Occupational Needlestick Injuries in a US Airport

Samuel Dorevitch, MD, MPH, Steven E. Lacey, PhD, Anders Abelmann, MS, and John Zautcke, MD

Objective: To characterize needlestick injuries (NSIs) among airport workers, and to suggest preventive strategies. **Methods:** A retrospective chart review (2003–2008) of workers evaluated at a clinic in a large US airport that provides occupational health services. **Results:** Over a period of 6 years, 14 NSI cases were seen. The majority of injuries occurred while workers cleaned lavatories in the airport or on airplanes. Insulin needles were involved in most cases, and the injuries typically occurred on the hand. No cases of hepatitis B, C, or HIV seroconversion were documented, although follow-up was typically incomplete. **Conclusions:** The improper disposal of used insulin needles among travelers can result in potential bloodborne pathogen exposure among airport workers. Occupational NSIs have not previously been described among airport workers. A multilevel approach to prevention is recommended.

Needlestick injuries (NSIs) and the transmission of bloodborne pathogens have been recognized as hazards of hospital work for more than 40 years.[1] An estimated 325,000 NSIs per year occurred among health care workers in hospitals in the late 1990s,[2] and this worker group has remained the focus of preventive efforts and workplace surveillance. Home health workers, paramedics, and law enforcement personnel have more recently been described as victims of nonhospital occupational NSIs.[3–5]

After providing clinical care to several airport workers who had sustained occupational NSIs, we conducted a chart review to evaluate the circumstances associated with such injuries. We present what we believe is the first report of occupational NSIs in an airport and a strategy to reduce the risk of such injuries.

METHODS

Setting

O'Hare International Airport is a major air transportation hub located in Chicago, IL. Approximately 77 million passengers passed through the airport in 2008.[6] The University of Illinois at Chicago operates a clinic on the secure side of one of the domestic terminals that provides acute care services to passengers. In addition, the clinic provides occupational health services to ~39,000 airport and airline workers at O'Hare, treating ~1200 new occupational injuries per year.

Study Design

A retrospective chart review was conducted. Each chart contains a brief description of the incident provided by the injured worker, as well as clinical notes, laboratory reports, and billing information.

Protocol

Charts of patients seen between January 1, 2003, and October 23, 2008, (the date that record review began) that included a diagnosis of "Exposure to potentially hazardous body fluids" (ICD-9 code v15.85) were requested. All obtained charts were reviewed by one of the authors, and those that included needlestick or other percutaneous injuries were subjected to more detailed review. A data abstraction form was used to collect information regarding patient demographics, circumstances of the injury, medical management, follow-up, and billing information. Two of the authors reviewed the charts and data abstraction forms. The protocol for this research was reviewed by the University of Illinois at Chicago Institutional Review Board and granted a claim of exemption under 45 CFR 46.101(b) and a waiver of Health Insurance Portability and Accountability Act authorization in accordance with 45 CFR part 164.512.

RESULTS

The Injuries—General and Medical Aspects

Records of 56 patients with a diagnosis of potentially hazardous body fluid exposure were identified and reviewed. Seventeen of these exposures resulted from percutaneous injuries. After excluding one case of an NSI that occurred to a nurse who administered influenza vaccine outside the airport and two cases of percutaneous injuries in Transportation Safety Administration employees that were caused by objects other than needles (razor, glass) when checking passenger bags, 14 cases of occupational NSIs that occurred at the airport were identified. Eleven of the 14 patients were women, and the age range was 23 to 47 years. In two cases, it was noted that the "source"—the person who had used the sharp—had been identified. Three injured workers were tested for hepatitis B virus (HBV), hepatitis C virus, and HIV in the airport clinic. HBV vaccine was administered to four patients in the airport clinic. In one case, the recommendation was made to start postexposure prophylaxis for HIV, using a combination of lamivudine 150 mg and zidovudine 300 mg. All patients with NSIs are referred for follow-up to the University's employee health clinic (located ~15 miles from the airport) for counseling, follow-up serologic testing, and vaccination as indicated. Only six of the 14 patients who presented for follow-up and those patients whose initial serologic studies did not show immunity to HBV were vaccinated. Two of the six patients had serologic testing for hepatitis C virus and HIV drawn three times out to 6 months postinjury, whereas two other patients had follow-up serologic testing at 2 months. No cases of seroconversion were identified.

