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United States General Accounting Office
Washington, DC 20548

November 17, 2000

The Honorable Pete Stark
House of Representatives

Subject: Occupational Safety: Selected Cost and Benefit Implications of Needlestick Prevention Devices for Hospitals

Dear Mr. Stark:

This letter responds to your request for an examination of the potential benefits and costs of changes that would be mandated under the proposed Health Care Worker Needlestick Prevention Act (HR 1899), which would require the use of needles with safety features.[1] Percutaneous injuries caused by needlesticks (puncturing of the skin by a needle or similar sharp object) are a serious concern for the approximately 10 million health care workers in the United States. These injuries pose a significant risk of occupational transmission of bloodborne pathogens such as human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV) to health care workers. In addition, the emotional distress of a needlestick injury can be severe and long lasting, even when a serious disease is not transmitted. According to the Centers for Disease Control and Prevention (CDC), approximately 384,000 percutaneous injuries occur annually in U.S. hospitals, with about 236,000 of these resulting from needlesticks involving hollow-bore needles. Although the proposed legislation applies to health care workers in all settings, we focus only on hospital settings, as there are no reliable data on percutaneous injuries sustained in other settings.[2] It should be noted, however, that more than one-half of all health care workers are in nonhospital settings.

This letter presents the number of needlestick injuries potentially prevented by the use of needles with safety features and the estimated ranges of the benefits and costs of using such needles in hospitals. Our analysis is based on data provided by CDC, the International Healthcare Worker Safety Center, the

[1]Subsequent to the introduction of HR 1899, a similar bill, HR 5178, was introduced and enacted into law. On Nov. 6, 2000, the President signed the Needlestick Safety and Prevention Act (P.L. 106-430), which mandates changes in the bloodborne pathogens standard in effect under the Occupational Safety and Health Act of 1970. The Act requires employers to document the consideration and implementation of safer medical devices, including safe needle devices, in their facilities.

[2]CDC's National Institute of Occupational Safety and Health (NIOSH) is beginning a study to determine the incidence of nonhospital percutaneous injuries.

American Hospital Association, the states of California and Maryland, the Becton-Dickinson Corporation, articles published in peer-reviewed medical journals, and other sources dated between 1995 and 1999. A detailed discussion of our methods, results, and the potential limitations of our analysis is provided in enclosure I. We conducted our analysis in August and September 2000 in accordance with generally accepted government auditing standards.

In summary, we estimate that about 69,000 needlesticks in hospitals can be prevented in 1 year through the use of needles with safety features. However, the use of needles with safety features alone is insufficient to prevent the majority of needlestick injuries. Our analysis indicates that the use of needles with safety features may have financial benefits that exceed the cost of these features because they can reduce needlesticks and associated treatment costs for hospitals. The extent to which needles with safety features are cost effective depends on their incremental costs, the extent to which they reduce the risk of a needlestick injury, and the costs of postexposure treatment of health care workers. Even though these factors and their potential costs and benefits cannot be measured precisely, eliminating 69,000 needlesticks could reduce the number of health care workers who become infected with HBV, HCV, or HIV after sustaining a needlestick injury. Our analysis of CDC data shows that reducing needlesticks by this amount may prevent at least 25 cases of HBV infection and at least 16 cases of HCV infection per year. The reduction in the number of HIV infections cannot be validly estimated. In commenting on a draft of this letter, CDC stated that it provides an objective presentation of the information.

BACKGROUND

Risk of exposure to bloodborne pathogens has always been a problem for health care workers, but the emergence of acquired immunodeficiency syndrome (AIDS) in 1981 brought the issue to the forefront of public health policy. Percutaneous injuries, which include needlestick injuries, expose health care workers to deadly bloodborne pathogens, including HIV. At least 17 states have enacted safe needle laws.[3] These laws usually either instruct health departments to require hospitals to use needles with safety features or commission studies to evaluate the feasibility of such features. It has been within the past 2 years that states began enacting safe needle laws, beginning with California in September 1998.

