diverse sharps are represented in this study including disposable syringes, suture needles, surgical scalpels, surgical drills, and glassware items such as capillary tubes, flasks, and laboratory slides. Individual occupations of the injured HCW include, but are not limited to registered nurses, attending physicians, housekeeping staff, school nurses, medical students, and various types of medical technicians.

Reporting

In 2001, the Texas State legislature passed House Bill 2085, which mirrored the national Needlestick Act of 2000 (Occupational Safety and Health Administration 2011). Now part of the Texas Health and Safety Code, Chapter 81 requires that:

- government entities develop an exposure control plan
- frontline staff evaluate and select safety engineered sharps

- government worksites maintain a confidential sharps injury log
- sharps injury reports are submitted to the Texas Department of State Health Services

According to state law, a healthcare worker in a state facility (government entity) is required to report to their supervisor any contaminated sharps injury sustained during work hours. The facility where the injury occurred is responsible for completing the official injury report form. The reporter must submit the form to the local health authority. If there is no local health authority, the facility submits the form to the director of the DSHS regional office. Most forms are received through fax and mail in the original paper format. Some are submitted online. These reports come from hospitals, clinics, schools and other government entities where the HCW is employed.

Data Analysis

Descriptive statistics, counts and percentages, were used to characterize the responses to each question. Cross tabulations were used to examine relationships between responses to different questions. Chi-squared analysis was used to compare nominal data. A p-value of 0.05 or less was considered significant. Reference data on HCWs and the geographic distribution of healthcare facilities in Texas was obtained from the Center for Health Statistics at DSHS, the Texas Medical Board and Texas Board of Nursing.

Data Highlights

Facility where injury occurred. Out of 1309 reported injuries, 85% (1109) occurred in hospitals. Clinics reported the second highest number of injuries 7% (86) with school/college, dental and correctional facilities accounting for a combined total of 4% (55) (Figure 1).

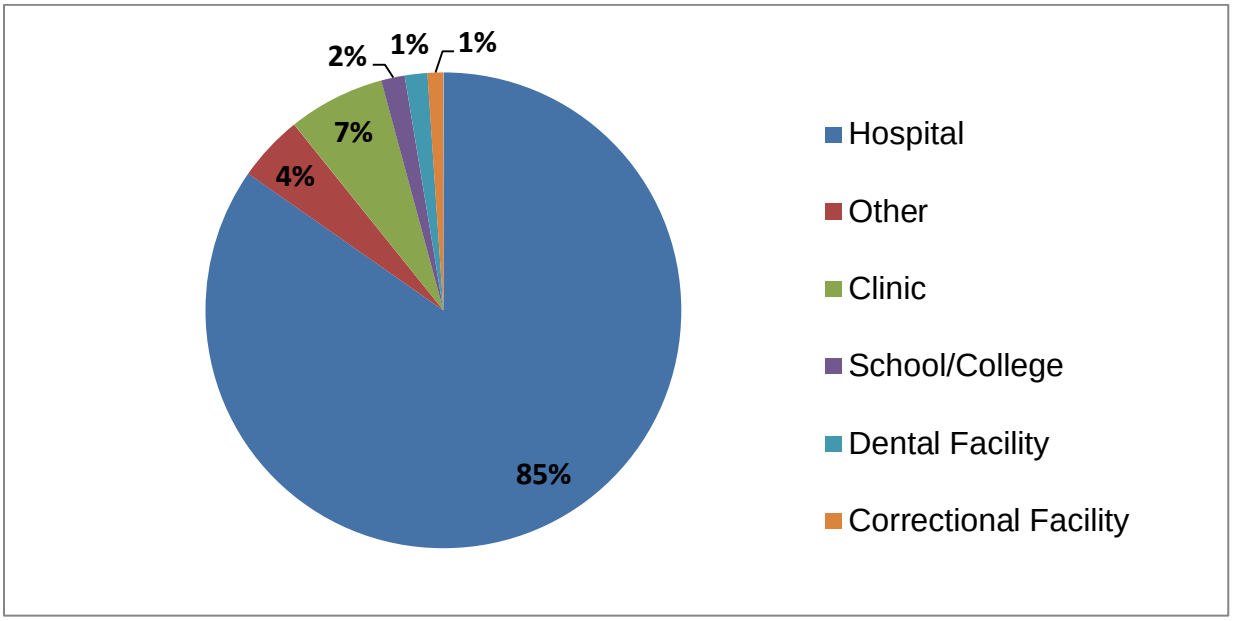
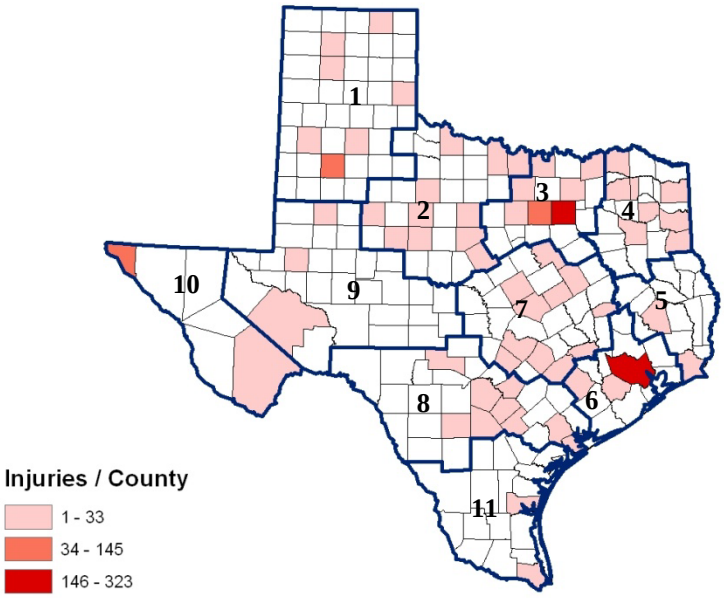


Figure 1 Injury by facility type

Public Health Region and County where Injury Occurred. As seen in figure 2, 63% (822) of reported injuries occurred in regions 3 and 6. These regions also contain the counties that reported the largest numbers of injuries which are home to the Dallas/Fort Worth metroplex and the city of Houston respectively. Regions 4, 5, 8, 9 and 11 combine reported 142 injuries or 10.7% of the total.



Region	Count	Percent
3	426	32.5%
6	396	30.3%
1	131	10.0%
7	75	5.7%
10	71	5.4%
2	70	5.3%
4	51	3.9%
8	46	3.5%
9	22	1.7%
5	13	1.0%
11	8	0.6%
Total	**1309**	**100.0%**

Figure 2 Injuries by region and county.

