

Operating Room Sharp Injuries in a Teaching Hospital

Poonam Kutre
MPH 2015

Illinois Occupational Surveillance Program

University of Illinois at Chicago
School of Public Health
Environmental and Occupational Health
Sciences, SPH
2121 W Taylor, Rm 117, MC 922
www.illinoisinjuryprevention.org

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What is sharp injury

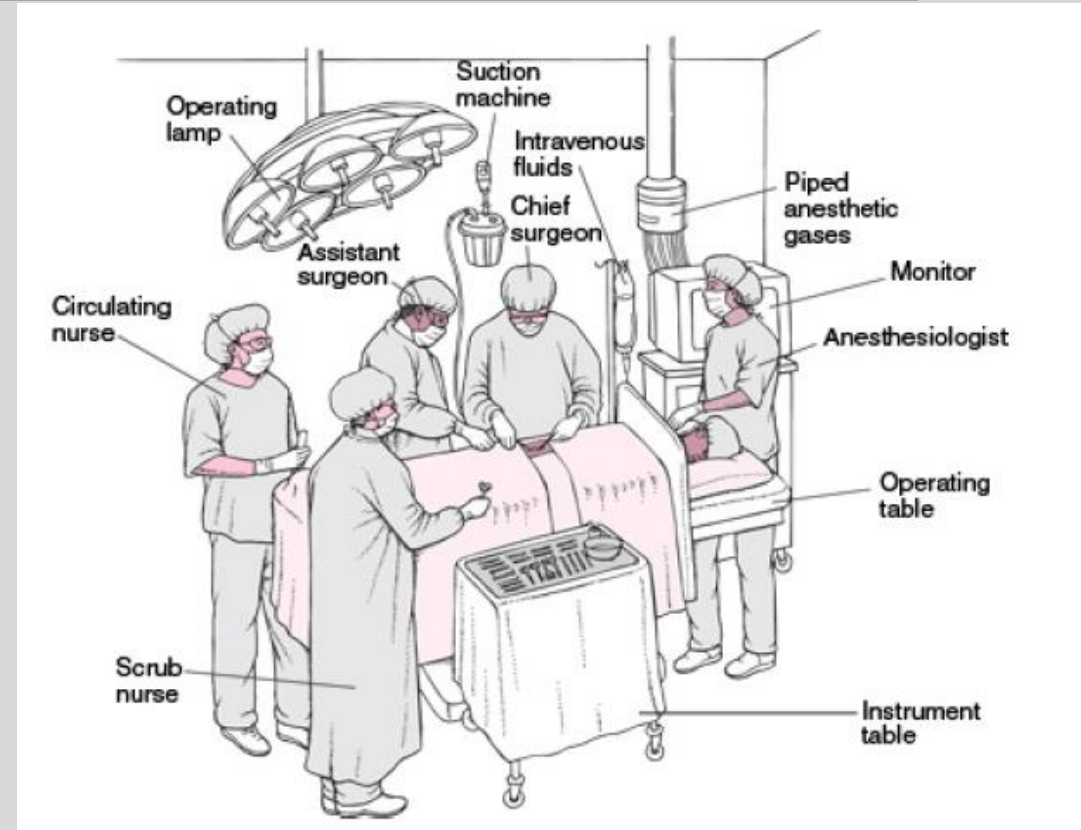
- A sharp injury is a penetrating stab wound from a needle, scalpel, or other sharp object that may result in exposure to blood or other body fluids.(CDC)
- Sharp injury rates in surgical settings have increased 6.5 % compared to a 31.6 % decrease in injury rates in non-surgical settings (Jagger et al.2010)
- Each year, 30% of estimated needle sticks and other sharps-related injuries occur in the operating room (Epinet)



Source:http://www.cdc.gov/niosh/stopsticks/sharps_injuries.html

Factors Influencing Exposure

- Type of medical procedure
- Characteristics of the device & equipment used
- Nature of work
- Space and visibility within operative fields
- Level of staffing
- Frequency of emergency patient care situations
- Pace of work



Source: <http://nursingcrib.com/perioperativenursing/operating-room-team-sterile-members>