The Nature and Magnitude of the Needlestick Injury Issue

The total number of needlestick injuries sustained annually in the United States is unknown, and the lack of data from nonhospital settings appears to be the

[3]The following states have enacted safe needle laws: Alaska, California, Connecticut, Georgia, Iowa, Maine, Maryland, Massachusetts, Minnesota, New Hampshire, New Jersey, New York, Ohio, Oklahoma, Tennessee, Texas, and West Virginia. In addition, Hawaii adopted a resolution supporting the implementation of safer medical devices.

greatest obstacle in deriving a national injury estimate.[4] Our analysis focuses on health care workers in hospital settings, who account for approximately 40 percent of health care workers. According to CDC survey data, approximately 384,000 percutaneous injuries occur annually in hospitals,[5] with about 61 percent (236,000) resulting from hollow-bore needlestick injuries. CDC adjusted their estimate of the number of percutaneous injuries for underreporting[6] and other factors. However, these estimates exclude the unknown number of needlestick injuries to health care workers in nonhospital settings, where about 60 percent of health care workers are employed.

According to CDC survey data, most needlestick injuries occur after the device has been used—and therefore exposed to potentially contaminated blood—but before its disposal. Fifty percent of injuries occur between the time the procedure is completed and disposal of the device; 20 percent are associated with disposal of the device. Other injuries occur when the needle pierces the syringe cap as the syringe is recapped after use, when a body fluid is transferred from a syringe to a specimen container, and when used needles are not disposed of in puncture-resistant containers. Devices requiring disassembly (for example, prefilled cartridge injection syringes that need to be detached from needles) are associated with higher rates of injury.

However, many injuries to health care workers occur during use of a needle in a patient, when the needle is inserted, manipulated, or withdrawn. Sudden patient movement can also jar the needle loose and cause injury to a worker. Among hospitals participating in CDC's survey, 26 percent of needlesticks occur at this time. For the most part, these are not preventable with current safer technology.

Risks Faced by Health Care Workers

Needlestick injuries are a significant risk for health care workers because these injuries expose workers to diseases caused by bloodborne pathogens. The

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[4]Nonhospital facilities include nursing homes, physician and dental offices, medical and dental laboratories, and residential care, hospice care, home health care, and outpatient facilities. Other employees at risk include personnel from funeral homes, schools, correctional facilities, and waste removal, law enforcement, and fire and rescue services.

[5]CDC based this estimate on data from 15 hospitals participating in its National Surveillance System for Health Care Workers (NaSH) and on data from 45 hospitals participating in the Exposure Prevention Information Network (EPINet) of the International Health Care Worker Safety Center. The 95 percent confidence interval for this estimate is 311,000 to 464,000 percutaneous injuries per year in U.S. hospitals.

[6]Rates of underreporting are difficult to ascertain. Hindrances to reporting injuries include the perception that a low risk of infection is associated with certain types of injuries, or patients, or both; lack of knowledge of the appropriate procedures to follow after injury has incurred; fear of punitive employer response; and time constraints.

primary diseases of concern in current occupational settings are AIDS (from HIV), hepatitis B (from HBV), and hepatitis C (from HCV).[7]

HIV attacks part of the body's immune system, and most health care workers who become infected with HIV are likely to develop AIDS, which is characterized by severe infections, other complications, and death. As of December 1999, CDC had received reports of 56 documented and 136 possible cases of occupationally acquired HIV infection in the United States.[8] Twenty-five of the 56 documented cases of HIV infection have progressed to AIDS. The average transmission rate of HIV infection following a needlestick injury from an infected patient is 0.3 percent. No vaccine currently exists to prevent HIV infection, and there is no cure.

About one-third to one-half of those with acute HBV infection develop symptoms of hepatitis such as jaundice, fever, nausea, and abdominal pain. Most acute infections resolve, but 5 to 10 percent of patients develop chronic infection and become carriers of the disease. Chronic carriers of the infection have an estimated 20-percent lifetime risk of dying from cirrhosis and a 6-percent risk of dying from liver cancer. The average transmission rate of HBV infection following a needlestick injury from an infected patient is estimated to range from 6 to 30 percent. Hepatitis B vaccines have been available since 1982. Currently, the genetically engineered hepatitis B vaccine is recommended for all health care personnel who are occupationally exposed to blood and has a 96-percent vaccine efficacy rate. According to CDC, about 71 percent of workers who are at risk for occupational exposure to blood had been vaccinated by 1995. The Department of Health and Human Services (HHS) has established a goal of increasing hepatitis B vaccine coverage within this group to 98 percent by 2010.

HCV infection often occurs initially with only mild symptoms or none at all. However, approximately 75 to 85 percent of persons with HCV infection subsequently develop chronic infection, and 70 percent develop active liver disease. Of the patients with active liver disease, 10 to 20 percent develop cirrhosis, and 1 to 5 percent develop liver cancer. The average transmission rate of HCV following a needlestick injury from an infected person is 1.8 percent. Currently, no vaccine is available to prevent HCV infection.

