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Brief Report

Health care worker follow-up compliance after occupational bloodborne pathogens exposure: A brief report

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Key Words:

Public health
Workplace injury

A retrospective cohort study was conducted examining health care worker (HCW) compliance with Centers for Disease Control and Prevention recommendations following occupational bloodborne pathogen (BBP) exposure. HCWs with a BBP exposure from a known HIV- or hepatitis C virus-seropositive individual were less likely to complete recommended follow-up compared with HCWs with seronegative source patient exposures (adjusted odds ratio, 0.02 and 0.09, respectively). Continued targeted education and extra vigilance in performing postexposure surveillance are warranted in this higher-risk population.

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BACKGROUND

Exposure to bloodborne pathogens (BBPs) is a well-described occupational hazard affecting an estimated 385,000 health care workers (HCWs) annually.¹ Sharps injuries sustained by HCWs while providing patient care can potentially transmit more than 20 pathogens, most commonly hepatitis B virus (HBV), hepatitis C virus (HCV), and HIV.¹ An estimated 8% of HCV, 1% of HBV, and 0.5% of HIV infections in HCWs are directly attributable to occupational sharps injuries²; risk of seroconversion after percutaneous exposure to seropositive source patients is estimated at 6%–30% for HBV, 0.5%–2% for HCV, and 0.3% for HIV.^{3,4}

The Centers for Disease Control and Prevention (CDC) recommends health care institutions implement postexposure protocols for injured HCWs, including assessment of source patients for evidence of HIV, HCV, and HBV infection as well as periodic follow-up testing and management of the injured HCW.^{3–5} Although previous studies demonstrate HCW compliance with performing CDC-recommended follow-up ranges between 33% and 87%, none have systematically evaluated factors influencing HCW completion of follow-up.^{6,7}

METHODS

A retrospective cohort study was designed using de-identified data routinely collected by the occupational medicine department of a large military treatment facility to evaluate clinical and demographic factors influencing HCW completion of CDC-recommended follow-up. Subjects were eligible for inclusion if they reported an occupational BBP exposure to the hospital's occupational medicine clinic or emergency room from August 1, 2011–October 31, 2014. Hospital resident physicians and fellows sustaining offsite occupational exposures while performing a rotation at another facility were also eligible for inclusion because hospital policy mandated local administrative tracking and management of such exposures. The surveillance period was from August 1, 2011–March 31, 2015, to allow subjects to complete a minimum of 6 months of follow-up after exposure. Primary outcome measure was completion of CDC-recommended management and follow-up testing defined as completion of all required postexposure laboratory studies at least once a minimum of 6 months after exposure.

Analysis of demographic and clinical covariate influence upon outcome was restricted only to those HCWs who had the opportunity to complete at least 6 months of follow-up after exposure. Two separate multivariate models were generated (1 evaluating influence of HIV source patient seropositivity and 1 for HCV) because inclusion of both HIV and HCV covariates into a single model resulted in zero cell counts and prohibited performance of logistic regression. This project was reviewed and approved by the Uniformed Services University of the Health Sciences' Office of Research (T0873293) and Walter Reed National Military Medical Center Institutional Review Board (408721-1).

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Conflicts of Interest: None to report.

RESULTS

A total of 582 occupational BBP exposures were reported during the exposure period (Table 1). The majority of exposures involved source patients with no serologic evidence of HIV (73.6%; *n* = 428), HBV (75.3%; *n* = 438), or HCV (73.2%; *n* = 426).

