HHS Public Access

Author manuscript

Int Emerg Nurs. Author manuscript; available in PMC 2017 September 01.

Published in final edited form as:

Int Emerg Nurs. 2016 September ; 28: 14–19. doi:10.1016/j.ienj.2015.11.007.

SHARPS INJURIES AMONG EMERGENCY DEPARTMENT NURSES IN ONE TERTIARY CARE HOSPITAL GHANA

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Keywords

Healthcare worker safety; Ghanaian healthcare workers; bloodborne pathogen transmission; sharps injury prevention; infectious diseases

INTRODUCTION

Exposure to bloodborne pathogens is the most serious occupational health risk encountered within the healthcare profession worldwide (Leow et al., 2012; Wicker et al., 2008). In a study of US hospitals, nurses accounted for nearly half of all needlestick injuries (Chen and Jenkins, 2007). Additionally, sharps injuries often go unreported. In a survey of 259 US emergency healthcare workers (physicians, nurses, and technicians), nurses were found to report only two-thirds of sharps injuries (Tandberg, Stewart and Doezema, 1991).

On a global scale, the cost of disease from occupationally acquired hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) is high (Phillips, Owusu-Ofori, and Jagger, 2007; Yang and Roberts, 2010). The World Health Organization (WHO) estimates that of 35 million healthcare workers (HCWs) worldwide, approximately 3 million experience percutaneous injuries each year. As a result of these exposures, 66,000 HCWs are likely to become infected with HBV, 16,000 with HCV, and 1,000 with HIV (Pruss-Ustun, Rapiti and Hutin, 2005; WHO, 2003). A disproportionate number of these bloodborne infections (more than 90%) occur in developing countries (WHO, 2003; Yarahmadi et al., 2014). Additionally, HCWs providing care in operating, delivery, and emergency departments (ED) have an enhanced risk of exposure due to the nature of their frequent exposure to sharps used in these specialized areas (WHO, 2003).

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BACKGROUND

The adult (15-49 years) prevalence of HIV/AIDS in the country of Ghana is 1.4% (UNAIDS, 2013; WHO, 2005a). In Africa, HBV is endemic (Hwang and Cheung, 2011; WHO, 2002; WHO, 2010). Decreasing the risk of infection caused by bloodborne pathogens in Ghana and other developing countries has the potential to significantly influence healthcare economics and positively impact infection prevention.

The Occupational Safety and Health Administration (OSHA) is a part of the United States Department of Labor, and was created in the 1970s to ensure safe and healthful working conditions (OSHA, 2010a). This is achieved by setting and enforcing standards and by providing training, outreach, education, and assistance in the workplace (OSHA, 2010b). Although OSHA is an institution specific to the U.S., its standards serve as a model for occupational healthcare worldwide.

The major source of bloodborne infections among hospital workers is through percutaneous injury by needlestick or other sharp instrument (WHO, 2011). A sharps injury is defined by the Center for Disease Control and Prevention (CDC) (2011) as “a penetrating stab wound from a needle, scalpel, or other sharp object that may result in exposure to blood or other body fluids” (p. 1). The CDC, OSHA, and WHO have all synthesized the most current scientific findings to create recommendations, guidelines, and protocols to reduce the risk of sharps injuries (CDC, 2001; Kuhar et al., 2013; OSHA, 2010b; WHO, 2003). These include compliance with universal precautions, pre-employment hepatitis B immunizations of HCWs, utilization of personal protective equipment, and post-exposure management.

Very few studies have examined the occurrence and risk of sharps injuries among nursing staff in sub-Saharan Africa (Amira & Awobusuyi, 2014; Nsubuga & Jaakkola, 2005), and no prevalence data exist, The objectives of this study were to: (1) examine the frequency of sharps injuries, and (2) assess the adequacy, understanding, and use of post-exposure protocols within a sample of the nursing staff at a busy tertiary care emergency department in the Ashanti Region of Ghana. The aim of the study was to examine the policies and procedures for sharps injuries in a Ghanaian ED within the context of OSHA standards, describe adherence to the policies, and make recommendations for practice both locally and internationally.

METHODS

Study design

A mixed-methods descriptive study was conducted in July, 2010 to examine the frequency of sharps injuries among the nursing staff and assess the adequacy, understanding, and use of post-exposure protocols at a busy tertiary care ED in the Ashanti Region of Ghana. Data collection included a written survey of emergency department nurses, and review of hospital injury reports, policies, and procedures. The study was approved by the Institutional Review Board at the author’s university and the health system associated with the emergency department.