Postexposure treatment is recommended for health care workers following a needlestick exposure from an HIV-infected patient or an HBV-infected patient. Many drugs used for HIV postexposure treatment are expensive and have unpleasant side effects. There are no medications for postexposure treatment for health care workers following a needlestick exposure to an HCV-infected patient.

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[7]Other diseases from bloodborne pathogens include HTLV-I-associated myelopathy (from the human T-lymphotrophic virus Type I [HTLV-I]), syphilis, malaria, dengue, babesiosis, brucellosis, leptospirosis, Creutzfeldt-Jakob disease, arboviral infections, relapsing fever, viral hemorrhagic fever, and Colorado tick fever.

[8]Documented cases include those health care workers who were HIV negative before the injury and were HIV positive after the injury. Possible cases include health care workers who acquired the infection without a documented occupational exposure and without identifiable behavioral or transfusion risks.

Even when a serious disease is not transmitted, the emotional distress of a needlestick injury can be severe and long lasting, often requiring counseling. This is especially true if the injury involves exposure to HIV. Not knowing the infection status of the source patient can also create distress. Emotional distress from needlestick injuries may also extend to colleagues and family members.

Safer Medical Devices Technology

Hospitals and other facilities can use many types of safer medical devices to reduce the number of percutaneous injuries. Examples of needles with safety features include protected needle intraveneous (IV) connectors; needles that retract into a syringe or vacuum tube holder; hinged or sliding shields attached to phlebotomy needles (needles for drawing blood), winged-steel needles, and blood gas needles; protective encasements to receive an IV stylet as it is withdrawn from the catheter; sliding needle shields attached to disposable syringes and vacuum tube holders; self-blunting phlebotomy and winged-steel needles; and safer IV catheters that encase the needle after use.

According to OSHA, facilities using needles with safety features are reducing the number of needlestick and other types of percutaneous injuries.[9] Training and education are necessary for health care workers to learn how and when to use these safer medical devices properly. Other changes in work practices such as not allowing disposal containers to overfill can also reduce the risk of needlestick injury.

These devices have limitations. Many new devices have been developed to reduce the risk of needlestick injuries, but those that have been assessed vary considerably in their clinical efficacy and in their effectiveness in reducing rates of injuries. Also, needles with safety features may not be available or may not be a practical alternative to conventional devices in certain situations.[10] In some cases, these devices have caused needlesticks while in use. Besides these limitations, there are obstacles to the use of needles with safety features, which include their increased purchase price compared with conventional devices, possible staff resistance to changes in the devices used, and the time required to train staff in the use of new devices.

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[9]On Sept. 9, 1998, OSHA published a Request for Information in the *Federal Register*. This request asked for information on engineering and controls used to eliminate or minimize the risk of occupational exposure to bloodborne pathogens due to percutaneous injuries from contaminated needles and other sharp instruments. OSHA received 396 responses from nursing homes, clinics, and acute care, tertiary care, rehabilitation, and pediatric hospitals. See Occupational Safety and Health Administration, "Record Summary of the Request for Information on Occupational Exposure to Bloodborne Pathogens Due to Percutaneous Injury" (Washington, D.C.: Occupational Safety and Health Administration, May 1999) http://www.osha-slc.gov/html/ndlreport052099.html (downloaded Sept. 5, 2000).

[10]Respondents to OSHA's Request for Information indicated that this is true in dentistry and pediatric applications. Currently, safer needles are only available in limited sizes.

In addition to these obstacles, some needles with safety features have been reported to affect patients adversely. Adverse effects reported in response to OSHA's Request for Information include additional venipunctures with some blood draw devices and safety catheters, increased pain, and hematomas. However, the majority of respondents indicated that delivery of patient care has not been affected by the use of needles with safety features.

CDC recommends that use of needles with safety features be combined with comprehensive programs that include reducing the unnecessary use of needles, modifying procedures and work practices, training health care workers in safer work practices involving the use of needles, promoting safety awareness in the work environment, and evaluating the effectiveness of these measures.

