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EPINet™ Report:

DISPOSAL-RELATED Sharp-Object Injuries

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Introduction

For as long as the risk of percutaneous injuries among health care workers has been an issue of major concern, the safe disposal of used needles and sharp devices has been recognized as an important factor in minimizing injury risk. Official recommendations for the safe disposal of contaminated sharp devices were among the prevention measures promoted by the Centers for Disease Control (CDC) in 1983.¹ In addition to other measures, the 1983 document specified that sharp medical devices should be discarded in puncture-resistant disposal containers placed near the point of use. These guidelines became an enforceable national workplace standard in December 1991 when the Occupational Safety and Health Administration (OSHA) enacted the final Bloodborne Pathogen Standard.²

Although there is little documentation of the most common disposal systems and practices in effect in hospitals prior to the promotion of Universal Precautions guidelines, it is nevertheless apparent that

many changes and improvements have occurred, particularly since 1987 when OSHA first announced the preliminary Bloodborne Pathogen Standard. It is now common to find sharps disposal containers located in each patient room in clinical units, rather than at central locations such as nurses' stations. Flimsy disposal containers have for the most part been removed from the market, and manufacturers have recently developed disposal containers with enhanced features, including increased puncture resistance, one-way openings, and mechanisms to prevent overfilling. Because of the lack of standard data collection methods for occupational blood exposures before 1987, the impact of recent improvements has not been well documented.

EPINet data available for this analysis reflect only data that were collected from September 1992, after the implementation of OSHA mandated standards. Despite recent advances, it is clear that disposal-related injuries continue to occur in significant numbers and that many problems remain. This



Disposal-Related Injuries (cont.)

analysis is intended to describe the current characteristics of disposal-related percutaneous injuries in a network of hospitals, and to provide a baseline for assessing future progress in addressing specific disposal issues identified by this and other research.

Methods

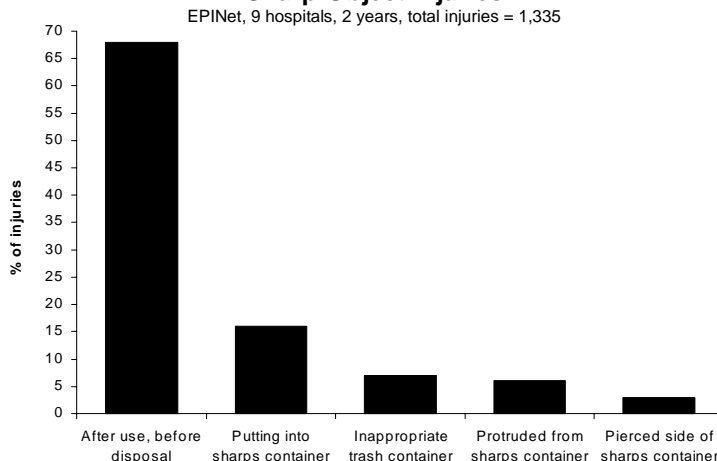
Nine hospitals participating in a data-sharing network provided two years of data to University of Virginia researchers on percutaneous injuries reported to each hospital's employee health department. Data collection began in September 1992; all data were collected in EPINet format. (See "What is EPINet" box, page 5.) The nine hospitals had a mean average daily census of 4,550, and reported a total of 3,666 percutaneous injuries during the two-year period. Participating hospitals are listed on page 11.

The descriptive categories regarding mechanism of injury that are provided on the durre. The following analyses refer only to disposal-related injuries using 1,335 (100%) cases as the denominator, unless otherwise stated.

Figure 1 shows mechanism of injury for 1,335 cases of disposal-related injuries. Of these, 910 (68.2%) occurred after use but before disposal, indicating a failure to properly dispose of a sharp item that was left on a table, bed, or floor, or an intervening situation which prevented safe disposal, such as fumbling with a sharp item on the way to the disposal container. This category also includes 20 cases (1.5%) that occurred from sharp items left on or near a disposal container. Because there were few such incidents and they were similar to cases in which devices were left in other inappropriate places, these 20 cases were included in the 910 injuries occurring after use but before disposal.