Occupation of the Injured Healthcare Worker. Individual occupation types were grouped into five broad occupation classes (Figure 3). Nurses accounted for 29% (375)

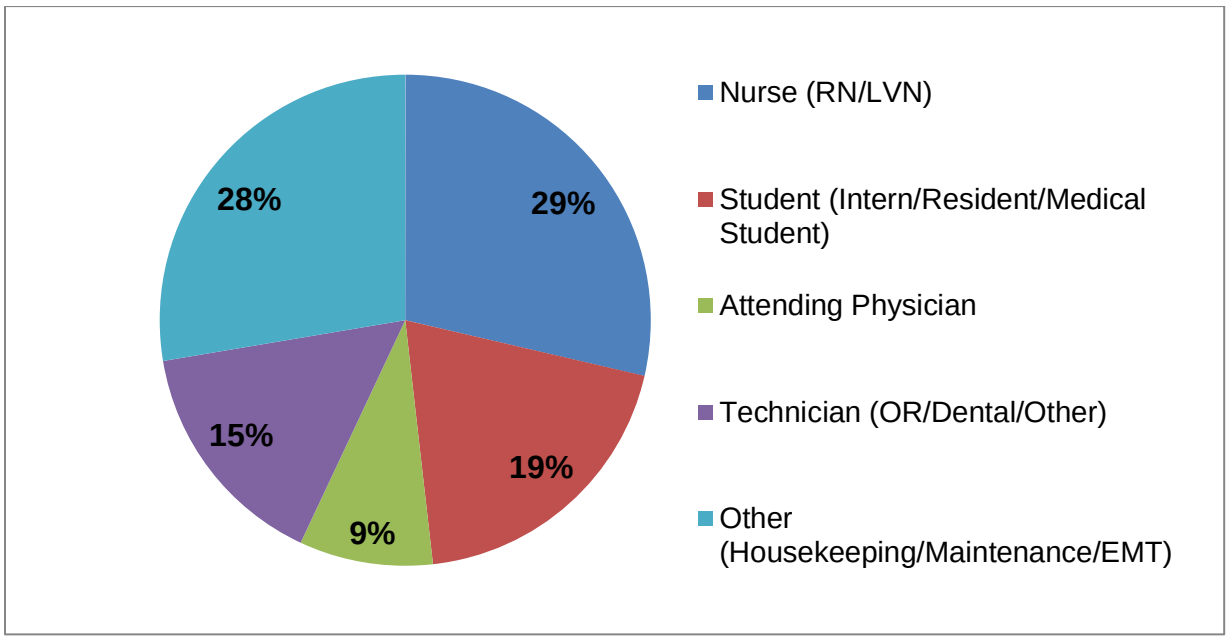


Figure 3 Injuries by occupational class.

of the injured HCWs, followed by students (and recent graduates) with 256 (19%) injuries. Attending physicians accounted for 115 (9%) of injury reports and technicians accounted for 201 (15%). Nearly half of injuries were incurred by nurses and students.

Table 1 displays the five occupation types that incurred the greater number of injuries.

Table 1. Devices Involved in Injury for Top Five Occupations of Injured HCWs

Occupation	***Device***	***Number***	***Percent***
Registered Nurse	Syringe (all types)	138	43.8%
	IV Catheter Stylet	36	11.4%
	Suture Needle	20	6.3%
	Winged Steel Needle	18	5.7%
	Huber Needle	12	3.8%
	Needle, not sure what kind	9	2.9%
	Disposable Scalpel	6	1.9%
	All other devices	76	24.1%
	Total	**315**	**100%**
Intern/Resident	Suture Needle	110	48.0%
	Syringe (all types)	24	10.4%
	Disposable Scalpel	20	8.7%
	Needle, not sure what kind	11	4.8%
	Wire (suture/fixation/guide)	8	3.5%
	All other devices	56	24.4%
	Total	**229**	**100%**
Attending Physician	Suture Needle	45	39.1%
	Syringe (all types)	20	17.4%
	Needle, not sure what kind	9	7.8%
	Disposable Scalpel	7	6.0%
	All other devices	34	29.6%
	Total	**115**	**100%**
OR/Surgical Technician	Suture Needle	38	35.2%
	Syringe (all types)	19	17.6%
	Disposable Scalpel	9	8.3%
	Needle, not sure what kind	4	3.7%
	All other devices	38	35.2%
	Total	**108**	**100%**
Licensed Vocational Nurse	Syringe (all types)	38	63.3%
	Winged steel	4	6.7%
	Needle, not sure what kind	2	3.3%
	Suture needle	1	1.7%
	All other devices	15	25.0%
	Total	**60**	**100%**

While nurses' injuries involved more syringes and IV Catheter stylets, medical interns, residents, physicians and technicians were primarily injured by suture needles. These five occupations account for 63% of the total number of injury reports.

Work Area Where Injury Occurred. Slightly more than a quarter, 27% (356), of the sharps injuries occurred in the surgery/operating room.

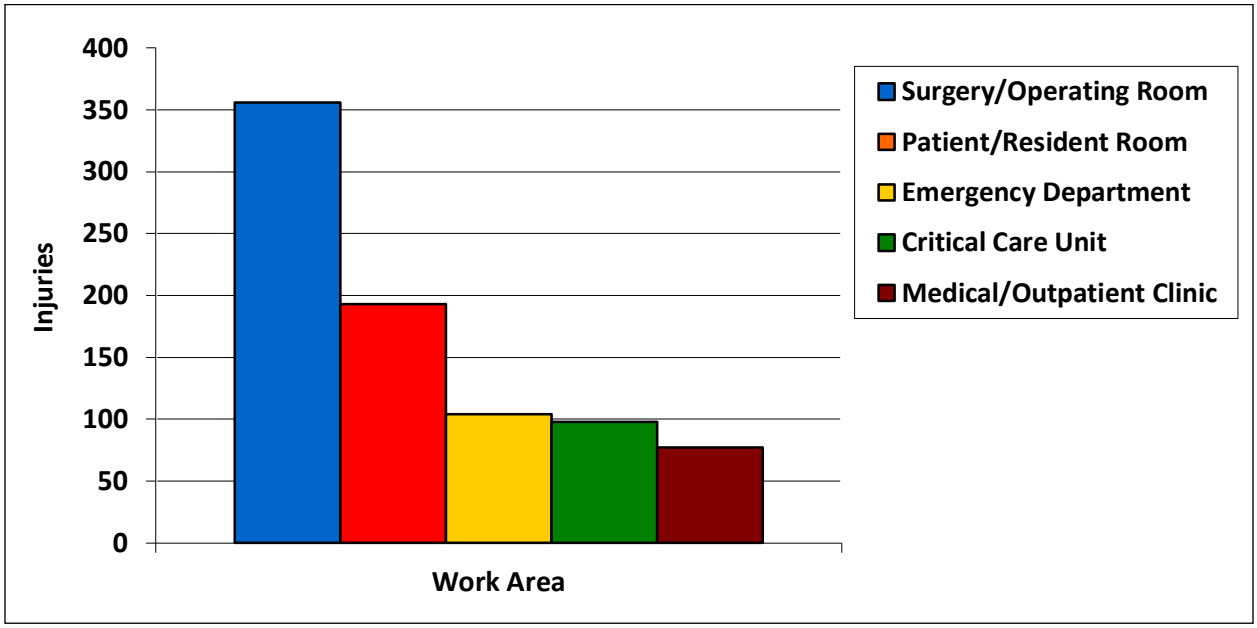


Figure 4 Work area where injury occurred.

