AORN Sharps Safety Tool Kit

Sharps Injury Data Analysis Tool

Adapted from the Centers for Disease Control and Prevention's

Workbook for Designing, Implementing, and Evaluating a Sharps Injury Prevention Program

Pages 46-50,118-119

The *Workbook for Designing, Implementing and Evaluating a Sharps Injury Prevention Program* has been developed by CDC to help health care facilities prevent needlesticks and other sharps-related injuries to healthcare personnel. Available at http://www.cdc.gov/sharpssafety/pdf/sharpsworkbook_2008.pdf

OPERATIONAL PROCESSES

Analyze Sharps Injury Data

Introduction

Sharps injury data must be compiled and analyzed if they are to be used for prevention planning. This section describes:

- How to compile data from injury and hazard reports.
- How to perform simple and complex analyses.

Compiling Sharps Injury Data

Data on sharps injuries can be compiled by hand or with a computerized database. The latter facilitates multiple types of analyses (eg, line lists, frequency lists, cross-tabulations). Alternatively, these facilities might participate in a professional organization's regional or state data collection network that allows several facilities to contribute descriptive data (with confidential individual identifiers removed) on injuries. (Although such networks are not known to be available, it is possible that they will be developed in the future.) The advantage of having small organizations of similar purpose (eg, medical or dental offices) contribute to a larger data collection pool is so that aggregate data can enhance the understanding of the frequency of sharps injuries and identify unique injury risks associated with these work sites. Small facilities may choose to aggregate data over several years, if the data in each year is not enough to use to determine prevention priorities.

Injury data can be analyzed with very simple statistical tools, such as frequency distributions and cross-tabulation. Large databases can perform more sophisticated analyses (eg, multivariate analysis).

Analyzing Sharps Injury Data

The first step in the analysis of data is to generate simple frequency lists, by hand or computer, on the variables that make up the following data elements:

- Occupations of personnel reporting injuries;
- Work locations (eg, patient units, operating room, procedure room) where reported injuries occur;
- Types of devices (eg, hypodermic needles, suture needles) involved in reported injuries;
- Types of procedures (eg, phlebotomy, giving an injection, suturing) during which injuries occur;
- Timing of occurrence of injuries (eg, during use, after use/before disposal, during/after disposal); and
- Circumstances of injuries (eg, during use of the device in a patient, while cleaning up after a procedure, as a result of improper disposal of a device).

Once frequencies are tabulated, a cross-tabulation of variables provides a more detailed picture of how injuries occur. This is most easily performed in a computerized database, but it can be

done by hand. For example, simple cross-tabulations using occupation and device variables might reveal differences in the types of devices involved in injuries among persons in different occupations. Cross-tabulations can also assess whether certain procedures or devices are more often associated with injuries. The example below shows that nurses are more frequently injured by hypodermic needles and physicians by winged steel needles. Nurses and phlebotomists report the same number of injuries from phlebotomy needles. Armed with this information, it is then possible to seek additional information that might explain these differences in injuries for each occupation.

Example of how to perform a cross-tabulation* Types of devices involved in injuries sustained by different occupational groups during (time period being analyzed)				
Occupation/device	**Nurses**	**Physicians**	**Phlebotomists**	**Total**
Hypodermic needle	20	12	2	34
Winged steel needle	12	25	1	38
Phlebotomy needle	8	3	8	19
Scalpel	1	17	0	18
TOTAL	41	57	11	109

Hypothetical example, using a grid with one variable (eg, occupation) in the horizontal axis and another variable (eg, device) in the vertical axis shows differences in occupational injuries by type of device. Other variables (eg, procedure, injury circumstances, etc.) can be cross-tabulated to better understand injury risks.

Calculating Injury Incidence Rates

Injury incidence rates provide information on the occurrence of selected events over a given period of time or other basis of measurement. The calculation of injury incidence rates for specific occupations, devices, or procedures can be useful for measuring performance improvement.

