Using Denominators to Calculate Percutaneous Injury Rates

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THE DATA THAT HEALTH CARE FACILITIES COLLECT IN SHARPS injury logs can be used to calculate needlestick rates and to make comparisons among different professional groups, device categories, and hospital settings. Rates consist of a numerator and a denominator; in the three methods of rate calculation that follow, the numerator always consists of the number of needlesticks that occurred in a specific time period. The denominator is either the number of occupied beds, the number of full-time equivalent (FTE) employees in a specific job category, or the number of devices in a given device category used in a given time period. The time period corresponding to the numerator and denominator should always be the same.

The rate that is simplest to calculate is the total number of needlestick injuries (NSI) reported during a specific time period (numerator) over the number of occupied hospital beds in an institution for the same time period (denominator). The average daily census of occupied hospital beds for the same year as the reported needlesticks is the relevant number to use in the denominator, since it corrects for unused hospital beds. A realistic example would be:

$$\frac{\text{350 NS per yr.}}{\text{800 occ'd beds per year}} \times 100 = \text{44 NSI per 100 occupied beds per yr.}$$

This gives a rough idea of the institutional needlestick experience, which can then be used to track NSI levels over time. If you are comparing your rates to other institutions, you should be aware that rates are affected by a number of factors, including the level of needlestick underreporting and the types of patients the hospital treats. A regional medical center is likely to treat a higher proportion of patients requiring intensive care than a community hospital, and may therefore have a higher needlestick rate per bed because more needles are used per patient.

Needlestick rates can also be calculated for different professional groups, such as nurses, physicians, laboratory technicians, and housekeepers. With this method, the numerator is the total number of needlesticks reported by the professional group during a given time period. The denominator is the total number of FTE employees for that professional group during the same time period. Using nurses as an example, the rate would be calculated this way:

$$\frac{\text{250 nurse-reported NSI in 1 yr.}}{\text{1,000 FTE nurses employed that yr.}} = \text{.25 NSI per FTE nurse per yr.}$$

A full-time equivalent means that if you have 50 part-time nurses, they count as 25 full-time equivalent nurses. This method gives a more accurate denominator than simply counting the number of nurses employed. For some occupational categories it may be difficult or simply impossible to calculate an accurate rate. For instance, in some hospitals, contract workers who provide services such as phlebotomy are technically not considered employees of the hospital. If those workers report their injuries to their contracting agency, the hospital may not have a record of all or any of their incidents. Furthermore, in many private hospitals physicians are not employed by the hospital they practice in, and their injuries might not show up in hospital records. For other groups such as medical residents, whose working hours may be extremely erratic, it may not be possible to obtain a reasonable full-time equivalent estimate for a denominator. When using this method of calculating rates, it is better to limit the calculations to occupational categories for which a reliable numerator and denominator can be obtained.

Finally, rates can be calculated for specific devices. Rates of needlesticks for specific types of needles are necessary when comparing needlestick risk from different devices and for evaluating the effectiveness of products designed to prevent needlesticks. To calculate device-based rates, a health care worker must accurately identify the type of needle involved when reporting his or her needlestick injury. The numerator consists of the number of needlesticks with a particular device during a specific period of time, and the denominator consists of the number of devices used during the same time period. A device-based needlestick rate, using syringes as an example, would be calculated in the following way:

$$\frac{\text{100 NSI from disposable syringes during given time period}}{\text{1 million disposable syringes used or purchased during same period}} \times 100{,}000 = \text{10 NSI per 100,000 syringes}$$

If a trial of a "safety syringe" were carried out, the above rate would be compared to:

$$\frac{\text{\# NSI from "safety syringes" during given period}}{\text{\# "safety syringes" used or purchased during same period}}$$

It may be difficult to find out exactly how many devices have been used in direct patient care. Usually, the number of devices purchased is the closest approximation that can be obtained, so the denominator for calculating device-based rates must be obtained from the purchasing department. For devices like I.V. catheters

Denominators (cont.)

that are used for one purpose, all devices purchased can be included in the denominator. Some devices, such as disposable syringes, are used for many purposes, not all of which are patient-related. If a large number of devices in a given device category are not used for patient care, such as syringes used by pharmacy for mixing drugs, then the devices not used for patient care should be excluded from the denominator when calculating the injury rate.

To determine which rate or rates you want to calculate, decide what questions you want to answer. Do you want to compare your hospital to other hospitals? Compare exposure risk among different professional groups in your facility? Compare injury risk for different devices? Also, the rates you can calculate depend upon the denominator data that are available to you.

Following these steps will help you to calculate meaningful rates and make optimum use of your facility's data. ❒

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