The patient/resident room was the second most frequent location with 193 injuries. Combined, these two locations account for 42% of the sharps injuries reported.

For the four most injury-prone work areas, the most common devices involved in injuries are given in Table 2. Suture needles were the most common device causing injury in the surgery/operating room (44%, 158) while syringes accounted for the largest number of injuries in other work areas. In patient/resident rooms, syringes were involved in 58% (111).

Table 2. Devices Involved in Injuries in Top Four Most Injury-Prone Work Areas			
Work Area	**Device**	**Number**	**Percent**
Surgery/Operating Room	Suture Needle	158	44.4%
	Syringe (all types)	37	10.4%
	Scalpel (disposable and reusable)	20	5.6%
	All other devices	141	39.6%
	Total	**356**	**100%**
Patient/Resident Room	Syringe (all types)	111	57.5%
	Winged steel needle (includes butterfly/ winged-set type devices)	19	9.8%
	Vacuum tube blood collection holder/needle	15	7.8%
	All other devices	48	24.9%
	Total	**193**	**100%**
Emergency Department	Syringe (all types)	30	28.8%
	Winged steel needle (includes butterfly/ winged-set type devices)	16	15.4%
	IV Catheter Stylet	15	14.4%
	Suture needle	10	9.6%
	All other devices	33	31.7%
	Total	**104**	**100%**
Critical Care Unit	Syringe (all types)	34	34.7%
	Suture needle	18	18.4%
	All other devices	46	46.9%
	Total	**98**	**100%**

of all injuries and in the emergency department and critical care units – 29% (30) and 35% (34) respectively. These four work areas account for 57% of all injuries.

Injury by Work Shift. Figure 5 shows the time of day, by shift, when the injuries occurred. The majority of injuries, 57%, occurred between 6am and 2pm. Because employee resources may not

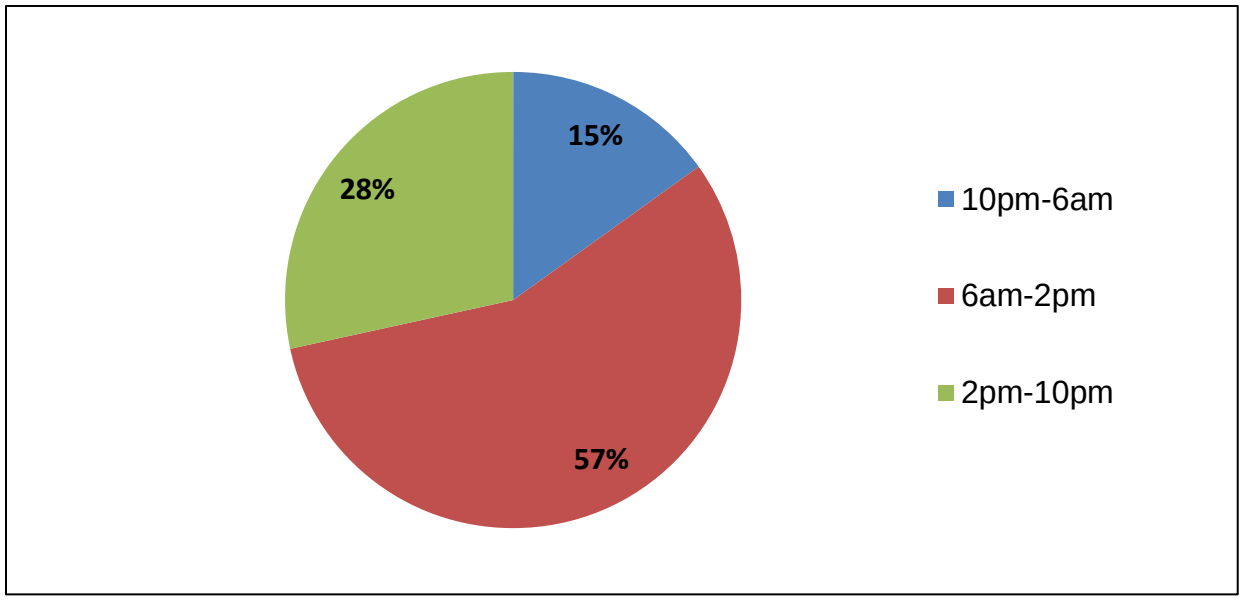


Figure 5 Injuries by work shift.

be readily available during the 10pm to 6am time period, addressing injuries that occur during this shift may present some additional challenges.

Injury by Device Type. When the data were broken down by three broad device categories, needles accounted for 74% of all injuries (Table 3).

Table 3. Injury by Device Type Overview

Device Type	Number	Percent
Needles	970	74.1%
Surgical Instruments	249	19.0%
Glass Items	11	0.9%
Unknown	79	6.0%
Total	**1309**	**100%**

Surgical instruments accounted for 19% of all injuries. These included surgical drills, scalpels, forceps and other devices. Out of the 1309 injuries, 4% were due to scalpels.

However, within the category of surgical instruments, scalpels were the number one device associated with injury. Among needlestick injuries, syringes accounted for 41% of all injuries followed by suture needles at 27%. Additional data analysis, showed that 53% of syringes associated with injuries were safety engineered. Details on each of the three device categories are found in the appendix.

It is possible to be injured during, or after performing a medical procedure with a sharp. Knowing when in the use process the injury occurred and how it occurred is essential for quality improvement activities. Injuries occur almost twice as often after the intended use as during. Injuries from sharps found in inappropriate places, recapping, activation of the safety device and use of sharps container indicate that very basic safety practices require more training. That most injuries occur during a multistep procedure suggests communication and teamwork skills warrant examination and practice.

Table 4. When and How the Injury Occurred		
After Intended Sharps Use	**Number**	**Percent**
Between Steps of Multistep Procedure	125	16.7%
Found in an Inappropriate Place	64	8.5%
Unsafe Practice	63	8.4%
Activating Safety Device	61	8.1%
Use of Sharps Container	55	7.3%
Recapping	44	5.9%
Patient Moved	43	5.7%
All Others	164	21.9%
Left Blank	131	17.5%
Total	**750**	**100%**
During Intended Sharps Use		
Between Steps of a Multistep Procedure	137	29.0%
Suturing	75	15.9%
Patient Moved	46	9.7%
Interacting With Another Person	35	7.4%
All Others	70	14.6%
Left Blank	110	23.3%
Total	**473**	**100%**

Intended Sharps Use. The intended use of the device provides another perspective on the injuries and their prevention. Injections and suturing accounted for the largest proportions of injuries, 21% each (Figure 6).

