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Comparison of EPINet data for 1993 and 2001 shows

Marked Decline in Needlestick Injury Rates

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FOR MORE THAN A DECADE THE UNITED STATES has been the leader in the development, testing and implementation of safety-engineered sharp medical devices. The new devices became widely available in the U.S. in the early 1990s, and their acceptance and implementation in the workplace has been gradual but steady. The Needlestick Safety and Prevention Act of 2000, which became fully enforceable in July 2001, turned a trend into a requirement and made the use of safety devices mandatory. The benefits of the new technology have been documented in numerous ways, including clinical trials and demonstration projects comparing conventional needles to their safety counterparts, and in reports from specific institutions showing downward trends in percutaneous injury rates following the adoption of a variety of safety-engineered devices. These focused reports have been encouraging, but there has been a lack of documentation showing an across-the-board impact of both the new technology and the Needlestick Safety Act in a multihospital sharps injury surveillance network. In this report we present data from the EPINet Multihospital Sharps Injury database, coordinated by the International Healthcare Worker Safety Center at the University of Virginia, which documents the impact on needlestick injury rates associated with the widespread adoption of safety devices.

The interpretation of needlestick data from healthcare facilities is complicated by a variety of factors. Many different healthcare worker occupational groups are represented in the data, and some groups report their injuries more reliably than others. The reporting patterns for specific worker groups may change over time, and an increase in reporting rates for certain groups may mask a decline in the overall injury rates in an institution or network. Further, the devices causing sharps injuries are numerous. While there has been a widespread conversion to safety in some device categories, such as phlebotomy needles and intravenous catheters, in others, such as laboratory equipment and surgical instruments, relatively small numbers of safety devices are in use. Reductions in overall injury rates will be diluted by device categories in which safety-engineered alternatives have not been widely adopted. One example is sharp-tip suture needles, where the safety alternative, blunt-tipped suture needles, has yet to be accepted by most surgeons.

Another factor affecting before-and-after comparisons of needlestick data within a long-term multihospital surveil-

Decline in Injury Rates

lance network is the number of teaching hospitals relative to the number of community hospitals in the two years being compared. Since teaching hospitals have higher rates of reported percutaneous injuries than community hospitals, a change in the balance of teaching/nonteaching facilities in the two time periods introduces a confounding factor that could mask true changes in rates.

All of these complicating factors make it difficult to attribute observed changes in percutaneous injury (PI) rates within a multihospital network to a specific cause, and also may preclude real changes from being observed.

In order to document the impact of safety-engineered sharp devices on PI rates for hospital workers, we compared rates from 1993 and 2001 in a network of participating EPINet hospitals. We selected 1993 because it was the first year for which EPINet data were available, and 2001 because it is the most recent complete year of EPINet data. In order to avoid the confounding factors described above, we specified several parameters for the data used in this report.

First, we used only data from teaching hospitals, to avoid the problem of changing ratios of teaching and nonteaching hospitals in the two time periods. Second, we selected data for nurses only: historically, they are the professional group with the largest proportion of PIs (44% of all cases in the 2001 EPINet data), and their reporting patterns have remained relatively stable over time. Third, we compared PI rates for conventional and safety devices separately, so that the relative effects of conventional versus safety device usage could be distinguished. Also, the different device categories were compared separately so that reductions in categories where there has been a high penetration of safety devices (such as intravenous catheters) would not be obscured by other categories in which there has been a low penetration of safety devices (such as suture needles).

We expressed PI rates as the number of injuries per 100 occupied hospital beds (# PIs/100 occupied beds). To obtain a denominator, we added together the annual average daily census (i.e., the average number of occupied beds per day) for all the hospitals in each of the comparison groups. For 1993, the cumulative average daily census (ADC) for the 18 teaching hospitals reporting data that year was 7,000; in 2001, the ADC for the 11 teaching hospitals reporting data was 4,174. There are other relevant denominators that could be used, such as the number of full-time equivalent nurses employed in each group; these may be considered in subsequent reports.

Percutaneous Injury Rates for Conventional Devices

Disposable syringes caused the largest proportion of PIs to nurses in both the 1993 and 2001 EPINet data for conventional devices (38% and 40%, respectively). However, in 1993 the PI rate for conventional disposable syringes was 6.8/100 occupied beds; in 2001, the rate declined by 59% to 2.8/100 occupied beds (Figure 1).

