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Brief report

Occupational exposure to blood and compliance with standard precautions among health care workers in Beijing, China

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This cross-sectional survey assessed both risk and prevention of health care workers to bloodborne virus transmission in 2 hospitals in Beijing. The identified discrepancy between the high level of occupational blood exposure and suboptimal compliance with standard precautions underscores the urgent need for interventions to enhance occupational safety of health care workers in China.

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Health care workers (HCWs) are at a high risk of occupational exposure to blood and, thus, infection with bloodborne viruses (BBV), such as hepatitis B virus, hepatitis C virus, and HIV.¹ An exposure that might place HCWs at risk for BBV infection is defined as a *percutaneous injury* (PI) (eg, a needlestick or cut with a sharp object) or the contact of mucous membrane or nonintact skin (eg, exposed skin that is chapped, abraded, or afflicted with dermatitis) with blood, tissue, or other body fluids that are potentially infectious.² Despite the marked epidemic of BBV, data concerning the extent of occupational exposure of HCWs to blood are rarely available at both national and local level.

Internationally, following standard precautions (SP) has been regarded as fundamental in preventing occupation exposure to BBV infection. As in other countries, the Chinese SP promotes basic infection control practices, including the use of personal protective equipment (PPE), the safe use and disposal of sharps, and the decontamination of equipment and environment and waste management, aimed at preventing contamination by blood and specific body fluids from all patients.³ Despite the severe acute respiratory syndrome outbreak of 2003, evidence suggests that the adherence to SP may still be low in China, and compliance varies along different aspects of SP.⁴ Six years after issuing the Chinese SP, we

aim to describe the extent of occupational blood exposure and compliance with SP of HCWs in China and identify correlates of compliance.

METHODS

We conducted a cross-sectional survey of HCWs in 2 tertiary hospitals in Beijing from May 10 to June 28, 2010. The purposive sample was enrolled from the departments where doctors, nurses, and technicians were likely to be in contact with blood, needles, and sharps, such as internal medicine, surgery, and laboratories. Temporary employees were excluded. Participants were informed verbally of the aims of the survey and provided their answers voluntarily in an anonymous written questionnaire, which assessed (1) sociodemographic characteristics: age, gender, job category (doctors, nurses, technicians); (2) exposure type: exposure to blood that is potentially infectious during work lifetime; (3) exposure frequency: number of exposure episode(s) during the previous year; (4) engagement in 8 protective behaviors related to the practice of SP; and (5) awareness and training history on SP. We calculated an individual compliance score by summing the scores for the 8 protective behaviors of SP, ranging from 0 to 8. A higher compliance score indicates better compliance with SP.

The data were analyzed using SPSS version 20.0 (SPSS Inc, Chicago, IL). All variables were treated as categorical, except age and exposure frequency. Descriptive statistics were performed to each item of exposure and compliance. One-way analysis of variance was used to test for differences in blood exposure type

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Table 1
Occurrence of health care workers reporting occupational exposure to blood by job category

Occupational exposure to blood	Total (N = 374)		Doctors (N = 94)		Nurses (N = 235)		Technicians (N = 43)		χ^2	P value
	n	%	n	%	n	%	n	%		
Percutaneous exposure	307	82.1	69	71.9	213	90.6	25	58.1	35.3	<.001
Mucous membrane exposure	79	21.1	28	29.2	49	20.8	2	4.6	17.7	.008
Nonintact skin exposure	182	48.7	37	38.5	135	57.4	10	23.3	24.7	<.001
Exposure episodes per person during last year, mean (95% CI)	1.9 (1.7–2.1)		1.6 (1.4–1.8)		2.2 (1.9–2.5)		1.2 (1.0–1.3)		6.6	.001

Table 2
Self-reported compliance of health care workers with standard precautions