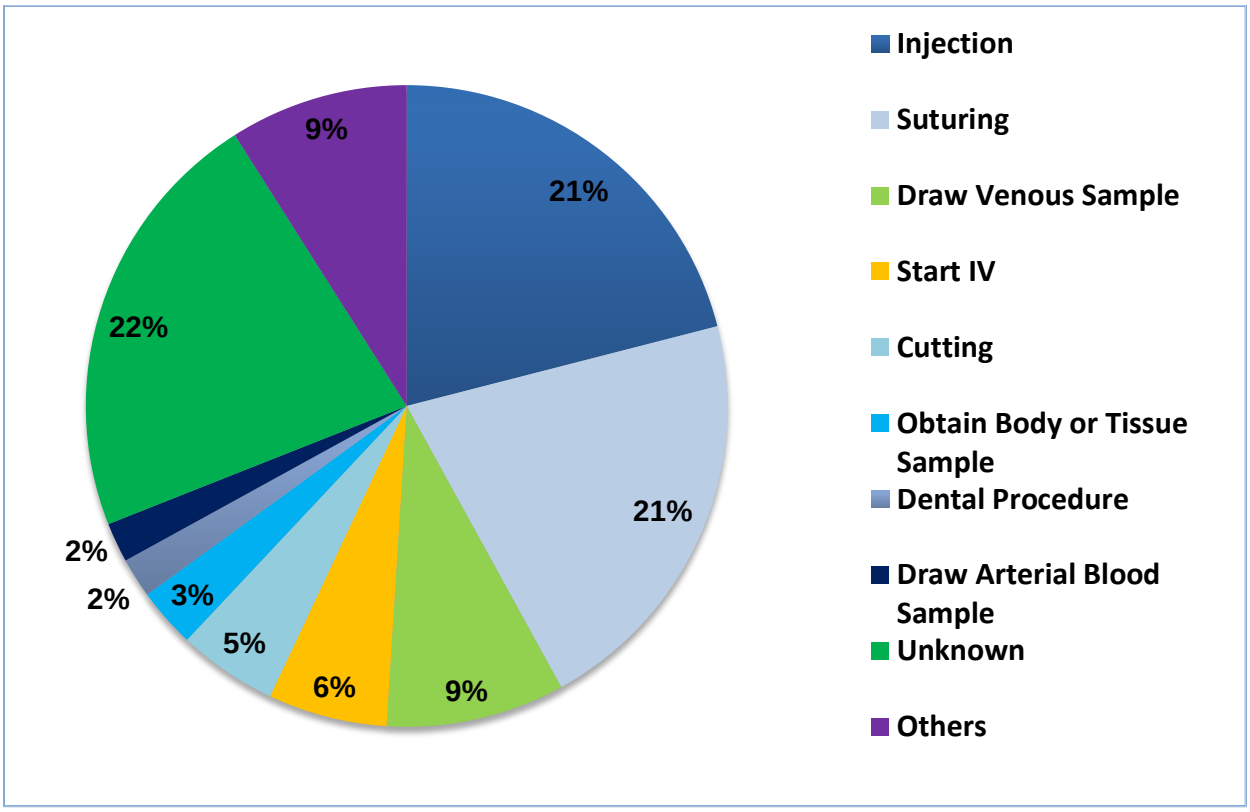


Figure 6 Injuries by intended use of the device..

Drawing blood or taking tissue samples accounted for an additional 14% of the injuries. For 22% of devices, the intended use of device was unreported or unknown.

Safety Engineering Status. Figure 7 breaks down injuries by whether or not the device had safety engineering protection. Devices that had safety engineering were further examined by the activation status of the safety feature. Nearly one third of all devices involved in injuries did not have safety engineered protection.

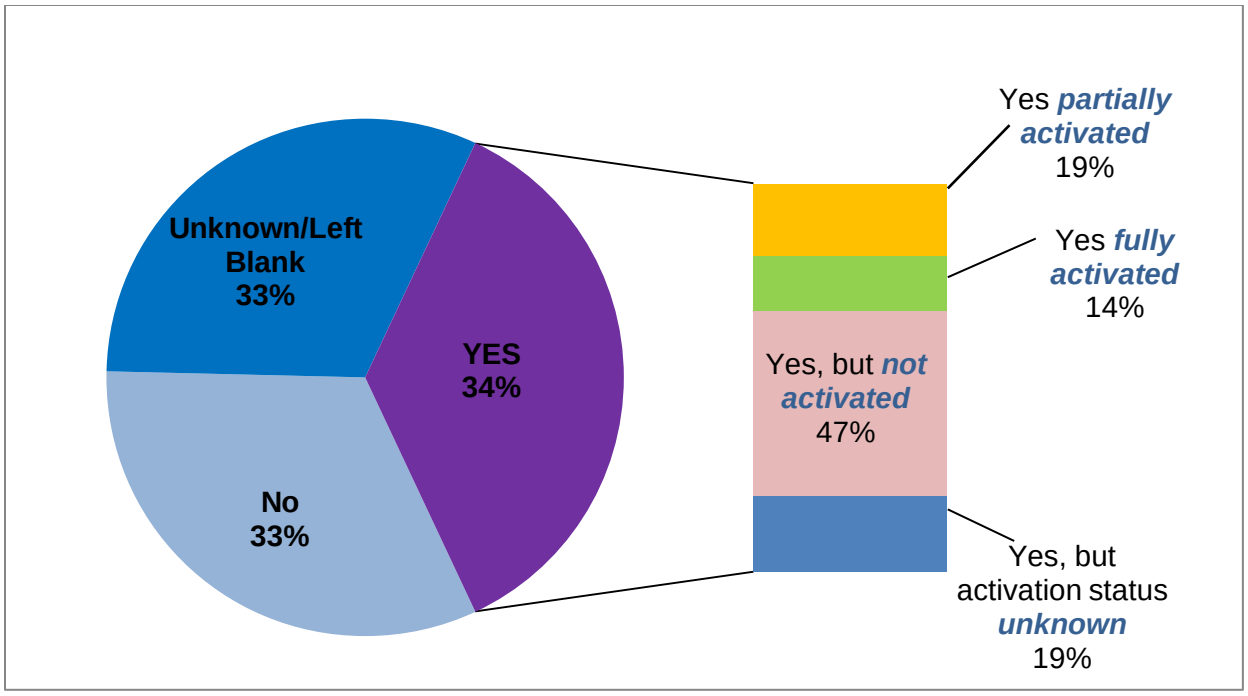


Figure 7 Injuries by safety engineering and device activation status.

