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Major Article

Needlestick injuries and other body substance exposures among police officers in a city police department

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Key Words:

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Background: We determined the incidence and circumstances of needlestick injuries and other body substance exposures among police officers in a city police department.

Methods: We analyzed data extracted from the city's centralized human resource database on all incidents from January 1, 2011, to December 31, 2016, and characterized their circumstances. We calculated the annual incidence of needlestick injuries per 1,000 officers and per 10,000 reactive calls. We ran a Poisson regression model to determine the trend in the annual incidence over time.

Results: We found 13 needlestick injuries and 37 additional body substance exposures involving city police officers. Needlestick injuries most commonly occurred during pat-down searches and searches of property or vehicles; 9 source persons tested positive for hepatitis C. The annual incidence of needlestick injuries ranged from 0–5.1 per 1,000 police officers and from 0–2.5 per 10,000 reactive calls for service without a significant trend. Most body substance exposures consisted of spitting, human bites, and other contact with blood. No incidents reportedly led to transmission of bloodborne viruses.

Conclusions: Although these appear to be rare events, police officers in this department are at risk for needlestick injuries and other body substance exposures. We recommended engineering, administrative, and personal protective equipment control improvements.

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BACKGROUND

Police officers are at risk of bloodborne diseases through needlestick injuries and other exposure incidents because of the nature of their work.^{1,2} The bloodborne viruses of most concern include hepatitis B virus, hepatitis C virus, and HIV. Updated information on risks of needlestick injuries among law enforcement is important in the face of increasing illicit drug use and hepatitis C incidence in many communities in the United States.^{3,4}

The Health Hazard Evaluation Program at the Centers for Disease Control and Prevention's National Institute for Occupational Safety and Health received a request from employer representatives at the risk management office in a large city in Ohio.⁵ The request concerned

police officer exposures to needlestick injuries and other body substance exposures.

At the time of this investigation, the city's police department was the primary law enforcement agency and provided police services to residents in 5 districts. The department had approximately 1,000 sworn officers and 125 civilian employees. Law enforcement operations were divided among 3 bureaus: patrol, investigations, and support. Historically, the department received 160,000–210,000 reactive calls for service a year, in which a 911 call results in a call for service. Police officers assigned to the districts for uniform patrol activity worked on 1 of 3 fixed shifts. The objective of this investigation was to determine the incidence and circumstances of needlestick injuries and other body substance exposures among the city's police officers from 2011–2016.

METHODS

We obtained an electronic spreadsheet containing data from reports on all needlestick injuries and other body substance exposure incidents from January 1, 2011, through December 31, 2016. These reports were extracted by the representative from the city's risk management office from the city's human resource information system,

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the centralized database maintained by the city's employee safety department. Using information contained in the electronic spreadsheet, we characterized circumstances surrounding the reported injuries and exposures. Body substance exposures included incidents not involving a needle or sharp. Not all body substance exposures had details of the exposures in the database. We also reviewed laboratory testing results for all source persons for applicable incidents. We calculated the overall and annual incidence rates of needlestick injuries using 2 different denominators: (1) per 1,000 officer-years, in which officer-years represents the number of sworn police officers employed by the city during a given year, and (2) per 100,000 reactive calls for service. For overall and annual incidence rates of needlestick injuries, we calculated 95% confidence intervals (CIs) using Miettinen's modification of the Mid-P exact test.⁶ We ran a Poisson regression model to determine the trend in the annual incidence over time using SAS 9.4 (SAS Institute, Cary, NC). We considered a *P* value <.05 to indicate statistical significance. As a public health response, according to Title 45 Code of Federal Regulations Part 46, this evaluation did not require review by an institutional review board.

RESULTS

Needlestick injuries

A total of 13 needlestick injuries were recorded in the department's database from January 1, 2011, to December 31, 2016. The 13 needlestick injuries were experienced by 13 officers working in criminal investigation and in 4 of the 5 police districts. Ten of the needlestick injuries occurred while the officer was on a uniform patrol assignment.