Items	n	%
I protect myself against the blood and body fluids of all patients, regardless of their diagnosis.	301	80.5
I wash my hand after removing disposable gloves.	362	96.8
I wear double-layer glove when I have broken skin in my hand and there is possibility of exposure to blood or other body fluids.	280	74.9
I put needles and other sharp objects into the designated sharp container.	199	53.2
I wear gloves whenever there is possibility of exposure to blood or body fluids.	323	86.4
I wear a mask whenever there is possibility of exposure to blood or blood fluids splashing in my face.	206	55.1
I wear eye protection (glasses) whenever there is possibility of exposure to blood or blood fluids splashing in my face.	150	40.1
I wear a waterproof apron whenever there is possibility of exposure to blood fluids splashing on my clothes.	153	40.9
Compliance score, mean (95% CI)	5.3	5.1–5.5

and frequency among 3 job categories. Multivariable linear regression analyses were conducted to study possible correlates of compliance.

RESULTS

Of the 422 questionnaires distributed, 391 (92.7%) were returned, and 374 (88.6%) had been completed. The average age of the HCWs was 36.2 years (range, 19–64). The majority was female (84.0%) and working as a nurse (62.8%).

Most HCWs (82.1%) reported to have experienced PI, and 48.7% had experienced exposure by contact of nonintact skin during their work lifetime. On average, they had almost 2 episodes of exposure in the preceding year (Table 1). PI was the major threat in all job categories. The leading causes of PI were injuries by suture needle (40.6%) in doctors, by hypodermic needles (75.7%) and syringe needles (56.6%) in nurses, and by hypodermic needles (32.6%) in technicians. Nurses experienced significantly more PI, nonintact skin contact, and exposure episodes than doctors and technicians ($P < .001$).

Of all HCWs, only half reported to have correctly practiced the procedures regarding the disposal of sharp objects (53.2%). Compliance with regard to the wearing of PPE other than gloves was low (less than 50%) (Table 2). Overall, the HCWs followed an average of 5.3 of the 8 guidelines (95% confidence interval [CI]: 5.1–5.5). Less than half of all HCWs indicated that they were aware of the guideline (46.8%) or had ever been trained on related knowledge (43.6%). Regression analyses of compliance score demonstrated that compliance was higher in nurses ($\beta_{\text{nurses}} = 1.24$; 95% CI: 0.65–1.83 and $\beta_{\text{doctors}} = 1.02$; 95% CI: 0.41–1.63), those who were aware of SP ($\beta = .45$; 95% CI: 0.08–0.81), and those who were trained on SP ($\beta = .42$; 95% CI: 0.05–0.78).

DISCUSSION

This study reveals a high level of occupational exposure to blood and overall suboptimal compliance with SP among HCWs in 2 hospitals in Beijing. The specific information on blood exposure provides evidence for priority setting for behavioral change and target groups, eg, doctors should pay more attention to preventing injuries from suture needles, whereas nurses should pay more attention to preventing injuries from hypodermic and syringe needles.

The suboptimal compliance with SP, together with the high level of occupational blood exposure, highlights the urgent need for interventions to enhance the occupational safety of HCWs. To improve compliance of HCWs with SP, our results indicate the need for increasing awareness and improving training on SP among HCWs in China. Furthermore, we suggest to also include other psychosocial factors, such as attitude, belief, and social norm, from the Theory of Planned Behavior,⁵ which has previously shown effectively to explain and enhance compliance of HCWs.⁶ Finally, a favorable physical environment is essential. For example, sufficient supply of PPE is a prerequisite for compliance of HCWs with SP.⁷

Our findings need to be interpreted with some caution. This retrospective study relies on self-reported information, possibly leading to under-reporting of actual exposure (because of recall bias) and to overestimate the extent to which they comply with SP in practice (because of social desirability bias). Also, the respondents came from tertiary hospitals where health care quality and safety are considered to be higher than in general hospitals in China.⁸ Nevertheless, the high level of risk and insufficient precautions taken in the tertiary hospitals, as well as the likelihood of under-reporting of exposure and over-reporting of compliance, reflect an urgent need for interventions to improve the occupational safety of HCWs nationally.

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