Slightly more devices were reported to have safety engineered protection and of those injuries 47% occurred while the safety device was not activated. Fourteen percent of injuries occurred when the safety feature was fully activated. This last observation suggests catastrophic device failure or inappropriate user actions.

Area of Body Injured. The hand was the most injured part of the body, (Appendix Table 6). Injuries to the hand accounted for 95% of all injuries, while injuries to other body parts together accounted for 3 percent of the data. Twenty-eight reports (2%) indicated the injured body part was unknown.

Gender and Injury. Two-thirds of the injuries occurred in females – 67% (Figure 8). When further broken down by age (Table 5), the data suggested men were injured more often at a younger age, and women - at an older age. The age distribution by gender of injured HCWs was compared

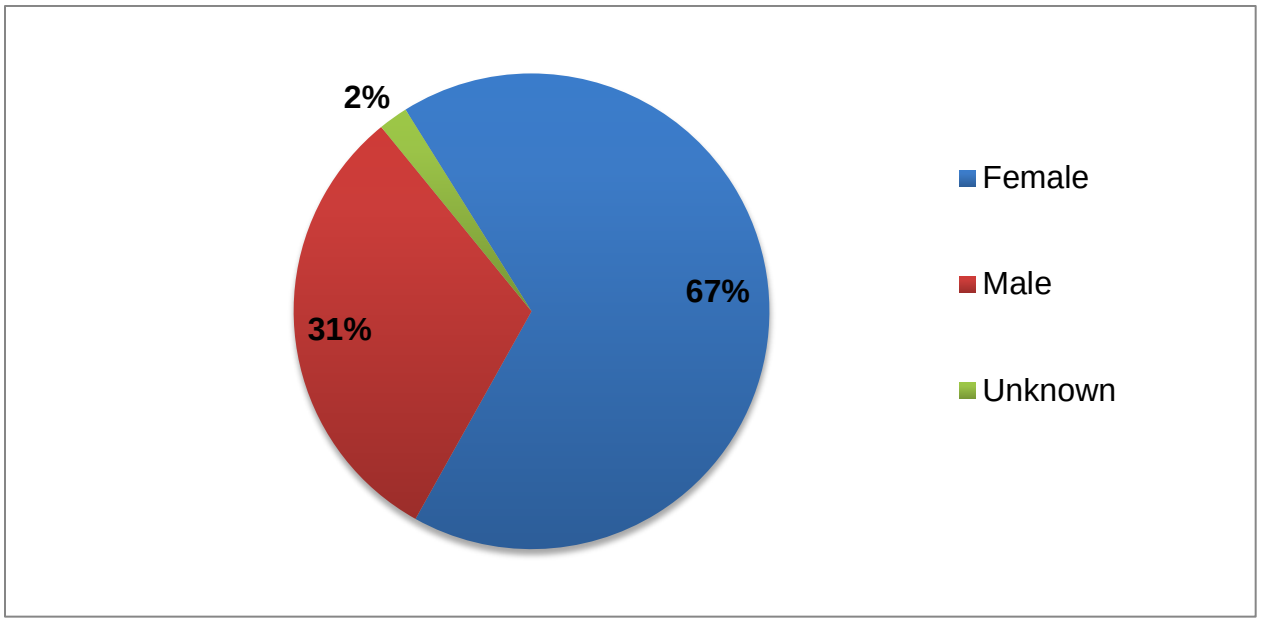


Figure 8 Injuries by gender.

using a chi-square test. For this analysis the two oldest age groups were combined.

Table 5. Injuries by Age and Gender		
Males' Age	**Number**	**Percent**
17-21	7	1.9%
22-32	209	56.8%
33-43	90	24.5%
44-54	41	11.1%
55-65	15	4.1%
66-80	6	1.6%
Total	**368**	**100%**
Females' Age		
17-21	20	2.4%
22-32	416	49.7%
33-43	191	22.8%
44-54	145	17.3%
55-65	62	7.4%
66-80	3	0.4%
Total	**837**	**100%**

The result was a chi-square value of 10.89 (df = 4, p = 0.03), a significant difference in the distribution by age of injuries occurring in males verses females.

For two high risk occupations, physicians (providing direct care) and RN's, statewide gender data was available from Center for Health Statistics at DSHS. The distribution, by gender, of these two occupations statewide and for HCWs reporting a sharps injury is found in figure 9. The majority (84%) of the injured nurses were female, while (59%) of injured physicians were male. Each is less than their proportional representation in the statewide workforce. This observation was further examined by chi-square (Table 23). The gender distribution for RN injuries does not mirror that of RN's statewide (X^2 = 5.34**,** p = 0.02, df = 1). A similar result for physicians was found (X^2 = 9.52**,** p = 0.002, df = 1).

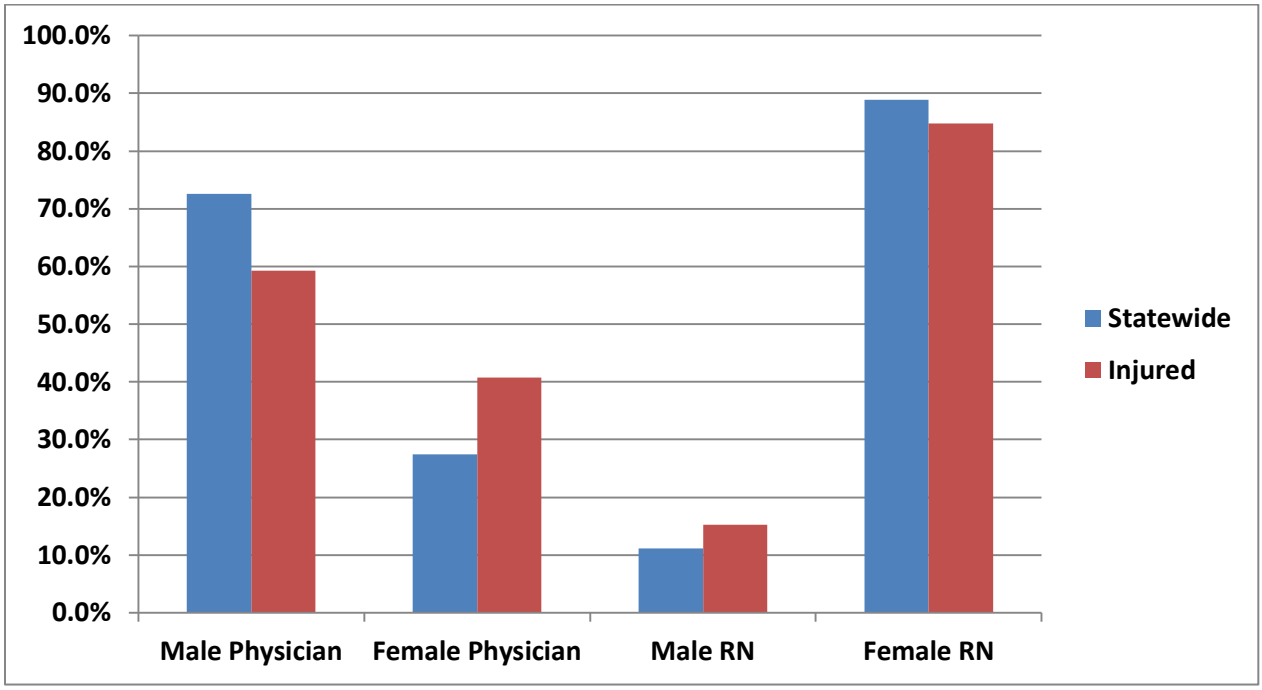


Figure 9 Distribution of physician and RN injuries by gender compared to the statewide workforce.