BENEFITS OF NEEDLES WITH SAFETY FEATURES EXCEED THEIR COSTS IN SOME CIRCUMSTANCES

Adoption of needles with safety features would prevent about 69,000 needlesticks each year. Many HBV, HCV, and HIV infections would be prevented as well. Needles with safety features are currently more expensive than conventional needles. However, our analysis of available data on the costs and preventability of needlestick injuries shows that the adoption of needles with safety features may be justifiable based solely on decreased initial treatment costs. The greatest dollar savings resulting from a needlestick reduction program would be the reduced cost of treating health care workers who have sustained needlesticks. Other costs also would be reduced, but these cost reductions are difficult to quantify as they are highly dependent on specific situations. These costs include medical treatment costs for health care workers who become infected after sustaining a needlestick; wages and time lost by these workers; emotional distress suffered by injured workers, their colleagues, and family members; reduced quality of life; and while rare, lives lost. Needles with safety features may also reduce liability and worker's compensation costs to hospitals when health care workers acquire diseases after a needlestick injury. These exact cost reductions cannot be determined from the available data, and we have not included them in our analysis.

Reduction of Needlestick Injuries in Hospital Settings

Using needles with safety features could prevent a sizable number of needlestick injuries in hospitals. According to our analysis, about 69,000 of these injuries are preventable by the use of needles with safety features (see table 1). Additionally, 109,000 needlesticks are preventable by eliminating the unnecessary use of needles[11] and by using safer work practices. The 69,000 needlestick injuries represent about two-fifths of the estimated 177,000 preventable needlesticks reported by hospitals participating in the National Surveillance System for Health

[11]Unnecessary use of needles is partially dependent on available technology. In particular, improved technologies that eliminate the use of needles as connectors in IV lines have proven useful.

Care Workers (NaSH),[12] which is managed by CDC's Hospital Infections Program. Hospitals use this system to report percutaneous injuries, health care worker exposure to blood and other body fluids, and other information related to preventing occupational exposures and infections among health care workers. Participation in CDC's NaSH system is voluntary, and the number of preventable needlesticks and means of preventing them in these hospitals may not be representative of all hospitals in the United States. The approximately 60 hospitals that currently volunteer to participate in NaSH tend to be large and are concentrated in the northeastern United States.

Table 1: Projection of the Percentage and Number of Preventable Needlesticks in Hospitals in 1 Year

	Percentage[a]	Number[b]
Projected number of annual needlesticks		236,000
Not currently preventable needlesticks[c]	25	59,000
Preventable needlesticks	75	177,000
Preventable by eliminating unnecessary use	25	58,000
Preventable by using needles with safety features	29	69,000
Preventable by using safer work practices	21	51,000

[a]Percentage is based on the number of annual needlesticks.

[b]Totals may not add due to rounding.

[c]Needlesticks that are not currently preventable often occur while the needle is in use in the patient.

Source: GAO projection of CDC NaSH data.

For our analysis, we assumed that the percentage of preventable needlesticks and the means of their prevention as shown in the NaSH data were reasonable models for all hospitals in the United States, regardless of their size or location. The NaSH estimates appear to be consistent with other published reports that show actual reductions in the percentage of needlestick injuries sustained in hospitals after needles with safety features were adopted.[13] These estimates are general in nature.

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[12]The percentage of preventable needlesticks varied in the 31 hospitals participating in NaSH (the preventability within specific hospitals ranged from 48 to 85 percent). The percentage of needlesticks preventable by method also varied. See S. Campbell, L. Chiarello, P. Srivastava, D. Cardo, and The NaSH Surveillance Group, "Preventability of Needlestick Injuries to Health Care Workers in the National Surveillance System for Healthcare Workers," *Abstracts--4th Decennial International Conference on Nosocomial & Healthcare-Associated Infections* (Atlanta, Ga.: Centers for Disease Control and Prevention, July 2000), http://www.cdc.gov/ncidod/hip/NASH/4thabstracts.htm - 7 (downloaded Sept. 5, 2000).

[13]See Centers for Disease Control and Prevention, "Evaluation of Safety Devices for Preventing Percutaneous Injuries Among Health-Care Workers During Phlebotomy Procedures—Minneapolis-St. Paul, New York City, and San Francisco, 1993-1995," *Morbidity and Mortality Weekly Report*, Vol. 46, No. 2 (1997), pp. 21-25; and F. Roudot-Thorval, O. Montagne, A. Schaeffer, et al., "Cost and Benefits of Measures to Prevent Needlestick Injuries in a University Hospital," *Infection Control and Hospital Epidemiology*, Vol. 20, No. 9 (1999), pp. 614-17.

The magnitude and methods for preventing needlesticks may not precisely match these estimates in every hospital.