However, many factors, including improved reporting of injuries, can influence changes in incidence rates. Depending on the denominator(s) used, a facility may be viewed favorably or negatively. A recent report compared sharps injury rates in 10 Midwestern facilities that differed in size and scope of operation. It found considerable variation depending on the selection of the denominator.[1] Therefore, the calculation of injury rates should be considered as one of many

tools available to monitor sharps injury trends within a facility, but should be used with caution when making inter-facility comparisons.

Calculating injury incidence rates requires reliable and appropriate numerators and denominators. Numerators derive from information collected on the injury report form; denominators must be obtained from other sources (eg, human resources figures, purchasing records, cost center data). The numerator and denominator must reflect a common opportunity for exposure. For example, when calculating injury incidence rates among nursing personnel, the denominator should ideally reflect only those nurses whose job responsibilities expose or potentially expose them to sharp devices.

Selecting Denominators for Calculating Occupation-Specific Injury Rates. Denominators sometimes used to calculate occupation-specific incidence rates include:

- number of hours worked,
- number of full-time equivalent (FTE) positions, and
- number of healthcare personnel.

Of these, number of hours worked is probably the most accurate and easiest to obtain, especially if part-time and per diem staff are included. Human resources and/or financial departments should be able to provide these numbers. For some complex healthcare organizations (eg university teaching centers) and for some occupations (eg, attending physicians, radiologists, and anaesthesiologists provided through contract), obtaining denominators might be more difficult. If the analysis does not use the same denominator to calculate occupation-specific rates, comparisons among occupational groups are invalid.

Adjusting Occupation-Specific Injury Rates for Underreporting. Although rates can be adjusted for underreporting, this step is not essential, nor is it necessarily useful, particularly for small facilities. For facilities that are interested in adjusting, the most reliable source of information is data from a survey of healthcare personnel in the facility (Appendix A-3). For example, if the survey finds considerable disparities in reporting among occupational groups (eg, phlebotomists reporting 95% of their injuries and physicians only 10%), then adjustment of occupation-specific rates is appropriate to accurately reflect differences among occupational groups. Guidance for performing these calculations is included in the toolkit.

Toolkit Resource for This Activity

Occupation-Specific Rate-Adjustment Calculation Worksheet
(see Appendix A-10)

Calculating Procedure- and Device-Specific Injury Rates. Procedure- and device-specific injury rates are also useful for defining injury risks and measuring the effect of interventions. Although the frequency of injuries is often higher with some procedures or devices, a calculation of rates can yield a different picture. For example, a 1988 study by Jagger et al,[2] found that,

although the highest proportion, or percentage, of total injuries involved the hypodermic needle/syringe, this type of device was also the most frequently used. When injury rates were calculated based on the number of devices purchased, results show that needles attached to IV tubing had the highest rate of injury, followed by phlebotomy needles, IV stylets, and winged steel needles. A later study, conducted in a single hospital, found that while hypodermic needle/syringe injuries were also the highest proportion of hollow-bore needle injuries, injuries involving winged-steel (butterfly type) needles occurred at a higher rate per 100,000 devices purchased.[3]

Ideally, the denominators for calculating procedure- and device-specific rates are based on the actual number of procedures performed or devices used. However, it is often difficult to obtain this information for calculating device-specific injuries; the number of devices purchased or stocked may be used as a surrogate. Information from the medical billing office, using Current Procedural Terminology (CPT) or Diagnosis-related Group (DRG) codes along with information from the purchasing department, may be used as the denominator for calculating procedure and device specific rates.

Using Control Charts for Measuring Performance Improvement

Control charts are graphical statistical tools that monitor changes in a particular set of observations over time and in real time. They are now used by many healthcare organizations as a quality improvement tool for a variety of patient-care activities and events, including healthcare-associated infections. They can be applied to the observation of sharps injuries in healthcare personnel. In concept, control charts indicate whether certain events are an exception. Over time, they can also demonstrate performance improvement.