In total, 6 needlestick injuries occurred between the times of 10:30 AM and 2:30 PM, 5 occurred between 1:00 PM and 5:30 PM, and 1 occurred at 1:00 AM. One injury did not have a time recorded. No seasonality pattern was detected because the 13 injuries occurred during 9 different months, all but May, July, and August.

Of the 13 needlestick injuries, 7 involved the hand, 5 involved a finger, and 1 involved the abdomen. The median age of the 13 officers sustaining needlestick injuries was 40 years (range, 28–50 years). The median length of service was 9 years (range, 5–24 years). Information about the brand of the needle and protective mechanisms of the device was unknown for 12 of the injuries. One injury involved a lancet needle used for checking blood glucose. Gloves were reportedly worn by officers in 7 of the incidents. Of these, latex gloves were reportedly used in 4 incidents, "rubber" gloves were used in 1 incident, and the type of gloves used was not recorded in 2 incidents. Gloves were reported not to be worn in 2 incidents, and it was unknown whether officers were wearing gloves for 4 instances. Explanations of how the injuries occurred, as recorded in available records, include during pat-down of a suspect (*n* = 4), during search of a suspect's purse (*n* = 4), during search of a suspect's vehicle (*n* = 2), identified syringe not immediately secured (*n* = 2), and during inspection of a capped needle (*n* = 1).

Of the 13 exposed police officers, 12 had medical evaluation and treatment at a university medical center after the incident; the

remaining officer was treated at the city's employee health service. Of the 13 source persons, 8 were evaluated at the university medical center, and 2 were evaluated at the local jail. For the 3 remaining incidents, the source person's treatment facility was not listed, and source person results were not recorded for 2 of these incidents. Nine (82%) of 11 source persons with test results tested positive for hepatitis C. Results were reported as negative for 2 additional source persons. None of the 11 source persons with test results tested positive for HIV or hepatitis B. We were unable to obtain test results for the injured police officers but were informed that none of the incidents led to transmission of hepatitis B, hepatitis C, or HIV.

The overall incidence of needlestick injuries for the 6-year study period was 2.15 per 1,000 officer-years (95% CI, 1.20–3.59; range, 0–5.07) and 1.12 per 100,000 reactive calls for service (95% CI, 0.62–1.87; range, 0–2.45) (Table 1). The year 2012 had the highest incidence at 5.07 needlestick injuries per 1,000 police officers and 2.45 needlestick injuries per 100,000 reactive calls for service. No needlestick injuries were recorded among police officers in 2016. We did not identify a significant trend in annual incidence of needlestick injuries per 1,000 police officers (*P* = .22) or per 100,000 reactive calls for service (*P* = .34).

Additional body substance exposure incidents

Thirty-seven additional body substance exposure incidents were reported from January 1, 2011, to December 31, 2016. Explanations of how the exposure incidents occurred included spit in the eyes or mouth (*n* = 9), spit in the face (*n* = 6), human bite (*n* = 6), blood contact with nonintact skin (*n* = 5), blood contact with mucous membranes (*n* = 1), blood contact with skin (unknown if intact) (*n* = 7), and other (*n* = 4). Based on the information in the database, only some of these incidents could be classified as a true risk for exposure to bloodborne viruses. These incidents include blood contact with nonintact skin, as well as blood contact with mucous membranes. There was insufficient information to determine whether the incidents involving spits, human bites, and blood contact with unspecified skin would be considered at risk for exposure to bloodborne viruses.

The 37 body substance exposure incidents occurred in all 5 police districts and the central business district. In total, 35 exposure incidents occurred while the officer was on a uniform patrol assignment. Thirteen incidents occurred between 12:00 AM and 7:00 AM, 10 incidents occurred between 9:00 AM and 4:00 PM, and 13 incidents occurred between 5:00 PM and 12:00 AM. One incident was missing the time. No seasonality pattern was detected because the 37 exposure incidents occurred during all 12 months. The median age of the 31 officers reported to have exposure incidents was 37 years (range, 24–52 years). The median length of service was 10 years (range, 1–25 years).