Reducing the number of needlestick injuries may also reduce the number of health care workers who become infected with HBV and HCV. The specific number of infections avoided is difficult to determine, as the risk depends on the type of virus and the nature of the exposure. The number of HIV infections that would be avoided cannot be validly estimated. Projections for the approximate number of HBV and HCV infections avoided, based on NaSH data, are shown in table 2. According to CDC, the prevalence of these viruses may be higher for patients in hospitals than in the general population. This would increase the risk of infection for health care workers, as the percentage of infected persons they may be exposed to may be greater than the percentage of infected persons in the general population. Therefore, these projected reductions in infections may be underestimates.

Table 2: Projection of the Number of HBV and HCV Infections Avoided From Needlesticks in Hospitals in 1 Year

Method of prevention	HBV Infections	HCV Infections
Infections avoided by eliminating unnecessary use of needles	21	14
Infections avoided by using needles with safety features	25	16
Infections avoided by using safer work practices	19	12

Source: GAO projection of CDC NaSH data.

While our analysis is focused on reducing needlesticks through the use of safety features, we also found that using safer work practices could prevent about 51,000 needlesticks. Safer work practices include such measures as not recapping needles unless no alternative exists; properly disposing of used needles in puncture-resistant sharps containers; and consolidating specimen collection from patients. We did not find any valid estimates of the costs of using safer work practices, so we have not estimated the potential costs and benefits of adopting them. However, as with the adoption of needles with safety features, the benefits of adopting safer work practices are likely to be significant due to the savings resulting from decreased postexposure treatment costs.

Costs of Needles with Safety Features and Number of Needles Used

The increased purchase costs of using needles with safety features in hospitals would be between $70 million and $352 million per year. These do not include the costs associated with training or changing work practices; however, eliminating the unnecessary use of needles would also produce savings. The exact cost of adopting needles with safety features is difficult to determine. Needles with safety

features generally cost more than those without, but the cost varies with the type of feature, the number of times the feature is used, the cost of training workers in its correct use, and other factors. For example, data reported to OSHA as part of its Request for Information indicated that the added cost of a needle with a safety feature ranges from $.07 to $.15 for a syringe/needle combination, from $.15 to $.30 for a blood collection needle or set, and to about $.70 for an intravenous catheter. Other OSHA respondents reported that a hypodermic syringe/needle without a safety feature would cost $.05, whereas a similar syringe/needle with safety features would cost about $.25. For the purposes of our analysis, we estimated costs at three possible levels, assuming that the cost of a needle with a safety feature would be 1.5, 2.0, or 3.5 times the cost of a similar needle without a safety feature. These cost estimates fall within the general range of other published cost estimates.

The number of hollow-bore needles used in hospitals is difficult to determine. Our estimate is based on data for a hospital with 250 to 300 beds. The devices included in this projection are the ones most commonly used to penetrate tissues or to enter arteries or veins. Table 3 shows our estimate of the number of needles by type per hospital bed.

Table 3: Estimate of the Number of Needles Used in Hospitals Per Year

Needle type	Number used per hospital bed	Number used per year
Vacuum tube blood collection	217	217,000,000
Winged-steel needle	56	56,000,000
IV catheter	111	111,000,000
Hypodermic syringe/needle	367	367,000,000

Source: GAO estimate based on data from OSHA, the International Healthcare Worker Safety Center, and other sources.

Costs for Treatment of Health Care Workers Injured by Needlesticks

Costs of initial postexposure treatment vary widely and depend on the situations faced by injured workers. Published estimates run from $500 to $3,000 per injury sustained. Depending upon the situation, an injured worker may need treatment for exposure to HIV, HBV, or other bloodborne pathogens. In addition, the patient involved may need to be tested for diseases. For the purposes of our analysis, we assumed postexposure treatment costs of $500, $1,500, and $2,500. These cost estimates fall within the general range of other published cost estimates.[14] We estimate that eliminating 69,000 needlesticks per year would reduce postexposure treatment costs for injured health care workers in hospitals by between $37 million and $173 million per year.

[14]Occupational Safety and Health Administration, "Record Summary of the Request for Information on Occupational Exposure to Bloodborne Pathogens Due To Percutaneous Injury" (Washington, D.C.: Occupational Safety and Health Administration, May 1999), http://www.osha-slc.gov/html/ndlreport052099.html (downloaded Sept. 5, 2000).