Aims

- To describe the distribution of sharp injuries reported to the hospital safety office by operating room staff at an urban academic-based hospital
- Identify predictors of repeated sharp injury over a 3 year period
- Evaluate and describe work place hazards associated with sharp injuries through onsite work place observation

At Risk Population

- WHO surveillance of sharp injury data of 150 countries from 1992-1998 indicated over 35 million health care workers were at risk of exposure, with 2.5% of these sharp injuries documented in USA (Rapiti et al. 2005)
- CDC estimates an average of 1000 injuries per day, with profound underreporting that may be as high as 70% in some health care facilities

Patterns of Sharp Injuries

Who?

Nurses (42%) followed by physicians (30%), technicians/maintenance (14%), and students (4%)

Where?

Sharp injuries most commonly occurred in the inpatient units (36%), operating rooms (29%), and patient rooms (9%)

What?

Hollow-bore needles: 55%

Solid Sharp: 41%

When?

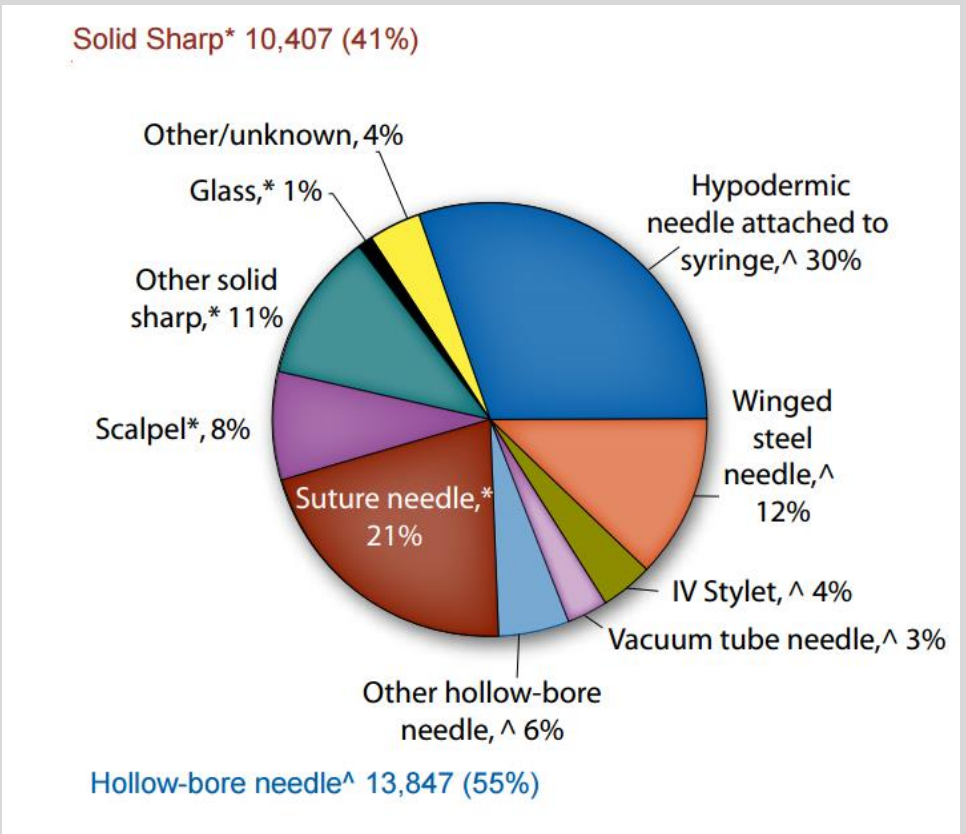
During use of a device : 70%

After use/before disposal:15%

During and after disposal:3%

Other 5%

Types of Devices Involved in Percutaneous Injuries (n=25, 324)



<http://www.cdc.gov/nhsn/PDFs/NaSH/NaSH-Report-6-2011.pdf>

Blood Borne Pathogens (BBP)

Factors determining the risk of acquiring blood borne infection:

- Circumstances of the injury
- Type of instrument
- Volume of blood
- Type/depth of injury
- Infectious state of the source blood
- Health care worker susceptibility