Percutaneous injuries from needles on IV lines were eliminated, with 1.78/100 occupied beds in 1993 and no injuries in 2001. This dramatic decline may in part reflect the impact of the 1992 U.S. Food and Drug Administration safety alert advising against use of needles on IV lines, and the widespread implementation of needleless and recessed needle IV systems that followed the alert.

Substantial declines in PI rates for nearly all the conventional needles that commonly injure nurses are seen in Figure 1. PIs from intravenous (IV) catheters decreased by 55%; PIs from phlebotomy needles decreased by 70%; PIs from prefilled syringes decreased by 62%; and PIs from winged steel needles decreased by 55%. PIs from lancets dropped by 87%. Only one device category, suture needles, did not show a similar marked decline; it decreased by only 5%.

Location-related rates

In both the 1993 and the 2001 data, PIs to nurses from conventional devices

Figure 1. Comparison of 1993 and 2001 Percutaneous Injury Rates for Nurses, By Device (Conventional Only)

U.S. EPINet Multihospital Surveillance Network

1993: 18 teaching hospitals; cumulative average daily census = 7,000; total injuries = 1,366
2001: 11 teaching hospitals; cumulative average daily census = 4,174; total injuries = 401

Conventional device:	1993 rate*	2001 rate*	% decline
Disposable syringes	6.80	2.80	59%
Needles on IV lines	1.78	0	100%
IV catheters	1.38	0.62	55%
Prefilled syringes	1.30	0.50	62%
Phlebotomy needles	0.77	0.23	70%
Winged steel needles	0.73	0.33	55%
Lancets	0.70	0.09	87%
Suture needles	0.84	0.80	5%

*per 100 occupied beds per year

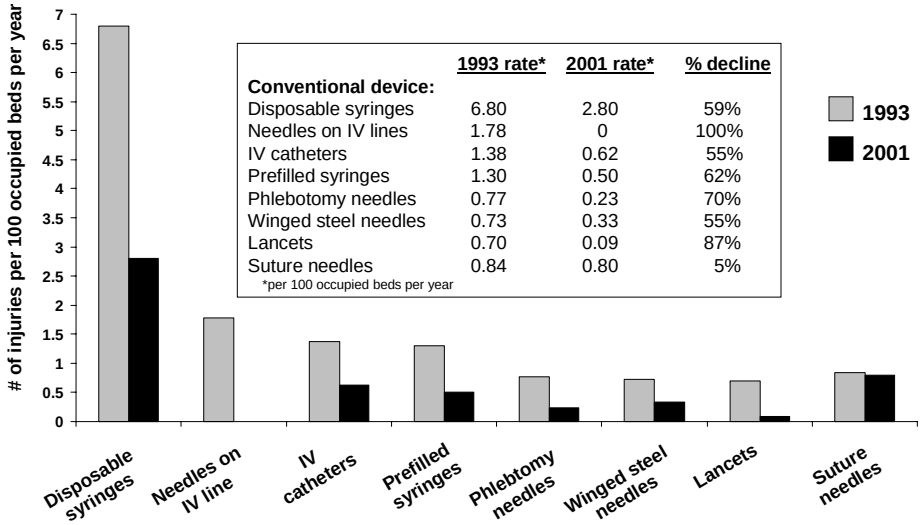

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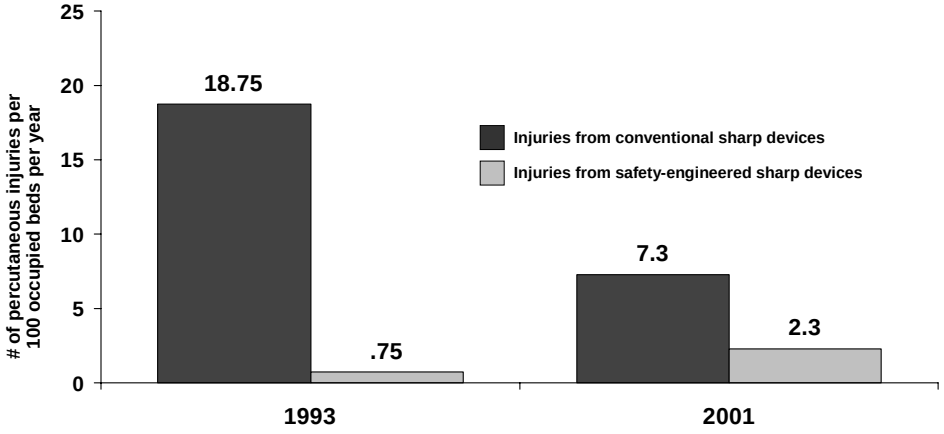
Figure 2. Comparison of Percutaneous Injury Rates for Nurses, 1993 and 2001