HCW Training and Practices. Of the injured HCWs, 91% were wearing gloves, were vaccinated for HBV and had a sharps disposal container available to them at the time of

injury. Additionally, 87% of HCWs reported that they received BBP exposure control training within the last 12 months.

Limitations

This report has two important limitations. First, there was no denominator to compute injury rates. A good denominator would be the number of total sharps procedures, broken out by type, carried out by facilities in Texas each year. Secondly, not all sharps injuries are reported (Mangione 1991; Kessler 2011) and many of the forms are not completely filled out. Therefore, this report likely underestimates the total number of sharps injuries that occurred in government entities during 2010 and does not fully characterize the reported injuries.

Additionally, illogical responses to questions resulted in records being removed from the analysis. For example, a report indicating that the device in use did not have safety engineering protection and in a subsequent response indicating that the safety feature was fully activated.

Discussion

The two occupations found most at risk for sharps injury are registered nurses and recent graduates/medical students. This is consistent with national data (Shelton 2004; Jagger 2008; Sharma 2009). A survey conducted among medical school graduates indicated that underdeveloped manual skills and a stressful work environment contribute to injuries and high rates of student underreporting – 47% (Sharma 2009). The two devices most often involved in RN injuries were syringes (44%) and IV catheter stylets (11%). This is also found in the national data (Shelton 2004). Providing better access to safety sharps and targeted training to these two risk groups may be the most effective way to reduce injuries.

The two devices most commonly involved in the reported sharps injuries were syringes (29%) and suture needles (20%). Today, almost all syringes in the market have a

protective engineering alternative. However, suture needles have fewer safety options available (Jagger 2008). More complete adoption and proper use of safety syringes will be signaled by their fall as the leading injury producing device.

Multiple studies found safety-engineered sharps use decreases the rate of percutaneous injuries (Tuma S. 2006; Centers for Disease Control and Prevention 2008; Jagger 2008). Despite the emphasis on engineered safety solutions, nearly 70% of injury reports indicated safety-engineering status was either absent or unknown. To address this issue, reaching out to healthcare facilities to assess safety engineered sharps purchasing decisions, training and use, particularly of syringes and suture needles, would be an important step in improving infection control and injury prevention (Tuma S. 2006).

Ultimately, it's a facility's embrace of the culture of safety that will lead to the lowest rates of sharps injuries. To facilitate that, the culture of safety must be part of the education of all future healthcare practitioners. Such a program would de-stigmatize accidental occupational injury and- promote reporting and the correct use of safety devices. This would occur before the practitioner has time to learn poor practice habits and mistaken beliefs, the root causes of sharps injuries.

Appendix

Table 1. Injuries by Facility Type		
Facility	**Number**	**Percent**
Hospital	1109	84.7%
Clinic	86	6.6%
School/College	21	1.6%
Dental Facility	20	1.5%
Correctional Facility	14	1.0%
Laboratory	8	0.6%
Residential Facility	7	0.5%
EMS/Fire/Police	4	0.3%
Medical Examiner Office/Morgue	4	0.3%
Home Health	3	0.2%
Outpatient Treatment	2	0.1%
Other	2	0.1%
N/A	2	0.1%
Blood Bank/Center/Mobile	1	0.07%
Total	**1309**	**100%**

Table 2. Injuries by Work Area		
Work area	**Number**	**Percent**
Surgery/Operating Room	356	27.2%
Patient/Resident Room	193	14.7%
Emergency Department	104	7.9%
Critical Care Unit	98	7.5%
Medical/Outpatient Clinic	77	5.9%
Laboratory	66	5.0%
Procedure Room	63	4.8%
Medical/Surgical Unit	52	4.0%
L&D/Gynecology Unit	47	3.6%
Dental Clinic	37	2.8%
Radiology Department	27	2.1%
Pre-op or PACU	15	1.1%
Nursery	14	1.1%
Service/Utility Area (e.g. laundry)	14	1.1%
Infirmary	12	0.9%
Autopsy/Pathology	9	0.7%
Other	8	0.6%
Floor, not Patient Room	7	0.5%
Home	7	0.5%
Jail Unit	7	0.5%
Pediatrics	7	0.5%
School Clinic	5	0.4%
Ambulance	3	0.2%
Sterile Processing	3	0.2%
Public Restroom	3	0.2%
Central Supply	2	0.2%
Classroom	2	0.2%
Dialysis Room/Center	2	0.2%
N/A	2	0.2%
Seclusion Room/Psychiatric Unit	2	0.2%
Work/Staff Area	2	0.2%
Blood Bank/Center/Mobile	1	0.1%
Decontamination Room	1	0.1%
Endoscopy/Bronchoscopy/Cystoscopy	1	0.1%
Field (non EMS)	1	0.1%
Occupational Health center	1	0.1%
Outside (disposing of medical waste)	1	0.1%
Pharmacy	1	0.1%
Recovery	1	0.1%
Rescue setting (non ER)	1	0.1%
(blank)	54	4.1%
Total	**1309**	**100%**

Table 3. Injuries by Occupation		
Occupation	**Number**	**Percent**
Registered Nurse	315	24.1%
Intern/Resident	229	17.5%
Attending Physician (MD/DO)	115	8.8%
OR/Surgical Technician	108	8.4%
Licensed Vocational Nurse	60	4.6%
Phlebotomist/Venipuncture/IV Team	47	3.6%
Fellow	32	2.4%
Housekeeper/Laundry	30	2.3%
Physician Assistant	30	2.3%
Clinical Lab Technician	30	2.3%
Medical Student	27	2.1%
Aide (e.g. CAN, HHA, orderly)	23	1.8%
Other Student	22	1.7%
Other Technician	22	1.7%
Dental Assistant/Technician	17	1.3%
Dental Student	16	1.2%
EMT/Paramedic	16	1.2%
CRNA/NP	12	0.9%
Radiologic technician	12	0.9%
Other	12	0.9%
Nursing Student	11	0.8%
Dentist	10	0.7%
Respiratory Therapist/Technician	10	0.7%
Researcher	7	0.5%
School Personnel (not a nurse)	7	0.5%
Central Supply	7	0.5%
Physical Therapist	4	0.3%
Dental Hygienist	3	0.2%
Pharmacist	3	0.2%
Law Enforcement Officer	3	0.2%
Maintenance Staff	3	0.2%
Clinical administrative	2	0.2%
Morgue tech/autopsy technician	2	0.2%
N/A	2	0.2%
Nursing Assistant	2	0.2%
Clerical/Administrative	2	0.2%
Counselor/Social Worker	1	0.07%
Disease Intervention Specialist	1	0.07%
Firefighter	1	0.07%
Food Service	1	0.07%
Occupational Therapist	1	0.07%
(blank)	51	3.9%
Total	**1309**	**100%**