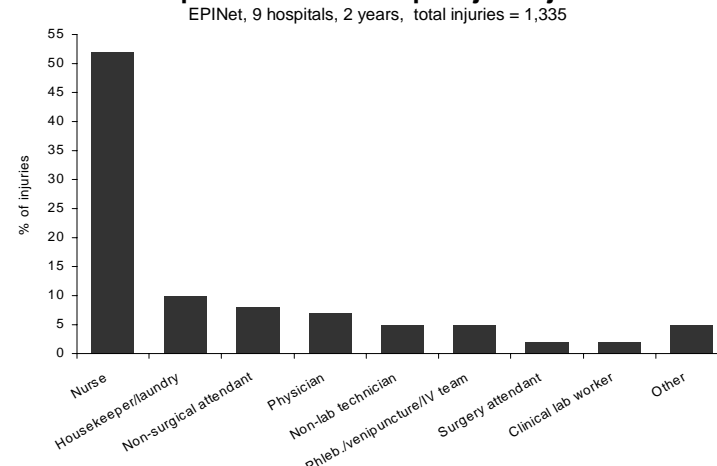
The remaining 425 (31.8%) injuries were directly related to the act of disposal or to a device that had al-

Figure 1. Mechanism of Disposal-Related Sharp-Object Injuries



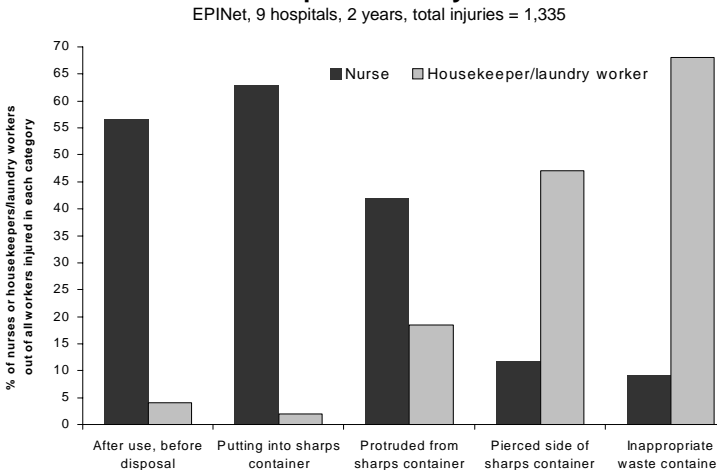
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Figure 2. Job Categories of Workers Reporting Disposal-Related Sharp-Object Injuries



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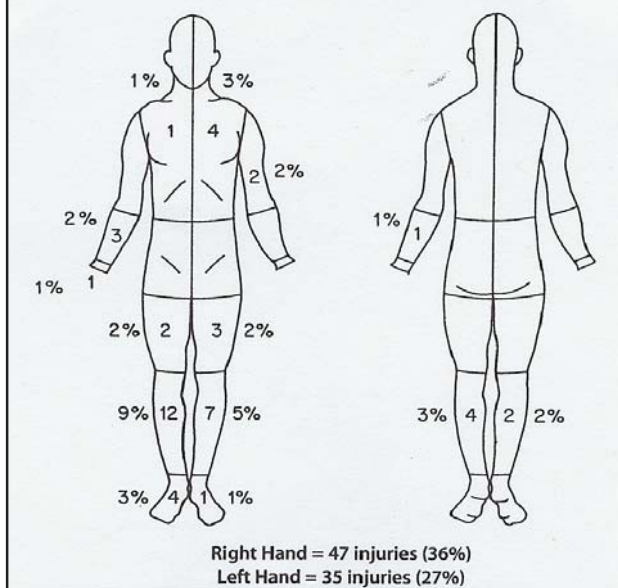
Figure 3. Comparison of Injury Mechanism for Nurses vs. Housekeepers/Laundry Workers



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Figure 4. Unusual Body Locations of Injuries from Needles in Inappropriate Trash Containers and Needles Piercing the Sides of Disposal Containers

9 hospitals • 2 years • 129 incidents



ready been disposed of. In 213 cases (16.0%) health care workers were stuck by a sharp device they were holding as they introduced it into a disposal container. In 97 cases (7.3%), workers were stuck by devices that were disposed of in inappropriate, non-puncture-resistant trash containers, such as patients' waste baskets. Many of these injuries occurred when needles pierced a plastic bag while trash was being removed from patients' rooms and other clinical areas. All of these injuries can be considered to be caused by inappropriate disposal practices of the original users of the sharp devices.