While only a subset of health care workers who suffer needlestick injuries subsequently become infected, adoption of needles with safety features also may reduce costs associated with longer term treatment for those workers. However, we did not estimate these reductions as they are highly dependent on the worker's situation. These situational factors include the worker's age and health status at the time of infection, the type of infection acquired, and the severity of diseases resulting from the infection. While we did not estimate these costs, they are potentially significant. For example, the average annual cost of treating a person with HIV has been estimated at between $20,000 and $24,700 in 1996.[15]

By reducing the risk of needlestick injuries, the use of needles with safety features may also reduce the potential liability costs to hospitals when health care workers become infected after a needlestick injury. Fears of HIV and other infections have led many health care workers to pursue legal action for compensation for a disease acquired at work. Even in cases where diseases have not been transmitted, health care workers are suing for compensation for the emotional distress experienced while waiting for test results. We were unable to identify data concerning the dollar amounts awarded for compensation.

Costs Avoided by Adopting Needles With Safety Features

Using the assumptions above, we estimated the potential costs of adopting a national requirement to use safe needle technologies. This analysis shows that the use of needles with safety features is cost efficient when the costs of postexposure treatment are moderate or high and the added costs per feature are low (see table 4).

[15]F. Hellinger and J. Fleishman, "Estimating the National Cost of Treating People With HIV Disease: Patient, Payer, and Provider Data, " *Journal of Acquired Immune Deficiency Syndromes*, Vol. 24 (2000), pp. 182-88.

Table 4: Estimates of Benefits Over Costs of Needles With Safety Features in Hospitals for 1 Year

		Cost scenarios for postexposure treatment		
		Low ($500 per injury)	Medium ($1,500 per injury)	High ($2,500 per injury)
Cost for needles with safety features compared with conventional needles	Low cost (1.5 times more costly)	-$ 47 million	$ 21 million	$ 90 million
	Medium cost (2.0 times more costly)	-$ 129 million	-$ 60 million	$ 9 million
	High cost (3.5 times more costly)	-$ 374 million	-$ 306 million	-$ 237 million

▒ Shaded figures indicate benefits that exceed costs.
□ Unshaded figures indicate costs that exceed benefits.

Source: GAO analysis.

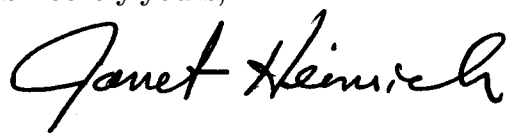
The scope of this analysis is limited to the selected financial costs that hospitals might incur that are associated with using needles with safety features, but it omits the effects of several relevant factors. For example, we did not factor in (1) decreases in subsequent medical treatment costs for health care workers who become infected, (2) reductions in health care workers' risks to life and health, (3) reductions in time lost from work, and (4) the emotional distress suffered by injured and infected workers. While it is not easy to quantify the additional benefits of using needles with safety features, they are real and likely to be substantial. If we were able to incorporate these additional factors, the estimated net benefits of needles with safety features would have been greater than the estimates reported above.

AGENCY COMMENTS

We provided a draft of this report to CDC for review and comment. In written comments, CDC stated that the agency generally agreed with our results and methodology, recognizing the limitations of the data (see encl. II). CDC officials also provided technical comments, which we incorporated where appropriate.

As arranged with your office, unless you publicly announce the contents of this letter earlier, we plan no further distribution of it until 30 days from the date of this letter. At that time we will send copies to the Honorable Jeffrey P. Koplan, Director of CDC, and other interested parties. We will also make copies available on request. If you have any questions regarding this letter, please contact me at (202) 512-7119. Marcia Crosse, Timothy Clouse, David Goodman, and Deborah Miller made major contributions to this work.

Sincerely yours,



Janet Heinrich
Director, Health Care – Public Health Issues

Enclosures–2

METHODOLOGY

Our analysis is based on data provided by the Centers for Disease Control and Prevention (CDC), the International Healthcare Worker Safety Center, the American Hospital Association, the states of California and Maryland,[16] the Becton-Dickinson Corporation, articles published in peer-reviewed medical journals, and other sources. Two surveillance systems provide most of the data relating to needlestick injuries: CDC's National Surveillance System for Health Care Workers (NaSH) and the International Healthcare Worker Safety Center's Exposure Prevention Information Network. While data from these two surveillance systems may not be representative of all hospitals, the data appear to be similar in terms of the types of devices that cause injuries and the approximate frequency of percutaneous injuries within participating hospitals. Given this similarity, we believe that, while data from these systems are not representative of hospitals generally, they do show injury patterns that could reasonably be expected to occur in hospitals.