Table 4. Injuries by Gender		
Gender of Worker	**Number**	**Percent**
Female	880	67.2%
Male	403	30.8%
Unknown	26	2.0%
Total	**1309**	**100%**

Table 5. Injuries by Age and Gender		
Males' Age	**Number**	**Percent**
17-21	7	1.9%
22-32	209	56.8%
33-43	90	24.5%
44-54	41	11.1%
55-65	15	4.1%
66-80	6	1.6%
Total	**368**	**100%**
Females' Age		
17-21	20	2.4%
22-32	416	49.7%
33-43	191	22.8%
44-54	145	17.3%
55-65	62	7.4%
66-80	3	0.4%
Total	**837**	**100%**

Table 5 includes only those cases that supplied both age and gender information.

Table 6. Area of the Body Injured		
Body Area	**Number**	**Percent**
Hand	1240	94.7%
Arm	17	1.3%
Leg/Foot	17	1.3%
Torso (front or back)	4	0.3%
Face/Head/Neck	3	0.2%
Unknown	28	2.1%
Total	**1309**	**100%**

Table 7. Injuries by Device Type: Needles		
Device Type	**Number**	**Percent**
Suture needle	258	26.6%
Winged steel needle (includes butterfly/ winged-set type devices)	84	8.7%
Syringe, other type	80	8.2%
Disposable syringe insulin	76	7.8%
Needle, not sure what kind	61	6.3%
IV Catheter Stylet	56	5.8%
Disposable syringe 24/25-gauge needle	54	5.6%
Vacuum tube blood collection holder/needle	43	4.4%
Other	29	3.0%
Disposable syringe 23-gauge needle	28	2.9%
Disposable syringe 22-gauge needle	25	2.6%
Pre-filled cartridge syringe	25	2.6%
Disposable Syringe Tuberculin	23	2.4%
Disposable Syringe 20-gauge needle	21	2.2%
Blood Gas Syringe	16	1.6%
Central Line Catheter Needle (cardiac etc.)	16	1.6%
Disposable Syringe 21-gauge needle	16	1.6%
Needle on IV line (includes piggybacks & IV line connectors)	8	0.8%
Arterial Catheter Introducer Needle	6	0.6%
Disposable Syringe 18-gauge needle	6	0.6%
Disposable Syringe 25-gauge needle	6	0.6%
Unattached Hypodermic Needle	6	0.6%
Spinal or epidural needle	5	0.5%
Disposable Syringe	3	0.3%
Disposable Syringe 27-gauge needle	2	0.2%
Homemade tattoo needle	2	0.2%
Disposable Syringe 19-gauge needle	1	0.1%
Disposable Syringe 24-gauge needle	1	0.1%
Disposable Syringe 25/26-gauge needle	1	0.1%
Disposable Syringe 30-gauge needle	1	0.1%
Drum Catheter Needle	1	0.1%
Heparin needle	1	0.1%
IV catheter Loose	1	0.1%
Lidocaine needle	1	0.1%
Needle	1	0.1%
Non Suture Bovie tip needle	1	0.1%
Non suture needle	1	0.1%
Omnisome	1	0.1%
Surgical Needle	1	0.1%
Syringe	1	0.1%
Transfer Needle	1	0.1%
Total	**970**	**100%**

Table 8. Injuries by Syringe Type		
Syringe Type	**Number**	**Percent**
Syringe, other type	80	21.0%
Disposable syringe insulin	76	19.7%
Disposable syringe 24/25-gauge needle	54	14.0%
Disposable syringe 23-gauge needle	28	7.3%
Disposable syringe 22-gauge needle	25	6.5%
Pre-filled cartridge syringe	25	6.5%
Disposable Syringe Tuberculin	23	6.0%
Disposable Syringe 20-gauge needle	21	5.4%
Disposable Syringe 21-gauge needle	16	4.1%
Blood Gas Syringe	16	4.1%
Disposable Syringe 18-gauge needle	6	1.6%
Disposable Syringe 25-gauge needle	6	1.6%
Disposable Syringe unknown gauge	3	0.8%
Disposable Syringe 27-gauge needle	2	0.5%
Disposable Syringe 19-gauge needle	1	0.3%
Disposable Syringe 24-gauge needle	1	0.3%
Disposable Syringe 25/26-gauge needle	1	0.3%
Disposable Syringe 30-gauge needle	1	0.3%
Total	**385**	**100%**

Table 8 is the syringe subset taken from Table 7.

Table 9. Injuries by Device Type: Surgical Instruments		
Device Type	**Number**	**Percent**
Scalpel, disposable	57	22.9%
Other	32	12.9%
Retractors, skin/bone hooks	19	7.6%
Lancet (finger or heel stick)	18	7.2%
Wire (suture/fixation/guide wire)	16	6.4%
Huber Needle	14	5.6%
Drill Bit/Bur	13	5.2%
Scalpel, reusable	11	4.4%
Pickups/forceps/Hemostats/Clamps	9	3.6%
Scissors	8	3.2%
Sharp item, not sure what kind	8	3.2%
Trocar	6	2.4%
Microtome Blade	5	2.0%
Staples/Steel Sutures	5	2.0%
Bone Chip/Chipped Tooth	4	1.6%
Fingernails/teeth	4	1.6%
Towel clip	4	1.6%
Razor	3	1.2%
Specimen/test tube (plastic)	3	1.2%
Electro-cautery device	2	0.8%
Cordless Saw Blade	1	0.4%
Dental Elevator	1	0.4%
Dental scaling instrument	1	0.4%
Motor Stimulus	1	0.4%
Non-suture needle	1	0.4%
Pin (fixation, guide pin)	1	0.4%
Scalpel	1	0.4%
Sintec Gun with sharp tip	1	0.4%
Total	**249**	**100%**

Table 10. Injuries by Device Type: Glass		
Device Type	**Number**	**Percent**
Glass item, not sure what kind	3	27.3%
Other	3	27.3%
Medication Ampule Vial/IV Bottle	2	18.2%
Break in glove contaminated with blood	1	9.1%
Capillary Tube	1	9.1%
Glass Slide	1	9.1%
Total	**11**	**100%**

