

How to Calculate Sharps Injury Rates

Introduction

Health care organizations that gather data on sharps injuries among their employees will want to take full advantage of these data to evaluate their safety programs and identify areas needing improvement. Sometimes all that is needed is to look at the raw data on who was stuck, when it occurred, and so on. But often these raw data give only an incomplete picture because they do not take account of the size of the workforce in different areas of the organization or the different medical procedures and patient or client populations involved. A full accounting of sharps injuries will involve the calculation of rates, which is the subject of this fact sheet.

What is a rate?

A rate is the amount that one quantity changes in relation to one unit of another quantity. The benefit of calculating rates is that they adjust the scale of a quantity so that it is easier to compare to other measurements. Rates help us think systematically, make useful comparisons and decide on whether to take action. Think of rates that we encounter routinely and how we use them to make decisions:

<i>Quantity</i>	<i>Rate</i>	<i>Units of comparison</i>	<i>Typical decisions</i>
Speed of the heart	Heart rate	Beats/minute	Is my heart beating too fast or too slow?
Speed of an Auto	Auto Velocity	Miles/Hour (mph)	Is my car within the speed limit? Is this speed reasonable for travel conditions?
Fuel efficiency	Gas mileage	Miles/gallon (mpg)	Will this car be economical? Should I choose this car or another?
Cost of money	Interest rate	\$ paid in interest/ \$ principal	How large a mortgage can I afford? Which credit card is better?

In healthcare, a rate is a tool to describe the disease or injury experience of a population. The key idea is that a rate refers to a group of people: individuals are stuck by needles, but populations experience a particular *rate* of needle stick injury. This distinction is useful because to prevent future injuries, we need to know which groups to target for intervention. The fact that a particular employee has been injured is probably not so useful for prevention. Instead, we want to identify the characteristics of employees or work circumstances in which injury rates are higher, so we can design interventions effectively.

Technically, an injury rate is a ratio of two numbers. The numerator is the number of events (injuries), and the denominator is a reference that puts the number of injuries in perspective.

Suppose for example that last year your organization recorded 45 sharps injuries. If the medical staff that year included the equivalent of 800 full-time employees (800 FTE), then a sharps injury rate (SIR) could be calculated as:

$$\text{Annual Sharps Injury Rate} = \frac{45 \text{ sharps injuries}}{800 \text{ FTEs}} = 0.056 \text{ sharps injuries per FTE}$$

This might also be written as 5.6 injuries per 100 FTE per year. This rate could then be compared to the institution's prior years' data, as a means of assessing injury prevention performance.

Why calculate a sharps injury rate?

The simple answer is that knowledge of sharps injury rates can help focus injury prevention efforts. The ideal number of sharps injuries would be zero, of course. But there are many reasons why a healthcare provider might not initially achieve this goal, or might have different injury rates than another organization:

- One provider may see many more seriously ill patients than another, and so the staff will perform many more procedures involving sharps, and this factor alone may increase the number of sharps injuries.

- Certain medical procedures may be accomplished only with sharps that lack a built-in safety feature, raising the risk of an injury.
- The skill level of the clinicians using sharps devices can impact the injury rate. For example, a hospital employing an IV team might have fewer injuries than another hospital using a floor nurse to perform the same task. A hospital with a phlebotomy team might have fewer injuries than a facility in which nurse techs draw blood.
- The setting in which the sharp device is used may influence the likelihood of injury. For example, a home setting where there is poor lighting or no clear work surfaces may make sharps procedures more difficult to do safely and hence influence the injury rate. Similarly, a busy Emergency Room may have a different injury rate than a quiet procedure room in a medical laboratory.

Some of these reasons, or risk factors, might be useful targets for intervention; for example technique-related injuries might be reduced through improved workplaces, more practice or training, and many injuries can be eliminated through use of needleless devices.

Effective analysis of sharps injury data involves calculating rates to account for inherently unmodifiable characteristics like the number of beds, the types of procedures performed or the inpatient/outpatient mix so that attention can be focused on those factors that can be improved to reduce injury.

To calculate the most useful sharps injury rates for your facility, you need to be aware of two key choices: which denominator to use, and which unit of analysis.