CDC's Hospital Infections Program manages NaSH, which is a voluntary system that hospitals use to report percutaneous injuries, health care worker exposure to blood and other body fluids, and other information related to the prevention of occupational exposures and infections among health care workers. Hospitals that have volunteered to participate in NaSH tend to be large and are concentrated in the northeastern United States. As NaSH participation is voluntary, data from NaSH may not be representative of hospitals across the nation. Participation in NaSH has varied over time; currently about 60 hospitals are participating.

Our estimates for the number of hollow-bore needles used and the cost of these features are based on information reported by the American Hospital Association, the states of California and Maryland, and the Becton-Dickinson Corporation. The cost of needles with safety features depends on the specific feature, usage patterns, and related factors such as the training needed to use the device properly. Because of these potential cost variations, we analyzed the costs and benefits of needles with safety features using the assumption that the unit cost for hollow-bore needles with safety features would be 1.5, 2.0, and 3.5 times more than similar needles without safety features (see table 5).

[16]California and Maryland are the only states with published estimates on the costs and benefits of requiring the use of devices with safety features.

Table 5: Cost of Using Needles With Safety Features in 1 Year

	Current	With use of safety features	Additional costs
Needles with safety features 1.5 times more expensive than conventional needles	$164,000,000	$245,000,000	$81,000,000
Needles with safety features 2.0 times more expensive than conventional needles	$164,000,000	$327,000,000	$163,000,000
Needles with safety features 3.5 times more expensive than conventional needles	$164,000,000	$572,000,000	$408,000,000

Source: GAO projections are based on data from the American Hospital Association, the states of California and Maryland, and the Becton-Dickinson Corporation.

These cost estimates are consistent with those published elsewhere. For example, the Becton-Dickinson Corporation estimates that a typical hypodermic syringe without a safety feature costs about $.09. A similar hypodermic syringe with a safety feature costs about $.30 or about 3.3 times more. For our analysis, we assumed that baseline costs for conventional devices were $0.10 for a vacuum tube blood collection needle, $0.65 for a winged-steel needle, $0.65 for an IV catheter, and $0.09 for a hypodermic needle/syringe.

We used a range of estimated costs for the treatment required after a needlestick to reflect the range of costs reported. Cost estimates given to the Occupational Safety and Health Administration and CDC and those published in peer-reviewed medical literature range from $500 to more than $3,000 per injury. These variations are due to the types of treatments needed, facility procedures for treating and accounting for the cost of needlesticks, and the extent to which other costs not directly related to the injury (such as administrative reporting requirements and training costs) are included. For our analysis, we used a range of costs—$500, $1,500, and $2,500 per injury (see table 6). These cost estimates are within the range of cost data we reviewed.

Table 6: Estimates for Postexposure Treatment Costs in 1 Year

	Current	With use of safety features	Avoided treatment costs
$500 per injury assumed	$118,000,000	$ 84,000,000	$34,000,000
$1,500 per injury assumed	$354,000,000	$ 251,000,000	$103,000,000
$2,500 per injury assumed	$591,000,000	$ 418,000,000	$173,000,000

Source: GAO analysis.

Our estimates do not include lifetime medical treatment costs, lost wages, or workmen's compensation costs for health care workers who acquire infections after sustaining needlestick injuries. These costs vary with the specific circumstances surrounding the injury.

We estimated the infection risk that health care workers face from needlestick injuries by using CDC reports on the risk of human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV) infections per needlestick and combined them with published reports on the prevalence rates of these diseases nationwide. For example, we estimated the probability that a needlestick injury could result in HCV infection by multiplying the probability that a needlestick involving a person with HCV infection would result in infection in the health care worker (about 1.8 percent) by the probability that the needlestick involved a person infected with HCV (about 1.3 percent). Multiplying these probabilities together indicates that the risk of HCV infection from a random needlestick involving a randomly selected person is about 0.02 percent or about 1 in 4,000. The results of our analysis are shown in table 7.