Setting and sample

The hospital selected for the study site is one of three large teaching hospitals associated with medical schools in Ghana. The 1000-bed facility serves approximately 4 million people in the Ashanti region and receives referrals from nearby regions and throughout the entire country. The Accident and Emergency Center was built as part of a government response to prioritize emergency medicine in the country and provides advanced clinical care through specialist outpatient consultation services, inpatient services, surgical operative care, pharmacy services, and emergency services consisting of resuscitation (trauma), major and minor procedures, clinical decision, and triage (University of Michigan – Emergency Medicine, 2010). The ED is extremely busy with 70-100 new patients admitted each day and is located within the National Accident and Emergency Center.

A purposive sample of emergency department nursing staff (n=45) was recruited to complete a structured survey. Inclusion criteria for the survey were employment as a nurse in the accident/emergency department, and ability to read and write English.

Instruments

Three members from the nursing department administration were purposively selected to participate as key informants to inform development of the written survey based on their knowledge of the department. The nurse administrators selected for key informant interviews included the nursing supervisor of the emergency department, the nurse-manager of a section within the emergency department, and the infection prevention and control nurse.

A semi-structured interview guide was created by the US investigators for use in conducting key informant interviews. The interview items focused on the content and detail of the post-exposure protocol and training practices in place at the hospital, with a focus on specific practices within the emergency department. Emergency department nurse administrators were selected for their first-hand, in depth knowledge about the topic. Semi-structured, in-depth interviews with key informants allowed them to illuminate their own perspective on the topic while shepherding development of the structured survey.

The 14-item written survey solicited descriptive information from subjects utilizing multiple-choice, closed-ended, and open-ended questions. The tool queried subjects regarding their personal history of sharps injuries within the past 12 months and knowledge of institutional post-exposure protocols. Details of sharps injuries were solicited, including the procedure being performed, the device that caused the exposure, and the circumstances that surrounded the exposure. Subjects were also given an opportunity to make suggestions to improve the existing sharps injury prevention program.

Hospital injury reports, policies, and procedures were reviewed. Selected data (e.g., frequencies of injuries) were extracted directly from emergency department injury reports, provided by the hospital Director of Nursing. The 2010 bloodborne exposure standards of OSHA (2010b) served as a guideline for review of hospital documents including policies and procedures.

Study procedures

Data collection methods included a structured survey and review of injury reports, policies, and procedures related to sharps injuries and bloodborne pathogens. Prior to administering the survey, the purpose of the study was explained to participants and all questions were answered. Participation was voluntary and informed consent was obtained from all participants. Pencil-and-paper surveys were administered to nursing staff jointly by the nursing supervisor of the emergency department and an investigator in a group setting at the hospital.

Hospital policies and procedures for post exposure prophylaxis in the event of a sharps injury were supplied by the key informants to the investigators for review. Data were collected over a three-week period in 2010.

Analysis

Data from the structured survey were entered and coded using Statistical Package for the Social Sciences 18.0 (SPSS; IBM, Armonk, NY, USA). Descriptive analyses included frequencies and distributions of key variables.

Written policies and procedures were reviewed and compared to OSHA standards. Emergency department injury records were examined and data were extracted for reported workplace sharps injuries.

RESULTS

Participant characteristics

A sample of 45 nurses from the emergency department was recruited to complete the study survey. Years of employment for participants in this study ranged from less than 1 year to 39 years, with an average of 8 years.

Results of survey data

Most nurses (93%, n=42) correctly selected all of the immediate steps to perform if a sharps injury occurs, (i.e., clean skin wounds with soap and water; flush mucosal surfaces with water, and note the details of the source of exposure, such as patient name, time, and location). Seventy-five percent (n=34) of emergency department nursing staff stated they did not routinely recap needles. When recapping was required, subjects reported, the task was usually accomplished with a single-handed technique.

Over half the subjects (n=23) completing the survey stated they were aware of a protocol within the hospital to report a sharps injury. However, less than 10% (n=4) could list in short answer format all three essential components to be followed when a sharps injury occurs: (1) perform the immediate steps (as listed above), (2) report to the voluntary counseling and testing center/dispensary for risk assessment, and (3) notify manager or supervisor. Only 20% (n = 9) of the ED nurses surveyed correctly identified from a list of pathogens, those that an employee could be exposed to from a sharps injury.

Results of review of hospital injury records, policies, and procedures

The hospital maintains a detailed procedure to be followed in the event of a possible sharps injury. This procedure consisted of an algorithm with steps included from immediate exposure to voluntary testing and counseling for HIV and long term medical care follow up. A post exposure prophylaxis record, to be filled out by a member of the infection prevention and control committee, was also reviewed. This record serves as documentation of an injury as well as any post exposure lab work and medication regimes started for the employee with a sharps injury.