Table 11. Injuries by Original Intended Use of Sharp		
Original Intended Use	**Number**	**Percent**
Injection, Intra-muscular/Subcutaneous/Intra-dermal, or other injection through skin	280	21.4%
Suturing	280	21.4%
Draw Venous Blood Sample	121	9.2%
Start IV or Set Up Heparin Lock	75	5.7%
Cutting	66	5.0%
Obtain a Body Fluid of Tissue Sample	42	3.2%
Dental Procedure	25	1.9%
Draw Arterial Blood Sample - direct stick	23	1.8%
Finger stick/Heel stick	19	1.5%
Other Injection into (or aspiration form) IV injection site or IV port	16	1.2%
Wiring	12	0.9%
Remove Central Line / Portal Catheter	12	0.9%
Connect IV Line (piggyback/other IV line connect)	10	0.8%
Drilling	9	0.7%
Contain a specimen or pharmaceutical (glass item)	6	0.5%
Draw Arterial Blood Sample	6	0.5%
Electrocautery	4	0.3%
Heparin or Saline Flush	3	0.2%
Tattoo	3	0.2%
Dialysis	2	0.2%
Draw Arterial Blood Sample - drawn from a line	1	0.07%
Surgical Procedure	1	0.07%
Tacking	1	0.07%
Unknown/(blank)	292	22.3%
Total	**1309**	**100%**

Table 12. When and How the Injury Occurred		
After Sharps Use	**Number**	**Percent**
Between Steps of a Multistep Procedure (carrying, handling, passing/receiving syringe/instrument, etc.)	125	16.7%
Found in an Inappropriate Place (e.g. table, bed, linen, floor)	64	8.5%
Unsafe Practice	63	8.4%
Activating safety device	61	8.1%
Use of Sharps Container	55	7.3%
Recapping	44	5.9%
Patient Moved During the Procedure	43	5.7%
Interaction with another person	31	4.1%
Preparation for reuse of instrument (cleaning, sorting, disinfecting, sterilizing, etc.)	31	4.1%
Disassembling device or Equipment	30	4.0%
Suturing	21	2.8%
Device Malfunctioned	19	2.5%
Use of IV/Central Line	14	1.9%
Laboratory Procedure/Process	10	1.3%
Device Pierced the Side of the Disposal Container	4	0.5%
Other	2	0.3%
After	1	0.1%
Disposing of needle	1	0.1%
(blank)	131	17.5%
Total	**750**	**100%**

Table 13. When and How the Injury Occurred		
During Sharps Use	Number	Percent
Between Steps of a Multistep Procedure	137	29.0%
Suturing	75	15.9%
Patient Moved During the Procedure	46	9.7%
Interaction with another person	35	7.4%
Unsafe Practice	17	3.6%
Use of IV/Central Line	10	2.1%
Laboratory Procedure/Process	9	1.9%
Activating safety device	6	1.3%
Disassembling device or Equipment	5	1.1%
Found in an Inappropriate Place (e.g. table, bed, linen, floor)	5	1.1%
Recapping	4	0.8%
Device Malfunctioned	2	0.4%
Device Pierced the Side of the Disposal Container	2	0.4%
N/A	2	0.4%
Other	2	0.4%
After	1	0.2%
Preparation for reuse of instrument (cleaning, sorting, disinfecting, sterilizing, etc.)	1	0.2%
Uncapping Needle	1	0.2%
Unknown	1	0.2%
Use of Sharps Container	1	0.2%
While pulling out suture needle from patient	1	0.2%
(blank)	137	29.0%
Total	**473**	**100%**

Table 14. Safety Engineered Protection		
Did the device have engineered sharps injury protection?	**Number**	**Percent**
Yes	433	33.1%
No	443	33.8%
Don't Know/(blank)	433	33.1%
Total	**1309**	**100%**

Table 15. Protective Mechanism Activation		
Was the protective mechanism activated?	**Number**	**Percent**
Yes, fully activated	70	16.2%
Yes, partially activated	93	21.5%
No	234	54.0%
Don't Know/ (blank)	36	8.3%
Total	**433**	**100%**

Table 16. When During Device Activation Did Injury Occur		
The injury occurred	**Number**	**Percent**
before activation.	177	40.9%
during activation.	97	22.4%
after activation.	103	23.8%
(blank)	56	12.9%
Total	**433**	**100%**

Tables 15 and 16 include only cases that indicated the device had safety engineered protection.

Table 17. Safety Engineering by Needle Type		
Safety Engineered	**Number**	**Percent**
Syringe, all types	199	52.8%
Winged Steel Needle	56	14.9%
IV Catheter Stylet	43	11.4%
Vacuum Tube Blood Collection Holder	34	9.0%
Suture Needle	19	5.0%
All others	27	6.9%
Total	**378**	**100%**
Not Safety Engineered		
Suture Needle	145	50.3%
Syringe, all types	89	30.9%
Needle, not sure what kind	22	7.6%
All others	33	11.1%
Total	**289**	**100%**
Safety Engineering Status "Don't Know"		
Suture Needle	86	38.4%
Syringe, all types	82	36.6%
Needle, not sure what kind	30	13.4%
All others	25	11.6%
Total	**223**	**100%**

Table 17 includes only cases where both needle type and safety engineering status were provided.

Table 18. Was the injured person wearing gloves?		
Wearing gloves	**Number**	**Percent**
Yes	1193	91.1%
No	64	4.9%
Unknown	52	4.0%
Total	**1309**	**100%**

Table 19. Was the injured person vaccinated for Hepatitis B?		
Vaccinated for HBV	**Number**	**Percent**
Yes	1195	91.3%
No	41	3.1%
Don't know/(blank)	73	5.6%
Total	**1309**	**100%**

Table 20. Was a sharps container available for disposal		
Sharps container available	**Number**	**Percent**
Yes	1191	91.0%
No	18	1.4%
Unknown	100	7.6%
Total	**1309**	**100%**

Table 21. Sharps container provided clear view of fill level		
Sharps container provided clear view	**Number**	**Percent**
Yes	1122	85.7%
No	13	1.0%
Unknown	174	13.3%
Total	**1309**	**100%**

Table 22. Injured person receive exposure control training within last 12 months		
Training last 12 months	**Number**	**Percent**
Yes	1134	86.6%
No	28	2.1%
Unknown	147	11.2%
Total	**1309**	**100%**

Table 23. Gender of Physicians and RN's Statewide and Injured		
Attending Physician	**Statewide**	**Injured**
Male	29,858	64
Female	11,308	44
Total	**41,166**	**108**
Registered Nurse		
Male	19,591	48
Female	156,907	268
Total	**176,498**	**316**

Table 23 includes only those cases that provided both occupational and gender information.

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