Eighty-one injuries (6.1%) occurred when workers were stuck by devices protruding from the openings of sharps disposal containers. These injuries can be attributed mainly to overfilled containers, and highlight the importance of an effective hospital policy on regular and frequent waste removal. Thirty-four injuries (2.5%) occurred when needles pierced the sides of sharp disposal containers, indicating that the containers were not adequately puncture-resistant. Twenty of the 34 injuries occurred in a hospital where a cluster outbreak of

needlesticks was attributed to one type of disposal container that was subsequently modified by the manufacturer to increase puncture resistance.

Figure 2 shows the job categories of workers sustaining disposal-related injuries. Nurses constituted the largest group with slightly more than 50% of cases. Housekeepers and laundry workers were the second largest group with 10.3% of cases. The remaining cases were broadly distributed across several job categories that each constituted fewer than 10% of cases.

Of interest was the comparison of mechanism of injury between the two top job categories, nurses versus housekeepers and laundry workers, as shown in **Figure 3**. This figure compares the percentage of all workers that were either nurses or housekeepers/laundry workers (mainly housekeepers) in each disposal categories. Injuries to nurses occurred primarily after use and before disposal of devices, and during the act of disposal. However, housekeepers' injuries usually occurred after devices were dis-

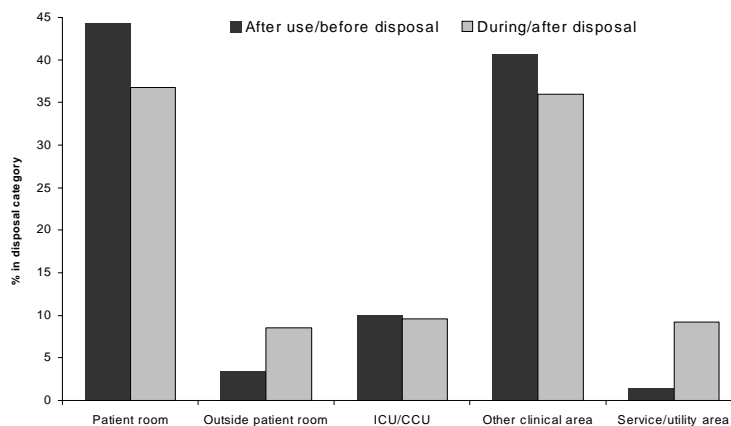
posed of. This comparison suggests that the actions of one group affects the risk of injury for other groups. For example, if disposal containers are not removed promptly by housekeepers when full, this increases the risk of other personnel being injured from devices protruding from openings of the containers. Conversely, if nurses (or other patient care personnel) dispose of sharp devices in patient waste baskets, this increases the risk of housekeepers being injured from needles sticking through plastic trash bags. However, injuries caused by needles piercing the sides of sharp containers indicate a design flaw in the containers—that is, inadequate puncture resistance.

Of interest was the body distribution of injuries that were caused by needles piercing containers and devices disposed of in inappropriate trash containers, as shown in **Figure 4**. An unusually high percentage of injuries were to locations other than hands (37%). Although injuries were widely distributed in different body locations, the highest number of non-hand injuries were from needles that pierced plastic trash bags and grazed the calves of housekeepers as they carried the bags at their sides.

Figure 5 shows the general locations where disposal-related in-

Figure 5. Location of Workers Reporting Disposal-Related Sharp-Object Injuries

EPINet, 9 hospitals, 2 years, total injuries = 1,335



Disposal-Related Injuries (cont.)

juries occurred. Injuries were separated into two categories: (a) injuries occurring after use and before disposal (68.2%), and (b) injuries occurring during or after disposal (31.8%). These two categories are presented separately for the purpose of comparison with previous studies that did not consider injuries which occurred after use and before disposal to be disposal-related. This figure shows the percentage distribution of each group across hospital locations. The majority of percutaneous injuries occur in areas where the sharp devices are used—in patient rooms, critical care units, and other clinical areas. A minority of disposal-related injuries occur outside clinical areas where sharps waste is transported and manipulated, such as corridors, elevators, and utility areas, and those injuries are more likely to happen during and especially after the act of disposal. Although service workers sustain most of the injuries that occur in utility areas, they nevertheless sustain more injuries in clinical areas (57.2%) than they do in utility and non-clinical areas (42.8%).

Figure 6 shows the percentage of cases in which the source patient identity was known in relation to different mechanisms of injury. Source patient identity was known in more than 80% of cases for injuries that occurred after use, before disposal, and during the act of disposal. But for injuries that occurred after disposal, when devices were already in a disposal container or other trash, source patient identity was known for only one-third or fewer cases. The consequence of this discrepancy is that housekeepers are disproportionately affected by the additional testing and uncertainty that occurs when source patient status cannot be verified.