The Injuries and Workplace Factors

In 10 of the cases, the sharp object was identified as an "insulin syringe" or "insulin needle," three cases were simply noted to be "needlesticks," and one case was caused by a sharp item in a trash bag that may have been a needle, but the patient did not see it. The employers of 13 of the 14 workers with NSIs were companies that provide janitorial service in airplane cabins or in the airport. The other worker was employed by a company that provides food service in the airport. None of the injuries occurred among flight attendants. In 11 (79%) of the cases, the NSI occurred when workers were handling garbage bags. Of the 11 cases related

From the Division of Environmental and Occupational Health Sciences (Dr Dorevitch, Dr Lacey, Mr Abelmann), School of Public Health; and Department of Emergency Medicine (Dr Dorevitch, Dr Zautcke), University of Illinois at Chicago, Chicago, Ill.

Address correspondence to: Samuel Dorevitch, MD, MPH, Division of Environmental and Occupational Health Sciences, School of Public Health, University of Illinois at Chicago, 2121 West Taylor St. (MC 922) Chicago, IL 60612; E-mail: sdorevit@uic.edu.

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TABLE 1. Key Features of NSIs in the Air Transportation Industry

Body part injured: hand most frequent, followed by lower extremities.
Location: airport terminal more common than on airplane.
Industry: cleaning services supporting air travel.
Occupation: cleaning staff, no flight attendants.
Task: handling trash more frequent than cleaning plane cabin.
Presence of needle not apparent, contained in bag or covered by other material.

to garbage handling, seven (63%) occurred in the airport terminal, two (18%) were on an airplane, and in two cases (18%) it was not clear from the records where the event occurred (the employer services both the terminal and airline cabins). One of the NSI incidents that occurred on an airplane involved a cabin cleaner who reached into a seatback pocket to clean it. A syringe and needle were in the pocket and causes an injury to the worker's finger. One injury occurred to a restaurant worker who was cleaning dishes and was stuck by an insulin syringe that had been left on a dish that was being washed. In two cases, the calf or leg was the site of injury (both involved contact with a garbage bag) and in the remaining cases, the fingers or hand were the site of the injury. Several of the injured workers noted that they would have avoided contact with the garbage bag that resulted in the injury if they known that it contained a needle. Common features of the injuries are summarized in Table 1. A representative description of an injury (translated from Spanish) follows:

> "I grabbed a can of garbage and a big plastic garbage bag. I turned the garbage can over to pour the garbage into the bag. Some of the garbage fell on the floor. When I picked up the garbage from the floor, I felt something pinch me. I took off my gloves and saw blood on my little finger of the right hand. I told a supervisor who checked the garbage and found two needles wrapped in a paper towel . . .."

DISCUSSION

Few reports have been published about NSIs among workers who were not health care providers.[3–5,7] In those reports, NSI cases occurred predominantly or exclusively among police and prison workers. A small number of NSI cases have been noted among cleaners and shop workers, some of whom were injured intentionally.[5,7] Several cases of non-occupational NSI in the context of transportation have been reported, with passengers having sat on discarded syringes on trains[5] or an airplane.[8] We are aware of no prior reports that identified airport workers as victims of NSIs.

Although the Exposure Prevention Information Network and National Surveillance System for Health Care Workers collect data about NSIs in health care settings,[9] surveillance data on the number of NSIs outside of hospitals are very limited. Data sources such as workers' compensation claims and US Occupational Safety and Health Administration (OSHA) injury logs may be useful in efforts to identify additional cases of out-of-hospital occupational NSI and lead to a more extensive identification of factors that lead to such injuries.

The series of cases we report may be an undercount of the NSIs that occurred at O'Hare airport during the time period of interest. Numerous obstacles to occupational injury reporting in general have been described.[10] In our context, other injured workers may have seen their own physicians or they may have been referred by their employers to off-site clinics. Some workers with NSIs may not have sought medical attention at all. Although employees who work in the ticketing and baggage claim areas of the airport would be able to go through security and seek medical attention in the clinic, passengers and visitors may not have that option.