Table 1

Characteristics of health care workers with reported bloodborne pathogens exposure, by completion of follow-up

Risk factor	n (%)	Completion of follow-up*		χ^2 P value
		Yes (%)	No (%)	
	N = 582	414 (87.5)	59 (12.5)	
Employment status				.08
Active duty	436 (74.9)	310 (87.3)	45 (12.7)	
Civilian	45 (7.7)	40 (93.0)	3 (7.0)	
Contractor	66 (11.3)	45 (86.5)	7 (13.5)	
General schedule	34 (5.8)	19 (86.4)	3 (13.6)	
Unknown	1 (.2)	0 (0.0)	1 (100.0)	
Institution role				.01
Medical student	23 (4.0)	17 (94.4)	1 (5.6)	
Midlevel provider	19 (3.3)	14 (87.5)	2 (12.5)	
Nurse	124 (21.3)	91 (91.9)	8 (8.1)	
Physician	161 (27.7)	127 (90.1)	14 (9.9)	
Medical technician	201 (34.5)	129 (83.8)	25 (16.2)	
Other	54 (9.3)	36 (80.0)	9 (20.0)	
Department				.02
Dental	34 (5.8)	24 (88.9)	3 (11.1)	
Fire/police	3 (.5)	1 (33.3)	2 (66.7)	
Housekeeping	21 (3.6)	14 (82.4)	3 (17.6)	
Medicine	239 (41.1)	173 (87.4)	25 (12.6)	
Offsite	17 (2.9)	11 (73.3)	4 (26.7)	
SPD	25 (4.3)	15 (75.0)	5 (25.0)	
Surgery	239 (41.1)	172 (91.0)	17 (9.0)	
Unknown	4 (.7)	4 (100.0)	0 (0.0)	
Injury location				<.01
Arm	23 (4.0)	17 (89.5)	2 (10.5)	
Eye/face/mouth	118 (20.3)	79 (81.4)	18 (18.6)	
Hand/finger	423 (72.7)	310 (90.4)	33 (9.6)	
Leg	9 (1.5)	4 (66.7)	2 (33.3)	
Other	9 (1.5)	4 (50.0)	4 (50.0)	
Instrument type				<.01
Blade	42 (7.2)	32 (94.1)	2 (5.9)	
Hollow needle	190 (32.6)	141 (91.0)	14 (9.0)	
Instrument	77 (13.2)	51 (85.0)	9 (15.0)	
Needle, unknown type	22 (3.8)	19 (90.5)	2 (9.5)	
Solid needle	126 (21.6)	97 (94.2)	6 (5.8)	
Splash	114 (19.6)	65 (73.0)	24 (27.0)	
Other	11 (1.9)	9 (81.8)	2 (18.2)	
Source HIV rapid test				<.01
Negative	428 (73.6)	338 (96.8)	11 (3.2)	
Positive	17 (2.9)	6 (37.5)	10 (62.5)	
Unknown	137 (23.5)	70 (64.8)	38 (35.2)	
Source hepatitis C status				<.01
Negative	426 (73.2)	337 (97.4)	9 (2.6)	
Positive	14 (2.4)	7 (50.0)	7 (50.0)	
Unknown	142 (24.4)	70 (61.9)	43 (38.1)	
Source hepatitis B status				.43
Negative	438 (75.3)	341 (95.3)	17 (4.7)	
Positive	3 (.5)	3 (100.0)	0 (0.0)	
Unknown	141 (24.2)	70 (62.5)	42 (37.5)	
Infectious diseases department referral				<.01
No	537 (92.3)	392 (90.1)	43 (9.9)	
Yes	45 (7.7)	22 (57.9)	16 (42.1)	
Placed on PEP				.13
No	17 (37.8)	7 (46.7)	8 (53.3)	
Yes	28 (62.2)	15 (65.2)	8 (34.8)	

PEP, post exposure prophylaxis.

*Completion of follow-up restricted to subjects with at least 6 months of observation after exposure (August 1, 2011–March 31, 2014).

Of the 473 subjects whose date of injury afforded a minimum of 6 months of observation, 88% (*n* = 414) completed CDC-recommended follow-up. Institution role, department, injury location, instrument type, source HIV status, source HCV status, and infectious diseases department referral were significantly associated with the outcome on χ^2 analysis.