Of the 37 police officers with reported exposure incidents, 26 had medical evaluation and treatment at a university medical center or the city's employee health service, 7 did not undergo treatment, and 4 had an unknown status. The source person was also evaluated at a local hospital in 19 incidents and at the local jail in 3 incidents. The evaluation location was not listed for 8 incidents, but 5 of these

Table 1
Annual and overall numbers and rates of needlestick injuries, police officers, and reactive calls for service

Year	No. of needlestick injuries	Officer-years	Incidence per 1,000 officer-years	No. of reactive calls for service	Incidence per 100,000 reactive calls for service
2011	1	1,031	0.97	204,085	0.49
2012	5	986	5.07	204,427	2.45
2013	3	959	3.13	206,425	1.45
2014	2	1,012	1.98	201,240	0.99
2015	2	1,010	1.98	192,035	1.04
2016	0	1,043	0	187,918	0
Total	13	6,041	2.15	1,158,289	1.12

source persons had “verbal” report of test results back to the city’s employee health service. Seven source persons did not receive any medical evaluation or treatment.

In 6 incidents, neither the source person nor the police officer underwent medical evaluation. Based on the information provided in the report, 5 of these incidents would generally not be classified as at risk of exposure to bloodborne viruses. Three incidents involved spitting incidents, 1 involved a bite that did not break the skin, and 1 involved unprotected mouth-to-mouth cardiopulmonary resuscitation.

Of the 22 source persons who had blood drawn in a follow-up evaluation, 4 (18%) tested positive for hepatitis C, 2 (9%) tested positive for HIV infection, and 2 (5%) tested positive for both HIV and hepatitis C infections. Results were reported as negative for 15 additional source persons. No source persons tested positive for hepatitis B. We were also unable to obtain test results for the police officers involved. However, we were informed that none of the incidents led to transmission of hepatitis B, hepatitis C, or HIV to officers.

DISCUSSION

We found 13 needlestick injuries and 37 other body substance exposure incidents among police officers in the police department we evaluated over a 6-year period. In this department, 82% of source persons for needlestick injuries with test results tested positive for hepatitis C. In addition, 23% of source persons for other exposures with test results tested positive for hepatitis C, whereas 14% of source persons for other exposures with test results tested positive for HIV infection. In southwest Ohio, where this department is located, the incidence of cases of positive hepatitis C tests increased from 104 per 100,000 persons to 197 per 100,000 persons from 2010–2015.⁷ After a needlestick or sharps exposure to hepatitis C–positive blood, the risk of hepatitis C infection has been shown to be 0.1% in health care personnel.⁸ Risk is unknown among public safety workers including police.⁹

Few studies have focused on needlestick injuries and other body substance exposures among law enforcement personnel, and the differences in definitions across the studies make comparisons difficult. However, the incidence rate of needlestick injuries we found (2.15 per 1,000 officer-years) appears to be similar to those in other studies. A retrospective study of police and corrections officers presenting to emergency departments in Rhode Island found an average annual incidence of 0.78 percutaneous or blood to mucous membrane exposures per 1,000 police and corrections personnel.¹⁰ Another study looking at surveillance records from the New York City police department found the rate of needlesticks to be 4.8 needlestick injuries per 10,000 officer-years (or 0.48 needlestick injuries per 1,000 officer-years).² The authors found that younger age (20–29 years) and having 4–10 years of service were associated with a higher risk of transcutaneous exposures (needlestick injuries and human bites).² More recent survey studies in North Carolina and Baltimore, Maryland, have documented that 3.8%–8% of police officers reported ever having a needlestick injury and a rate of 36–58 needlestick injuries per 10,000 officer-years (or 3.6–5.8 needlestick injuries per 1,000 officer-years).^{11,12}

Sonder et al.¹³ identified 112 exposures with risk for viral transmission in Amsterdam, The Netherlands, over a 4-year period. Of these, 43% were exposed through human bites and 10% were needlestick injuries. A review of case reports of blood and body fluid exposures by police officers in Scotland from August 2007 to July 2008 found 105 incidents reported. Of these, the most common types were spits (27%), bites (26%), and splashes (23%). Five needlestick injuries were reported.¹⁴ Similar to these studies, we found that most body substance exposure incidents consisted of spitting incidents, human bites, and contact with blood other than from a needlestick ($n = 33$).