This tool is applicable and useful only to healthcare organizations with a large amount of data on sharps injuries. A minimum of 25 data points are generally needed before it is possible to make a reliable interpretation. A discussion of methods for creating and interpreting control charts is beyond the scope of this workbook. The following web site and references are provided for those who are interested in pursuing this statistical technique: http://www.isixsigma.com/st/control_charts/.[4,5]

Calculating Institutional Injury Rates

In several published studies, investigators calculate institution-wide rates of sharps injuries using a variety of denominators (eg, number of occupied beds, number of inpatient days, number of admissions). Facility-wide information can help calculate national estimates of injuries among healthcare personnel.[6] But at the institutional level, this information has limited use and is difficult to interpret. It indicates only whether a rate is changing, not why. Also, safety improvements may be masked by improved reporting. For purposes of measuring performance improvement, the basic calculations described above will prove most reliable.

Benchmarking

Benchmarking provides a way for hospitals to measure performance against a pre-determined goal. There is limited information now for sharps injury benchmarking. Data provided by the

National Surveillance System for Health Care Workers, NaSH and others reflects the distribution of sharps injuries by factors such as occupation, device, and procedure, allowing hospitals to note areas where their experience differs. Data are not intended to set a mark, or acceptable level of sharps injuries. More important than measuring performance against other hospitals or national data is comparing data within one facility or group of facilities over time. In this process, identifying significant differences in the data as well as changes in work practice, engineering controls, patient population and volume, as well as staffing may help to evaluate the effect of various changes.

REFERENCES

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3. Patel N, Tignor GH. Device-specific sharps injury and usage rates: an analysis by hospital department. *Am J Infect Control*. 1997;25(2):77-84.

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5. Benneyan JC. Statistical quality control methods in infection control and hospital epidemiology, Part II: Chart use, statistical properties, and research issues. *Infect Control Hosp Epidemiol*. 1998;19(4):265-283.

6. Panlilio AL, Orelien JG, Srivastava PU, Jagger J, Cohn RD, Carco DM, NaSH Surveillance Group; EPINet Data Sharing Network. Estimate of the annual number of percutaneous injuries among hospital-based healthcare workers in the United States, 1997-1998. *Infect Control Hosp Epidemiol*. 2004;25(7):556-562.

A-10 Occupation-Specific Rate-Adjustment Calculation Worksheet

The data analysis section of this *Workbook*, *Operational Processes, Analyze Sharps Injury Data*, discusses the adjustment of occupation-specific injury rates based on levels of compliance with injury-reporting policies. This worksheet helps facilitate computation of this adjusted rate. Organizations that have surveyed healthcare personnel (Appendix A-3) to determine compliance with reporting occupational exposures to blood and body fluids can use these data to adjust injury rates.

Workbook Section Link for this Toolkit Product:

Operational Processes

Analyze Sharps Injury Data

Calculating Injury Incidence Rates

Sample Occupation-Specific Rate-Adjustment

Calculation Worksheet

Occupational Group: _____

Calculate the percentage of unreported injuries for the occupation:

1. From **the reporting survey**, record the number of injuries these workers say they sustained_____.
2. Record the number of injuries these workers say they reported _____.
3. Subtract #2 from #1 to obtain the number of unreported injuries _____.
4. Divide #3 by #1 and multiply by 100 to obtain _____%, the percentage of unreported injuries in this occupation.

Adjust the number of injuries for the occupation of interest:

5. From **facility-wide injury data**, record the number of injuries reported by the occupation during the period being analyzed (eg, previous year) _____.
6. Multiply #4 by #5 to obtain the number of unreported injuries for the occupation _____.
7. Add #5 and #6 to obtain the adjusted number of injuries for the occupation that should be used for adjusting the occupation-specific injury incidence rate _____.

Note: Additional adjustments in the calculation may be necessary if the time periods in the reporting survey and facility-wide data are different (eg, if the reporting survey asks only for injuries in the last six months and facility-wide data are for one year).

Other surveillance and data collection resources

EPINet

EPINet/Access-OR downloadable report forms. EPINet. Exposure Prevention Information Network. http://www.healthsystem.virginia.edu/internet/epinet/OR/epinet8.cfm. Accessed March 1, 2011.