Diseases transmitted to HCWs after sharp injury

| | | |
|---------------|----------------|--------------------------------|
| ■ Hepatitis B | ■ Malaria | ■ Toxoplasmosis |
| ■ Hepatitis C | ■ Syphilis | ■ Brucellosis |
| ■ HIV/AIDS | ■ Tuberculosis | ■ Herpes |
| | | ■ Diphtheria |
| | | ■ Blastomycosis |
| | | ■ Dengue Virus |
| | | ■ Rocky Mountain spotted fever |

BBP Risk With Sharp Injury

- 1.8 % risk for Hepatitis C if device is contaminated with HCV
- 6%–30% risk for Hepatitis B with contaminated device
- 0.3% (about 1 in 300) risk of contracting HIV with device contaminated with HIV
- Unlike HIV and Hepatitis C in which there is no vaccine, Hepatitis B is preventable with vaccine

Source: http://www.cdc.gov/infectioncontrol/faq/bloodborne_exposures.htm

BBP Statistics

- 2005 WHO report on global BBP infections among an estimated 35 to 100 million health care workers:
 - 65,000 Hepatitis B Virus infections (HBV)
 - 16,400 Hepatitis C Virus infections (HCV)
 - 1000 HIV infections
- CDC confirmed 44 health care associated outbreaks of Hepatitis B virus (HBV) and Hepatitis C virus from 2008-2014
 - 175 cases –HBV
 - 239 cases-HCV
- 1981-2010 occupationally acquired HIV/AIDS surveillance data: 57 health personnel in U.S. have been documented to seroconvert to HIV following occupational exposures

Underreporting

Needle stick injuries are underreported by health care workers and the number of exposures could potentially be much higher (Hamory, 1983)

Factors influencing reporting rates;

- Incident reporting process (Makary et al. 2007)
- Lack of time
- Employer response
- Concern about source infectious status

Consequences of Sharp Injury

| Direct Cost | Indirect Cost |
|---|---|
| <ul style="list-style-type: none">▪ Laboratory testing costs▪ vaccinations, health care visits | <ul style="list-style-type: none">▪ Loss of work days and loss of wages |
| <ul style="list-style-type: none">▪ Post exposure prophylaxis (PEP) | <ul style="list-style-type: none">▪ Lost productivity, time lost due to anxiety & distress |
| <ul style="list-style-type: none">▪ Follow-up blood test and long-term treatment | <ul style="list-style-type: none">▪ Higher insurance premiums |
| <ul style="list-style-type: none">▪ Costs associated with prevention and PEP side effects | <ul style="list-style-type: none">▪ Societal costs (social stigma) |
| | <ul style="list-style-type: none">▪ Emotional and psychological stress and fear of unknown consequences |
| | <ul style="list-style-type: none">▪ Side effects of prophylaxis and treatment |