Figure 7 shows the original purpose of devices causing disposal-

Figure 6. Cases in Which the Source Patient Identity Was Known

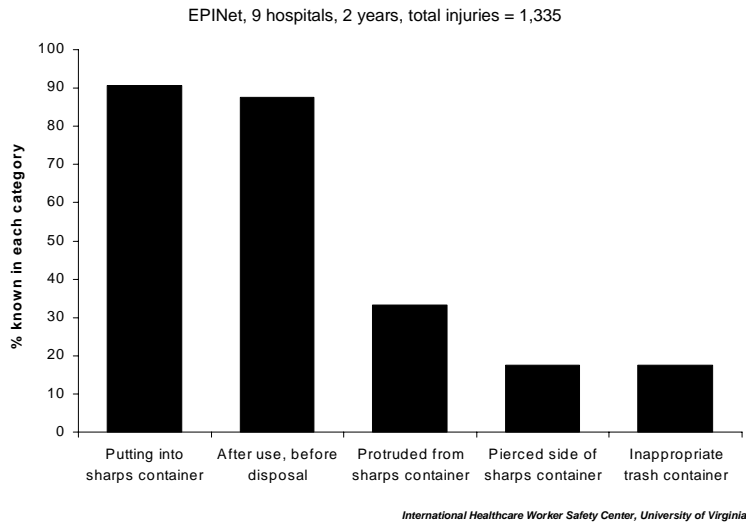


Figure 7. Original Purpose of Devices Causing Disposal-Related Sharp-Object Injuries

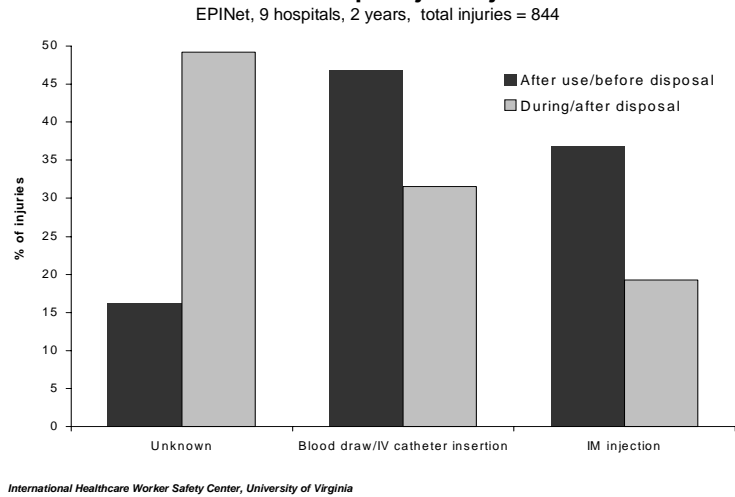
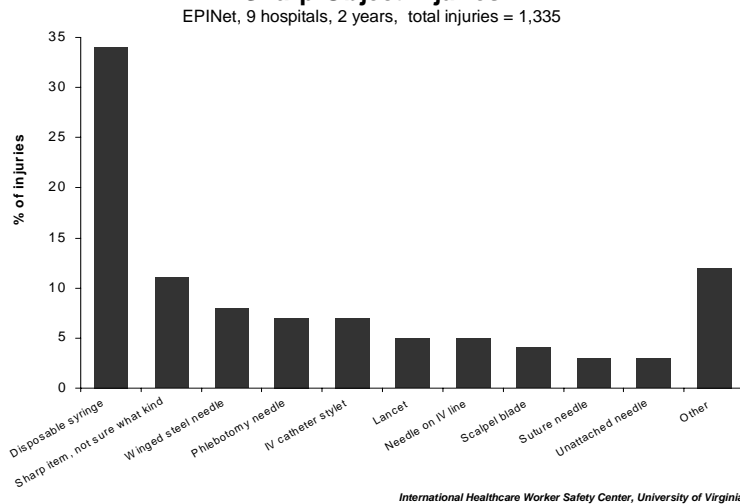


Figure 8. Devices Causing Disposal-Related Sharp-Object Injuries



related injuries for the three categories most commonly reported. The percentage distributions are presented separately for injuries occurring after use/before disposal, and for injuries occurring during/after disposal. This figure highlights the large proportion of disposal-related injuries that are of greatest concern for the transmission of bloodborne pathogens. Contaminated injuries from needles used for blood-drawing or intravenous catheter insertion carry the highest risk for bloodborne pathogen transmission. On the other hand, injuries from devices whose original purpose is unknown may or may not carry real risk, but by default are considered to be high-risk since transmission risk cannot be ruled out. Injuries from needles used for intramuscular injections seem to carry a lower risk of transmission of bloodborne pathogens than, for instance, blood-drawing needles, but they have not been proven to be risk-free and, therefore, the follow-up of these injuries does not differ from other injuries at present.