Saliva is not typically categorized as a potentially infectious material unless it contains visible blood or is from a dental procedure.¹⁵ For human bites, clinical evaluation must include the possibility that both the person bitten and the person who inflicted the bite were exposed to bloodborne viruses. Transmission of HIV by this route has been reported in rare instances but not after an occupational exposure.¹⁶

Among the reported needlestick injuries at another metropolitan department, 42% of respondents reported that the incidents occurred during second shift or evening. The most common circumstances were pat-down searches (36%), searches incident to arrest (25%), property searches (10%), and vehicle searches (10%).¹ In the police department we evaluated, needlestick injuries most commonly occurred during pat-down searches of a suspect and during searches of a suspect’s property or vehicle, which is similar to previous findings.¹ These appear to be high-risk activities because of their unpredictable nature. Annual training on safe searching techniques and safe handling of needles may further minimize risks of needlestick injuries. Police officers should not reach into any areas that they cannot see without first looking. Police officers in some countries outside of the United States may request that the public empty their pockets, which may reduce the risk of needlestick injuries. Syringe service programs, such as the one started in this city at the center of the evaluation in 2014, remove potentially contaminated syringes from the community and may reduce the risk of needlesticks to the public and first responders.^{17,18}

Our evaluation was subject to some limitations. First, the incidence of needlestick injuries and other body substance exposure incidents reported here may be an underestimation of the actual incidence of these injuries among officers. Previous studies have shown that underreporting of needlestick injuries and body substance exposure incidents in police officers occurs. Only 39% of police officers in San Diego, California, reported seeking medical attention for needlestick injuries, whereas 43% of police officers in Denver, Colorado, stated they reported their exposure to blood or saliva.^{1,19} Second, we did not have sufficient information to determine whether multiple reported non-needlestick incidents would be considered at true risk for exposure to bloodborne pathogens. Third, in this investigation, we were unable to obtain test results and other records for the affected police officers after the exposure incidents, so we are unable to comment on whether police officers underwent the appropriate evaluation and testing. However, we were informed by representatives of the city’s risk management office that none of the incidents led to transmission of hepatitis B, hepatitis C, or HIV.

Following the occupational safety and health hierarchy of controls, we recommended that the police department ensure the containers used to temporarily store needles or other sharps collected as evidence in the field are puncture resistant, leakproof, and labeled or color coded. Officers should transfer needles promptly in the containers and should never attempt to recap needles. We also recommended that the department provide all police officers with annual training on bloodborne viruses, methods used to control occupational exposures, hepatitis B vaccine, and medical evaluation and postexposure follow-up procedures. Training should also include safe searching techniques to reduce the risk of needlestick injuries. The department should ensure that each needlestick injury report contains all of the information required by the US Occupational Safety and Health Administration Bloodborne Pathogens Standard.¹⁴ This information includes the work area where the exposure occurred and an explanation of how the incident occurred. Each submitted report should be checked for completeness and address missing or incomplete responses. Police officers should be provided with nitrile gloves to prevent dermal exposure to blood and other potentially infectious materials.

Police officers in this city department are at risk for needlestick injuries and other body substance exposures. In our retrospective review of reports of exposure incidents, we found 13 needlestick injuries and 37 other body substance exposure incidents over a 6-year period. Nine of 11 source persons with documented test results after a needlestick injury tested positive for hepatitis C. Needlestick injuries most commonly occurred during pat-down searches of a suspect and during search of a suspect's property or vehicle (77%). Most body substance exposure incidents consisted of spitting incidents, human bites, and contact with blood other than from a needlestick.

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