Table 7: Estimated Risk Faced by Health Care Workers From Needlesticks

Characteristic	Percentage
Percentage of U.S. population with chronic HBV infection	0.42
Percentage of U.S. population with chronic HCV infection	1.30
Percentage of U.S. population with HIV infection	0.32
Probability of contracting HBV, from an infected patient, per needlestick	30.00
Probability of contracting HCV, from an infected patient, per needlestick	1.80
Probability of contracting HIV, from an infected patient, per needlestick	0.30
Probability of contracting HBV, from a patient, per needlestick[a]	0.126
Probability of contracting HCV, from a patient, per needlestick	0.024
Probability of contracting HIV, from a patient, per needlestick	0.001

[a]This probability is for a person who is not immune to HBV infection. In 1995, about 71 percent of workers at risk for HBV infection had been immunized and would not face this specific risk.

Source: GAO projection of CDC data.

According to CDC, this table may underestimate the risk to health care workers because it uses the population prevalence for the U.S. population as an estimate of the prevalence of these viruses in persons seeking medical care. Prevalence rates for persons seeking care will be different, and for some populations, the prevalence rates will be much higher.[17] Studies show prevalence rates as high as 76.9 percent for HCV and 65.7 percent for HBV for some inner city injecting drug user populations,[18] and HCV rates as high as 10.4 percent for patients in dialysis units.[19]

[17]R. S. Janssen, M. E. St. Louis, G. A. Satten, et al., "HIV Infection Among Patients in U.S. Acute Care Hospitals," *New England Journal of Medicine*, Vol. 327 (1992), pp. 445-52; G. D. Kelen, S. Fritz, B. Qaqish, et al., "Unrecognized Human Immunodeficiency Virus Infection in Emergency Department Patients," *New England Journal of Medicine*, Vol. 318 (1988), pp. 1645-50; P. Charache, J. L. Cameron, A. S. Maters, E. I. Frantz, "Prevalence of Infection With Human Immunodeficiency Virus in Elective Surgery Patients," *Annals of Surgery,* Vol. 214 (1991), pp. 562-68; M. A. Montecalvao, M. Sung Lee, H. DePalma, et al., "Seroprevalence of Human Immunodeficiency Virus-1, Hepatitis B Virus, and Hepatitis C Virus in Patients Having Major Surgery," *Infection Control and Hospital Epidemiology*, Vol. 16 (1995), pp. 627-32.

[18]R. S. Garfein, et al.,"Viral Infections in Short-Term Injection Drug Users: The Prevalence of the Hepatitis C, Hepatitis B, Human Immunodeficiency, and Human T-Lymphotrophic Viruses," *American Journal of Public Health*, Vol. 86 (1995), pp. 655-61.

[19]J. I. Tokars, E. R. Miller, M. J. Alter, M. J. Ardunio, "National Surveillance of Dialysis Associated Diseases in the United States, 1995," *ASAIO Journal,* Vol. 44 (1998), pp. 98-107.

LIMITATIONS OF THE DATA AND ANALYSIS

Our analysis of the costs and benefits of using needles with safety features excludes other factors that could affect the results shown above. We excluded these factors to focus on a broad range of costs and benefits associated with these features. Additional factors that could be considered include the relative costs of specific features, the costs and benefits associated with the reduced use of needles, the costs and benefits associated with improved training in the use of needles, the avoided treatment costs resulting from reduced numbers of needlestick injuries, and the additional time needed to perform a procedure without using a needle.

The total costs of needlestick prevention devices may be affected by the relative cost of specific features and by how many of those features are used. Our model assumes that the costs of all needlestick prevention devices will increase by roughly the same amount. However, if the increased cost varies by feature type, the overall benefits also may vary. For example, safety features for hypodermic syringes may cost three times as much as conventional needles, while other types of safety features may cost twice as much. In the latter case, the total cost of adopting these features will be between two and three times the cost of conventional needles.

COMMENTS FROM THE CENTERS FOR DISEASE CONTROL AND PREVENTION

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
and Prevention (CDC)
Atlanta GA 30333

NOV 0 6 2000

Janet Heinrich
Director, Health Care-Public Issues
U.S. General Accounting Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Ms. Heinrich:

The Centers for Disease Control and Prevention (CDC) appreciates the opportunity to review the draft correspondence to Representative Stark entitled, *Occupational Safety: Cost and Benefit Implications of Needlestick Prevention Devices for Hospitals (GAO-01-60R).* The report provides an objective presentation of the information, and the GAO is careful to point out the limitations of the methodology and the results. The CDC commends the GAO for producing an excellent report within the limitations of the data and the time frame for completing the task.

Sincerely,

James D. Seligman
Associate Director for Program Services

Attachment

(201098)