U.S. EPINet Multihospital Surveillance Network

1993: 18 teaching hospitals; cumulative average daily census = 7,000; total injuries = 1,366
2001: 11 teaching hospitals; cumulative average daily census = 4,174; total injuries = 401



Percutaneous injury (PI) rates for nurses, based on data for conventional and safety devices combined, declined from 19.50 per 100 occupied beds in 1993 to 9.6 per 100 occupied beds in 2001 (50.76% decrease).

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most frequently occurred in patient rooms, followed by operating rooms (OR), intensive/critical care units (ICU/CCU) and emergency departments (ED). Again, significant decreases in PI rates for each of these settings were seen: 65% for patient rooms; 50% for ORs; 79% for ICU/CCU; and 54% for EDs. However, there was a 58% *increase* in the rate of PIs in labor and delivery settings.

Procedure-related rates

Percutaneous injuries to nurses from conventional devices most frequently occur while giving injections (intramuscular or subcutaneous); injection-related PIs decreased by 39%. Other procedure-related PI rates dropped as well: for drawing venous blood, a 50% decrease; for starting IVs, a 59% decrease; for heparin or saline flushes, a 96% decrease. The PI rate for suturing remained the same (1/100 occupied beds).

Rates for when injuries occurred

In both the 1993 and 2001 data, PIs to nurses from conventional devices most frequently occurred during use or between steps of a multi-step procedure (32% in 1993 for both categories combined, and 31% in 2001). Rates in these combined categories decreased by 61% from 1993 to 2001. Rates for injuries occurring after use but before disposal decreased by 72%; for injuries occurring while withdrawing a needle from a resistant substance such as a rubber stopper, by 60%; from recapping, by 47%; and while disassembling a device, by 79%. The rate for injuries occurring while putting a device in a disposal container decreased by 47%, and for injuries from sharps protruding from disposal containers, by 17%. A category that was added after 1993—injury from a "device left on floor, table, bed or other inappropriate place"—had a 2001 rate of .55/100 occupied beds. Such data indicate a need for continued attention to disposal safety.

Injuries from Safety Devices

In 1993, when nurses were asked whether the device causing injury was a safety design, 4% answered yes and 96% answered no. In 2001, 25% answered yes, 72% said no, and 3% responded "unknown." These data reflect the sharp increase in adoption of safety devices over the last 10 years. When we consider PI data for safety-engineered sharp devices, it is important to keep in mind that safety devices that have a needle attached (in contrast to needleless devices) will still cause a residual fraction of sharps injuries. These are PIs that may be more difficult to eliminate, such as those that occur during use, when the sharp is, by necessity, exposed. Also, PIs from safety devices can occur *after* use if the protective feature is not activated.

As the number of safety-engineered sharp devices in the healthcare workplace increases, we can expect a rise in the number of PIs associated with them. The EPINet data for nurses from 1993 and 2001 reflect this reality: in 1993, the PI rate for all safety devices was .75/100 occupied beds; in 2001, it was 2.3/100 occupied beds (Figure 2). By contrast, the PI rate for all conventional devices declined from 18.75/100 occupied beds in 1993 to 7.3/100 occupied beds in 2001.

Conclusion

The most important finding from this comparison of 1993 and 2001 percutaneous injury rates for nurses is that **the overall rate (including injuries from both conventional and safety devices) declined from 19.5 PIs per 100 occupied beds in 1993 to 9.6 PIs per 100 occupied beds in 2001—a decrease of 51%.** The decline in PI rates from conventional devices—reflecting the decline in conventional device usage overall—far outweighs the increase in PI rates for safety devices that has accompanied their widespread implementation in healthcare facilities. Such data support the benefit of the new technology in reducing percutaneous injury risk to nurses, and most likely to other healthcare workers—benefits that will continue to increase as compliance with the Needlestick Safety and Prevention Act comes closer to 100%. ❐