Although the injuries we studied occurred among workers at a US airport, the common denominator—improper disposal of needles by travelers—could also be responsible for injuries among those who clean interstate buses and trains, as well as bus and train stations. One of the activities that resulted in injuries—putting one's hand in the seatback pocket that contains a used syringe/needle—could result in injury to travelers, as well as workers.

The vast majority of prior reports of NSIs outside of the health care industry are community-acquired NSI (CA NSI) in which children sustain injuries by discarded needles, typically in parks and play areas.[5,7,11–21] The needles involved in those cases are suspected of having been discarded by injection drug users, making the health risks substantial. In our setting, injection drug use could have been involved as well, though cases we identified in which the source was known all involved needle use for insulin administration.

Nearly all prior reports of non-health care NSI—either CA NSIs[5,7,11–17,19,20] or occupational injuries in law-enforcement[4,5,7]—come from outside of the United States. In the United States, there has been one report of NSI in law enforcement[21] and one case series of children with CA NSI.[22] The relatively small number of US reports of NSI outside of health care settings suggests a lower incidence rate, a lower rate of case identification/reporting, or both.

Prevention

Measures to reduce the risk of NSIs are well established in hospital settings. The introduction of needle disposal boxes, engineered safer needled devices, and enhanced staff education have been successful in reducing rates of injuries.[23,24] Although the factors that lead to injuries outside of hospitals are somewhat different, some of the same strategies, such as sharps containers, may be successfully applied. One component of an effort to prevent NSIs in the transportation industry is to make sharps boxes available. Our findings suggest that some travelers who use insulin syringes/needles dispose of them in airport and airplane waste bins, as well as locations such as seatback pockets of airplanes. Although some airports have sharps disposal boxes in some of their restrooms, others do not. Ensuring safe disposal methods for used needles in the restrooms of airports, and inter-city bus and train stations would provide travelers an alternative to using trash bins for this purpose. Currently, several commercial airlines (but not all) have sharps boxes on-board their planes, though travelers may not be aware of this fact. Informal discussions with flight attendants from several airlines indicate variability in how flight crews respond to requests for assistance with needle disposal. Providing sharps boxes on all commercial flights and making the flying public aware of their availability may prevent needle disposal in waste bins and seatback pockets on-board aircraft and in airplane terminals.

A second element of a prevention strategy involves educating people with diabetes and their health care providers about the importance of proper disposal of needles and syringes. Providers should advise patients who use needles and syringes to bring with them their own sharps disposal containers when they travel (such containers are commercially available, but nearly any secured, hard-sided container will suffice). The National Health Interview Survey has estimated that in the United States approximately 16 million people have been diagnosed with diabetes.[25] Among adults with diabetes, 27% use insulin.[26] When the several million insulin-dependent diabetics travel, they must use insulin in settings where sharps disposal can be challenging. On-line resources about safe needle disposal are available from the US Environmental Protection Agency (which includes information about traveling with needles),[27] and from education and advocacy groups for persons with diabetes.[28]

A third element of a prevention strategy focuses on workers in the transportation industry. According the US Bureau of Labor Statistics, more than 5000 people work as either "cleaners of vehicles and equipment" or "janitors and cleaners" in the "support services, air transportation" industry.[29] Workers should be educated about the risk of NSI and trained to avoid putting their hand in waste bins, manually handling waste, and placing their hands inside spaces such as seat pockets without first conducting a visual inspection.

Our case series suggests that percutaneous injuries involving exposure to blood or other potentially infectious material, in the language of the OSHA Bloodborne Pathogen Standard, can be "reasonably anticipated" to occur[30] among cleaners of airport and airplane restrooms, as well as airplane cabins. For that reason the OSHA Bloodborne Pathogen Standard should be extended to them, and exposure control plans and HBV vaccination programs should be implemented. A memorandum of understanding between OSHA and the US Federal Aviation Administration has addressed how the two agencies can divide jurisdiction in the context of commercial aviation and a joint working group published an assessment of how to improve worker protection in the industry.[31] The joint aviation safety and health team concluded that in general, the OSHA Bloodborne Pathogen Standard could be applied (other than to the flight deck crew) without compromising aviation safety. However, at this stage, the findings of the joint safety team have not been formalized into industry requirements.