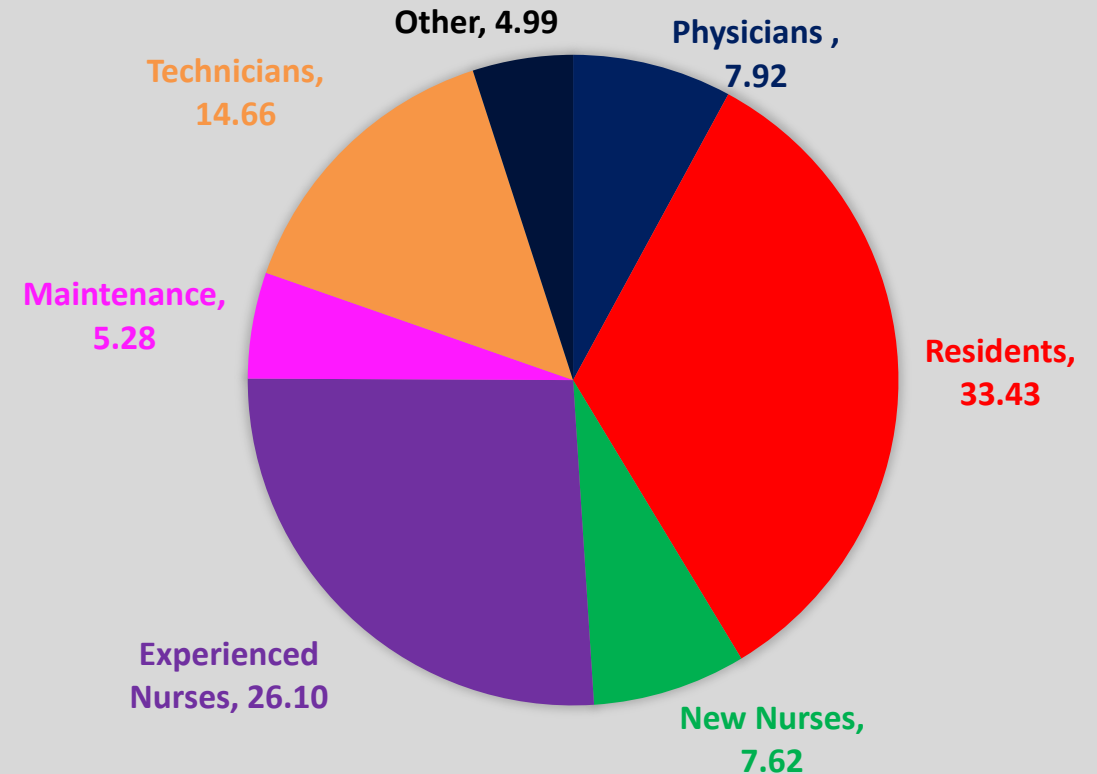
Methods

- Data on sharp injuries collected over a 3 year period from January 1st, 2012 through December 31st, 2014 through a sharp injury log reported to the hospital health services
- Repeat injuries among workers were identified by cross matching the cases by date of birth and hire date.
- Multivariable logistic regression model was built to describe the association of sharp injuries and job class, as well as age, years of experience, and type of sharps
- Conducted a 5 week (March-April 2015) observational study at operating room observing behavior, environment, and safe work practices such as double gloving, verbal communication, and use of neutral zone for sharp instrument transfer

Results

- During the 3 year period, a total of 392 percutaneous sharp injuries among 341 individuals were reported
- Based on the department :
Graduate medical services (33.5%),
Surgical services department (10%),
Nursing services department (7%).
- 51 individuals experienced more than one sharp injury, were more likely to be physicians (19%) and residents/students (19%)

Distribution of sharp injuries by job class (%)



Note: *Other occupational group includes researcher, security guard, dietician, mental health counselor, police officer, transporter, pharmacist, physician assistant

Results

- **Residents/students:** 51% injuries during the use of solid sharps, mainly by suture needles and scalpel blades, with high risk work activities including suturing (30%), injection (10%), and other related procedures (16%)
- **Experienced nurses:** 42% of sharp injuries attributed to the use of hollow sharps, with 24% of injuries occurring during the disposal of sharp in red box followed by injection related activities
- **Maintenance workers and technicians** sustained most injuries during handling and disposal of hollow sharps

**Comparison of Sharp Injuries by Job Class and Device Type
Among Operating Room Staff at a University Hospital, 2012-2014**

| Job Class | *Hollow Sharps | **Solid Sharps |
|--------------------|----------------|----------------|
| Physicians | 8 (6.7%) | 12(9.8%) |
| Students/Residents | 19 (16%) | 63 (51.2%) |
| New Nurses | 17(14.2%) | 5 (4%) |
| Experienced nurses | 50 (42%) | 18 (14.6%) |
| Maintenance | 9 (7.5%) | 6 (5%) |
| Technicians | 16 (13%) | 12 (9.8%) |
| *Other | 1 (0.008%) | 7 (5.7%) |

Note: *Other occupational group includes researcher, security guard, dietician, mental health counselor, police officer, transporter, pharmacist, physician assistant.