The devices associated with disposal-related injuries can be seen in **Figure 8**. The distribution of devices is similar to injuries that were not disposal-related. Very few devices—only 10.0%—could not be identified, despite the large number of instances in which the purpose of the device was unknown, as was seen in Figure 7.

Discussion

Although disposal-related percutaneous injuries constitute a significant proportion of all reported percutaneous injuries, a precise definition of disposal-related injuries is lacking. Injuries that occur while introducing a sharp device into a sharps container, and those that are caused by devices protruding from sharps or other trash containers, are clearly disposal-related. Other injuries, however, such as

those associated with recapping, may be directly affected by the disposal system in use. One of the reasons health care workers give for recapping needles is to protect themselves from an exposed needle on the way to a disposal container.³ When disposal containers are placed within arm's reach or a short distance from the point of use, the incentive to recap may decline. Therefore, one possible indicator of an improved disposal system that includes conveniently placed containers may be a reduction in injuries caused by recapping. There is indirect evidence consistent with this hypothesis. One study of needlestick injuries conducted in 1986 reported that 23% of injuries from hollow-bore needles were caused by recapping. The present study, using the same data collection definitions, showed that for the same hospital during 1992-1994 only 5.0% of injuries from hollow-bore needles were caused by recapping (6.8% for all 9 hospitals). Although it is not possible to determine to what degree these reductions were due to improved disposal systems implemented after 1986, as opposed to training and education to discourage recapping, they nevertheless suggest that changes in disposal systems influence the disposal practices of health care workers. Similarly, injuries occurring after use and before disposal of sharp devices, such as those from devices left on tables or in beds, may in part be due to the lack of convenient sharps disposal containers where the device was used. The availability and convenience of disposal containers in different areas of the hospital should continue to be evaluated and improved.

The continued need for a consistently communicated protocol for the handling and disposal of used sharps was emphasized by these data. Injuries that are caused by de-

vices disposed of in inappropriate trash containers or protruding from sharps containers are preventable by adherence to waste disposal recommendations. Hospitals must have an effective policy on monitoring sharps containers so that they will be consistently replaced before becoming full. Health care workers must be trained to understand the consequences to others if needles and sharp devices are placed in inappropriate trash containers.

Product design also plays an important role in the causation and prevention of disposal-related injuries. It is possible to eliminate all sharps injuries that occur when needles pierce the sides of disposal containers by requiring all sharps containers to have high puncture resistance; this is a readily achievable goal. Although disposal container design has greatly improved in recent years, those who make the product decisions for hospitals have no basis for determining the comparative puncture resistance of different containers. To date there is no standard test method for judging puncture resistance of containers and no industry-wide agreement on product labelling to indicate the level of puncture resistance of different disposal products. This remains an important need.

The design of sharp medical devices also has a bearing on the risk of sustaining disposal-related injuries. Devices that incorporate safety features that shield or blunt needles or blades after use will protect not only the user but the waste-handler as well. As devices with safety features become more widespread, the frequency of disposal-related injuries should decline. It is important, however, to note the differences in safety features of various devices. If a safety feature is automatic and does not require user activation, then the protective feature should prevent all disposal-related injuries

Disposal-Related Injuries (cont.)

from that device. If, however, a safety feature requires activation by the user, then activation rates should be monitored to determine whether the safety feature is providing the intended benefits for waste-handlers or if the devices are being disposed of before activating the safety feature.

Finally, disposal-related injuries impose a disproportionate burden of risk on housekeepers. Most of their injuries are associated with waste-handling. Because source patient identity cannot be established in a large percentage of disposal-related injuries, pathogen transmission must be considered a possibility in many instances when no risk exists. The psychological consequences and the lifestyle changes recommended until infection can be ruled out may have a major impact on the lives of the affected individuals. Continued efforts, including

training programs, monitoring of sharps disposal policies and practices, and further improvements in the safety engineering of disposal containers and medical devices, are all needed to better protect all health care workers, but especially those at the receiving end of the medical device waste stream. □

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