In addition to the emotional costs of NSIs, these preventable injuries result in significant costs to employers. Among the 14 cases, the charges for the visit to the airport clinic, including serologic testing, were typically $450 to $550, and follow-up evaluations (including serologic testing and HBV vaccination) ranged from $460 to $1307. An accidental NSI sustained by an airline passenger in another setting resulted in a lawsuit,[8] further increasing the financial exposure of airlines and their subcontractors.

Strengths and Limitations

Because the clinic where these patients were seen is a provider to workers from numerous employers in the air transportation and supporting industries, we were able to identify a pattern of injuries that would not have been possible if workers had seen their own providers. Furthermore, the fact that follow-up occurred within our university system simplified the process of evaluating whether cases of seroconversion occurred. Although we have identified a hazard to workers in the transportation industry using descriptive methods, we are unable to quantify an incidence rate because of incomplete capture of cases and lack of employment data for the airlines and subcontractors whose staff clean planes and airport lavatories. In addition, the relatively small number of injuries and the lack of complete follow-up preclude drawing firm conclusions about the risks of seroconversion. Future research could include concerted efforts at case identification in this and other sectors of the transportation industry, estimation of injury rates, and evaluation of the effectiveness of preventive efforts.

CONCLUSIONS

Workers in airports are at risk for occupational NSIs. The 14 cases evaluated suggest that the injuries are often caused by inappropriate disposal of insulin needles by travelers. Improving education of people with diabetes, and making sharps disposal available at airports and other transportation centers would likely reduce such injuries in the future. Given the hazard faced by workers who service airplanes and airport bathrooms, applying the OSHA bloodborne pathogen standard to them may lead to less frequent injuries and, through vaccination, should lower their risk of contracting HBV.

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REFERENCES

1. Byrne EB. Viral hepatitis: an occupational hazard of medical personnel. Experience of the Yale New Haven Hospital, 1952 to 1965. *JAMA*. 1966; 195:362–364.
2. Panlilio AL, Orelien JG, Srivastava PU, Jagger J, Cohn RD, Cardo DM; NaSH Surveillance Group; EPINet Data Sharing Network. Estimate of the annual number of percutaneous injuries among hospital-based healthcare workers in the United States, 1997–1998. *Infect Control Hosp Epidemiol*. 2004;25:556–562.
3. Leiss JK, Ratcliffe JM, Lyden JT, et al. Blood exposure among paramedics: incidence rates from the national study to prevent blood exposure in paramedics. *Ann Epidemiol*. 2006;16:720–725.
4. Larney S, Dolan K. An exploratory study of needlestick injuries among Australian prison officers. *Int J Prison Health*. 2008;4:164–168.
5. O'Leary FM, Green TC. Community acquired needlestick injuries in non-health care workers presenting to an urban emergency department. *Emerg Med (Fremantle)*. 2003;15:434–440.
6. Bureau of Transportation Statistics. Air Carrier Traffic Statistics. 2008. Available at: http://www.flychicago.com/Statistics/home.shtm. Accessed October 4, 2009.
7. van Wijk PT, Pelk-Jongen M, de Boer E, Voss A, Wijkmans C, Schneeberger PM. Differences between hospital- and community-acquired blood exposure incidents revealed by a regional expert counseling center. *Infection*. 2006;34:17–21.
8. *Waxman v. C.I.S. Mexicana De Aviacion, S.A. De C.V*. 13 F. Supp.2d 508 (S.D.N.Y 1998).
9. Centers for Disease Control. *National Surveillance System for Health Care Workers*. Atlanta: Centers for Disease Control. Available at: http://www.cdc.gov/ncidod/hip/NASH/default.htm. Accessed March 22, 2010.
10. Azaroff LS, Levenstein C, Wegman DH. Occupational injury and illness surveillance: conceptual filters explain underreporting. *Am J Public Health*. 2002;92:1421–1429.
11. de Waal N, Rabie H, Bester R, Cotton MF. Mass needle stick injury in children from the Western cape. *J Trop Pediatr*. 2006;52:192–196.
12. Garcia-Algar O, Vall O. Hepatitis B virus infection from a needle stick. *Pediatr Infect Dis J*. 1997;16:1099.
13. Nourse CB, Charles CA, McKay M, Keenan P, Butler KM. Childhood needlestick injuries in the Dublin metropolitan area. *Ir Med J*. 1997;90:66–69.
14. Thomas HL, Liebeschuetz S, Shingadia D, Addiman S, Mellanby A. Multiple needle-stick injuries with risk of human immunodeficiency virus exposure in a primary school. *Pediatr Infect Dis J*. 2006;25:933–936.
15. Makwana N, Riordan FA. Prospective study of community needlestick injuries. *Arch Dis Child*. 2005;90:523–524.
16. Wyatt JP, Robertson CE, Scobie WG. Out of hospital needlestick injuries. *Arch Dis Child*. 1994;70:245–246.
17. Haber PS, Young MM, Dorrington L, et al. Transmission of hepatitis C virus by needle-stick injury in community settings. *J Gastroenterol Hepatol*. 2007;22:1882–1885.
18. Thompson SC, Boughton CR, Dore GJ. Blood-borne viruses and their survival in the environment: is public concern about community needlestick exposures justified? *Aust N Z J Public Health*. 2003;27:602–607.
19. Russell FM, Nash MC. A prospective study of children with community-acquired needlestick injuries in Melbourne. *J Paediatr Child Health*. 2002; 38:322–323.
20. Papenburg J, Blais D, Moore D, et al. Pediatric injuries from needles discarded in the community: epidemiology and risk of seroconversion. *Pediatrics*. 2008;122:e487–e492.
21. Lorentz J, Hill L, Samimi B. Occupational needlestick injuries in a metropolitan police force. *Am J Prev Med*. 2000;18:146–150.
22. Babl FE, Cooper ER, Damon B, Louie T, Kharasch S, Harris JA. HIV postexposure prophylaxis for children and adolescents. *Am J Emerg Med*. 2000;18:282–287.