On univariate analysis, HCWs with exposure to a known HIV-seropositive source were 98% less likely to complete follow-up (odds ratio [OR], 0.02; 95% confidence interval [CI], 0.01–0.07) when compared with subjects exposed to a HIV-negative source; these findings persisted after multivariate adjustment (adjusted OR [aOR], 0.02; 95% CI, 0.004–0.13) (Table 2). Those exposed to source patients with unknown HIV serostatus demonstrated similarly decreased likelihood of follow-up (aOR, 0.03; 95% CI, 0.01–0.08).

Source patient HCV serostatus similarly influenced likelihood of follow-up completion. On crude analysis, subjects with exposure to a known HCV-seropositive source patient were 97% less likely to complete follow-up when compared with subjects exposed to a known seronegative HCV source (OR, 0.03; 95% CI, 0.01–0.10); these findings persisted after multivariate adjustment (aOR, 0.09; 95% CI, 0.02–0.45). Again, those exposed to source patients with unknown HCV serostatus demonstrated decreased likelihood of follow-up (aOR, 0.02; 95% CI, 0.01–0.06).

DISCUSSION

HCWs with a BBP exposure involving HIV or HCV seropositive or serostatus unknown patients were less likely to complete follow-up compared with HCWs exposed to seronegative source patients. At least 2 possible explanations exist for these surprising findings. First, the study design necessarily resulted in differential outcome assessment bias because a seronegative source exposure resulted in achieving outcome status with relative ease (essentially at time of presentation) compared with an HCW with an HIV- or HCV-seropositive source exposure requiring 6 months of follow-up to achieve outcome status. A second possible explanation can be found in the health belief model, a psychological model evaluating behavior using the 3 constructs of threat perception, benefit perception, and perceived disadvantage.⁸ Per hospital protocol, HCWs exposed to known HIV or HCV patients received consultation with infectious diseases specialists who perform a review of source patient infectivity, including a review of source patient viral suppressive therapy and viral load (data unavailable to the hospital occupational medicine clinic). It is possible that follow-up compliance may be affected by an HCWs low-perceived susceptibility following delivery of these data during specialist assessment; however, the de-identified data source utilized for this study prevented retrospective record review to explore such a hypothesis.

Interpretation of this study is subject to several limitations. BBP exposures are historically underreported. Despite an institutional policy mandating self-reporting, undoubtedly some individuals chose not to report a BBP exposure. Additionally, exposed HCWs with a sophisticated understanding of BBP exposure risk may self-stratify, resulting in an overly compliant cohort more motivated to complete therapy. Several demographic factors (eg, age, sex, race, and assessment of personal protective equipment use) were not systematically recorded and were unavailable for analysis. Finally, the study design resulted in differential observation time for exposed HCWs based on source serostatus.

Postexposure programs are essential to sustaining a healthy workforce and preventing pathogen transmission. These study results highlight need for further research to more completely assess factors differentially influencing the personal motivations for complying with recommended follow-up after BBP exposures, particularly for patients with higher-risk exposures.

Table 2
Health care worker crude and adjusted odds ratios (ORs) and 95% confidence intervals (CIs) for completion of follow-up after occupational bloodborne pathogen exposure: HIV and hepatitis C virus (HCV) models