A. The Denominator

The denominator should represent the potential for exposure to sharps. One can see, for example, that if a simple head count of employees is used, and if there are many part-timers, then the denominator will be mixing together some who work 8 or more hours per day, and others who may average 4 or less. The resulting rate will be diluted by the part-timers who have less potential for injury because they work fewer hours. Thus the FTE is a better measure than the employee head count.

Other denominators can also be very useful. For example, calculating the rate of sharps injuries per 100 occupied beds is often used to compare rates among different hospitals; an occupied bed implies a certain level of medical treatment to a patient, and that treatment carries with it a certain degree of exposure to sharps for the medical staff. To focus more directly on the potential for exposure, one can calculate the sharps injury rate using the number of medical procedures performed. Even better: subdivide procedures into those involving sharps and those which do not, and use only the former in the denominator. The difference between a rate using all procedures and one using only the sharps procedures is that the latter rate focuses more narrowly on situations in which a sharp is clearly present and the opportunity for an injury exists.

Some useful denominators for sharps injury rates are:

- Employee-hours at work (full-time equivalents)
- Number of occupied beds (or licensed beds) in a hospital
- Number of patients (average census, or annual total hospital admissions)
- Number of medical procedures performed
- Number of procedures involving a sharp
- Number of sharps used

B. The Unit of Analysis

The numerator and denominator of a rate should always refer to the same unit of analysis. By unit of analysis, we mean the division of your organization whose injury experience you want to focus on. For example, if rates are to be calculated for the entire facility in one year, then the numerator and denominator should both cover that entire universe:

Injuries organization-wide/# FTEs organization-wide

If, instead, the rate will cover only a limited group, such as nurses in the I.C.U., then the numerator would be the number of sharps injuries to I.C.U. nurses (in some time period), and the denominator would probably be a count of the nurses (perhaps corrected for part-timers by using full time equivalents instead of simply a head count) working in the I.C.U. in the same time period.

$$\# \text{ Injuries to ICU nurses} / \# \text{ ICU nurses}$$

There are many possible units of analysis, and each will provide a different view of the sharps injury situation in your facility. You might calculate rates by:

- Occupations of personnel reporting injuries (nurses, surgeons, phlebotomists, home care aides, physical therapists)
- Work locations where reported injuries occur (the I.C.U., out-patient chemotherapy, client’s home, adult daycare site)
- Types of procedures during which injuries occur (blood drawing, cleaning wounds, doing laundry, removing trash, etc.)
- Timing of occurrence of injuries (day versus night shift for example)

Making sharps injury rates work for you

Knowledge of injury rates can be used to support activities that prevent future injuries. It is important for an organization to think about what data are needed to support their efforts and to calculate the rates that inform their activities. The table below shows some examples of different rates and the type of information they provide.

<i>Rate</i>	<i>Units of comparison</i>	<i>Typical considerations</i>
Annual Needlestick Injury Rate	<ul style="list-style-type: none"> • Injuries/FTE • Injuries/Occupied Beds • Injuries/total annual admissions 	How does this compare with last year’s rate?
Annual injury rate by occupation	Injuries/# FTEs in an Occupation	Is there one group of employees that has a higher (or lower) injury rate than others? (e.g. Phlebotomists, nurse techs, RNs, aides, housekeepers) How can we use this information to reduce injuries?
Departmental injury rate	Injuries/# employees in a department	Should prevention activities be focused on a particular department? Is there a particular department that is more prone to injuries and if so, why and what can we do about it?

To find out more

The Centers for Disease Control and Prevention (CDC) offers the “Workbook for Designing, Implementing and Evaluating a Sharps Injury Prevention Program”. This workbook is directed towards healthcare administrators, program managers and members of healthcare committees addressing sharps-related health and safety issues. The workbook is online at <http://www.cdc.gov/sharpssafety/>

An excellent textbook that presents the necessary epidemiologic methods in a clear and helpful style is: Maizlish NA. Workplace Health Surveillance: An Action-Oriented Approach. Oxford University Press, 2000.

The Safe Home Care and Hospitals Program is a research group within the University of Massachusetts Lowell, Department of Work Environment. Please send comments and questions to: SafeHomeCare@uml.edu. For more information, visit our website: www.uml.edu/SafeHC