23. Sohn S, Eagan J, Sepkowitz KA, Zuccotti G. Effect of implementing safety-engineered devices on percutaneous injury epidemiology. *Infect Control Hosp Epidemiol*. 2004;25:536–542.
24. Valls V, Lozano MS, Yanez R, et al. Use of safety devices and the prevention of percutaneous injuries among healthcare workers. *Infect Control Hosp Epidemiol*. 2007;28:1352–1360.
25. Centers for Disease Control. Number (in Millions) of Civilian/Noninstitutionalized Persons with Diagnosed Diabetes, United States, 1980–2006. 2008. Available at: http://www.cdc.gov/diabetes/Statistics/prev/national/figpersons.htm. Accessed October 4, 2009.
26. Centers for Disease Control. National Diabetes Fact Sheet. 2007. Available at: http://www2.prnewswire.com/mnr/dtccfinaldata/37319/docs/37319-NEW_CDC_National_Diabetes_Fact_Sheet.pdf. Accessed October 4, 2009.
27. Environmental Protection Agency. Protect yourself, protect others. 2004. Available at: http://www.epa.gov/waste/nonhaz/industrial/medical/med-home.pdf. Accessed October 4, 2009.
28. American Association of Diabetes Educators. Educating providers and persons with diabetes to prevent the transmission of bloodborne infections and avoid injuries from sharps. 1997. Available at: http://www.diabeteseducator.org/export/sites/aade/_resources/pdf/EducProvidersBloodborneInfetions.pdf. Accessed October 4, 2009.
29. US Bureau of Labor Statistics Industry-Occupation Employment Matrix. Available at: http://data.bls.gov/oep/nioem/empiohm.jsp. Accessed October 4, 2009.
30. Occupational Safety and Health Administration. Bloodborne Pathogens. 1910.1030. Available at: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10051. Accessed October 4, 2009.
31. FAA/OSHA Safety and Health Team. First Report: application of OSHA's requirements to employees on aircraft in operation. 2000. Available at: http://www.faa.gov/about/initiatives/ashp/media/faa-osha-report.pdf. Accessed October 4, 2009.