Characteristics	HIV model			HCV model		
	Crude OR	Adjusted model*	P value	Crude odds ratio	Adjusted model*	P value
	OR (95% CI)	OR (95% CI)		OR (95% CI)	OR (95% CI)	
Institution role						
Medical student	Reference category	Reference category		Reference category	Reference category	
Midlevel provider	0.82 (0.10–6.62)	0.60 (0.03–10.79)	.73	0.82 (0.10–6.62)	1.21 (0.05–28.61)	.91
Nurse	1.34 (0.26–6.86)	2.08 (0.18–24.62)	.56	1.34 (0.26–6.86)	2.40 (0.20–29.39)	.49
Physician	1.07 (0.22–5.11)	1.44 (0.13–16.49)	.77	1.07 (0.22–5.11)	1.28 (0.11–14.93)	.85
Tech/corpsman/medic	0.61 (0.13–2.79)	1.45 (0.14–14.98)	.76	0.61 (0.13–2.79)	1.65 (0.15–17.71)	.68
Other	0.47 (0.09–2.42)	1.89 (0.12–29.82)	.65	0.47 (0.09–2.42)	3.14 (0.19–53.29)	.43
Department						
Surgery	Reference category	Reference category		Reference category	Reference category	
Fire/police	0.05 (0.01–0.60)	0.09 (0.01–2.37)	.15	0.05 (0.01–0.60)	0.41 (0.003–61.39)	.73
Housekeeping	0.49 (0.13–1.86)	1.73 (0.19–16.19)	.63	0.49 (0.13–1.86)	1.64 (0.17–15.82)	.67
Medicine	0.72 (0.38–1.38)	0.69 (0.25–1.90)	.48	0.72 (0.38–1.38)	0.78 (0.29–2.13)	.63
Offsite	0.29 (0.08–1.00)	1.12 (0.19–6.83)	.9	0.29 (0.08–1.00)	1.04 (0.16–6.77)	.97
SPD	0.31 (0.10–0.97)	2.07 (0.42–10.24)	.37	0.31 (0.10–0.97)	2.37 (0.47–12.05)	.3
Dental	0.84 (0.23–3.06)	1.36 (0.17–10.76)	.77	0.84 (0.23–3.06)	1.65 (0.22–12.40)	.63
Injury location						
Hand or finger	Reference category	Reference category		Reference category	Reference category	
Arm	0.93 (0.21–4.21)	2.49 (0.20–30.51)	.48	0.93 (0.21–4.21)	0.67 (0.10–4.50)	.68
Eye/face/mouth	0.48 (0.26–0.90)	1.44 (0.29–7.15)	.66	0.48 (0.26–0.90)	1.43 (0.26–7.89)	.68
Other	0.11 (0.03–0.46)	0.14 (0.01–1.56)	.11	0.11 (0.03–0.46)	0.18 (0.02–2.06)	.17
Leg	0.22 (0.04–1.24)	0.28 (0.02–3.84)	.34	0.22 (0.04–1.24)	0.94 (0.07–12.97)	.94
Instrument type						
Solid needle	Reference category	Reference category		Reference category	Reference category	
Blade	0.99 (0.19–5.15)	2.46 (0.37–16.15)	.35	0.99 (0.19–5.15)	3.04 (0.41–22.67)	.28
Hollow needle	0.62 (0.23–1.68)	1.16 (0.30–4.52)	.83	0.62 (0.23–1.68)	1.44 (0.37–5.63)	.6
Instrument	0.35 (0.12–1.04)	0.31 (0.07–1.41)	.13	0.35 (0.12–1.04)	0.51 (0.11–2.31)	.38
Needle, unknown type	0.59 (0.11–3.14)	1.41 (0.19–10.37)	.74	0.59 (0.11–3.14)	1.35 (0.19–9.32)	.76
Other	0.28 (0.05–1.59)	0.92 (0.10–8.42)	.94	0.28 (0.05–1.59)	1.15 (0.13–9.84)	.9
Splash	0.17 (0.07–0.43)	0.17 (0.03–1.11)	.06	0.17 (0.07–0.43)	0.18 (0.03–1.20)	.08
Source rapid HIV test						
Negative	Reference category	Reference category		Reference category	Reference category	
Positive	0.02 (0.01–0.07)	0.02 (0.004–0.13)	<.01	0.03 (0.01–0.10)	0.09 (0.02–0.45)	<.01
Unknown	0.07 (0.03–0.13)	0.03 (0.01–0.08)	<.01	0.05 (0.02–0.10)	0.02 (0.01–0.06)	<.01
Referral to infectious diseases department						
No	Reference category	Reference category		Reference category	Reference category	
Yes	0.15 (0.08–0.32)	0.41 (0.12–1.39)	.15	0.15 (0.08–0.32)	0.12 (0.04–0.37)	<.01

SPD, sterile processing.

*Models include institution role, department, injury location, instrument type, source rapid HIV test, and infectious diseases referral.

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