*Hollow sharps include-Hollow needle, stylet, butterfly needle,spinal Needle and huber needle

**Solid sharps include - solid blade, scalpel blade, other surgical instrument, suture and non-suture needles, solid glass

Missing: 98

Results

- Monthly distribution of sharp injuries was relatively constant over several years
- Fewer injuries were reported on the weekends

Table 2: Distribution of Sharp Injuries by weekday

| Injury Weekday | Frequency Count | Percent of Total Frequency |
|----------------|-----------------|----------------------------|
| Thursday | 78 | 19.90 |
| Monday | 72 | 18.37 |
| Tuesday | 66 | 16.84 |
| Wednesday | 65 | 16.58 |
| Friday | 64 | 16.33 |
| Saturday | 25 | 6.38 |
| Sunday | 22 | 5.61 |

Multivariable model

- Job class was not associated with repeat injuries
- Compared to hollow needle sharps, exposure to solid sharps (e.g. suture needle, scalpel blade, surgical instruments) were associated with repeated sharp injuries
- Age and years of experience was included in the regression model
- Continued to observe no differences between job classes

Table 3: Multivariate Logistic regression analysis of risk factors associated with repeat sharp injuries

| Job Class | Adjusted Odds Ratio | 95% Confidence Interval | p-value |
|------------------------|---------------------|-------------------------|---------|
| Physicians (reference) | 1.00 | | |
| Residents/Students | 1.20 | 0.42,3.42 | 0.738 |
| Nurses | 0.57 | 0.18,1.79 | 0.381 |
| Maintenance | 0.38 | 0.04,3.53 | 0.394 |
| *Other and Technicians | 0.43 | 0.11,1.68 | 0.224 |
| Age (years) | 1.01 | 0.97,1.05 | 0.463 |
| Solid Sharps | 2.84 | 1.41,5.7 | 0.003 |

Observation study results

Observation of 21 ophthalmic(eye) cases:

- Use of double gloving was not practiced
- Verbal communication during the transfer of sharps was observed only in 6 out of 21 cases
- There was hand to hand passing of sharp instruments between the scrub and the surgeon with no use of neutral zone
- There were 2 observations of improper disposal of needles by scrubs

Discussion

- Analysis of sharp injuries by job class and device revealed residents are more likely to injure themselves with solid sharps such as suture needles, scalpel blades and other surgical instruments

Implications:

- Relative inexperience in performing procedures and handling sharps devices
- Residents may be at higher risk of exposure to bloodborne pathogens
- Low adaptation of safer work practices

Discussion

- Since 2001, there are very few studies which assessed sharp injuries among US residents, majority of which were survey studies and others were based on sharp exposure log
- Sharp injury survey of 699 residents enrolled in 17 US surgery residency programs showed that 67% sustained injury in the operating room with more than half injuries unreported (Markary et al.2007)

Limitations

- The data lacked critical denominator information to calculate the rates:
 - Total number of resident trainees in each department
 - Total number of hours worked
 - Descriptive data of each event for a root cause analysis
- Some of the data on the type of device causing injury was missing
- Underreporting of sharps injuries
- Short period of observation study which involved only ophthalmology department

Summary

This study analysis can be considered as a baseline profile of sharps injuries in the operating room and can be used by the institution to:

- Create a sharps safety educational training which focuses on improving handling of solid sharp instruments and to enhance the resident's surgical skills
- Encourage health care professionals in surgical settings to use blunt-tip suture needle when it is clinically appropriate technique (CDC, 2008)
- Multidisciplinary approach, which includes representatives of front line workers of both non managerial (nurses, practitioners ,technicians, educators) and managerial (risk managers and directors) positions

Summary

- Recommended safety culture work practices: Competent education, accountability of health care staff, monthly institutional reminders, easy and accessible incident reporting, active multidisciplinary approach, and a goal of zero sharp exposures (Grimmond and Good, 2014)
- Use of neutral zone (Hands free technique) defined as a “zone which is a previously agreed location on the sterile field where sharps are placed from which physicians or scrub can retrieve them.” This method eliminates the hand to hand passing of sharps (Stringer 2002)
- Encourage the use of double gloving, which reduces blood exposure to 87% (Berguer, 2004)

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Thank you for Listening!

Any Questions ?