Institutional injury records revealed that within the past 12 months of employment, 28.9% of the emergency department nursing staff reported and documented a sharps injury. Of those nurses reporting this type of workplace injury, 45.5% incurred one sharps injury while 18.2 % stated they had experienced two sharps injuries. The remainder (36.3%) had experienced four or more sharps injuries within the past year. These injuries usually occurred prior to giving an injection. There were no reports of these incidents being sufficiently severe to require a dressing or suturing (See Table 1).

The policy for sharps injuries and post exposure procedures used in the emergency department generally met the bloodborne exposure standards of OSHA (OSHA, 2010b). The only exception to fully meeting the standards set by OSHA was the procedure for serologic testing for HBV. The procedure in place at the hospital where the study was conducted recommends testing employees with a sharps injury for HIV, but not for HBV. See Table 2 for a review of OSHA bloodborne pathogen standards and study hospital policies and procedures.

An algorithm detailing the specified actions to be taken in the event of a sharps injury is available to all HCWs in the ED and outlines the steps to be taken following a sharps injury. Table 3 presents a comparison of the hospital algorithm to the OSHA standards for post-exposure evaluation and follow-up.

DISCUSSION

The WHO (2005b) estimates 16000 new HCV infections and 66000 HBV infections occur annually in HCWs worldwide from exposure to bloodborne pathogens with 40%-65% attributable to percutaneous occupational exposure. Less than 10% of our sample could list the three essential components outlined in the hospital policy and procedures to be followed when a sharps injury occurs, putting them at high risk for potential infection.

A survey of 526 nurses and midwives providing direct patient care at a referral hospital in Uganda found 57% had experienced at least one sharps injury during the past 12 months (Nsubuga and Jaakkola, 2005). Findings from our study reveal over one-quarter of respondents reported at least one sharps injury in the past 12 months.

Each year in the US, hospital based health care workers sustain 385,000 sharps-related injuries equating to an average of approximately 1000 sharps injuries per day (Safe in Common, 2015). Over one-third of nurses responding to our survey reported four or more

sharps injuries in the past 12 months. This high rate of repeat exposure puts them at significant risk for acquiring a potential serious infection and resultant chronic infectious disease. It also highlights the need for additional risk prevention measures.

Although OSHA is an institution specific to the U.S., the Ghanaian hospital emergency department studied generally met the bloodborne exposure standards (OSHA, 2010b) of this agency. The only exception to fully meeting this section of the standard is in relation to serologic testing for HBV; the hospital tested the exposed employees for HIV, but not for HBV.

It is important to recognize that hepatitis B is more transmissible than HIV, and the risk of contracting HBV infection from a single sharps injury in the U.S. is between 6 and 30% (OSHA, 2010c). Additionally, 50% of people with HBV infection are unaware they have the virus (OSHA, 2010c). Since the rate of HBV in Ghana is much higher than HIV (Hwang and Cheung, 2011; UNAIDS, 2013; WHO, 2002; WHO, 2005a; WHO, 2010) it is noteworthy that HBV serology, and post-exposure HBV prophylaxis is not routinely offered to injured employees.

This study included several limitations. The study included a small sample size. Selection bias may be present in our results as only nurses during the day shift were surveyed; the study excluded emergency department nurses working at other times of day and other emergency department health care workers (e.g., physicians, staff). Other shift workers may also be at high risk for sharps injuries, and could benefit from inclusion in the study. Although the interviewers were not employees of the hospital, interviewees may have been reluctant to fully disclose. Finally, this work was limited to one hospital setting in the Ashanti region of Ghana. It would be useful for future studies to examine additional geographical locations and types of facilities. In addition, the review of hospital policies and procedures focused on post-exposure protocol and training. The OSHA Bloodborne Pathogens Standard is more comprehensive, and includes many activities focused on prevention of exposure. It may be fruitful to expand the review to include an examination of primary prevention policies and procedures.

Educational and Policy Implications

Several policy and educational interventions are indicated. Given the high rate of bloodborne disease in the population seeking care, the risk of occupation-acquired infection in this group is high. There is an urgent and pressing need for policy and educational interventions to address the infectious disease risk to this worker group.

Several recommendations for improving existing protocols and decreasing the risk of injury/exposure emerged from the study. First, more education (including periodic classes) on prevention of sharps injuries and proper disposal of sharps may reduce infection risk. This could potentially improve the handling of equipment used for injections – the most frequent mode of injury reported in this study.

It would be useful to display the exposure protocol in highly visible locations throughout all sections of the emergency department. Similarly, placement of proper sharps disposal

containers in convenient locations in all patient care areas would be useful. Finally, the immunization protocol could be changed to routinely offer vaccination for hepatitis B to all high risk employees.

Immunization against HBV for high risk workers such as nurses and others in emergency departments, operating rooms and delivery rooms is warranted in all countries. Offering HBV post-exposure prophylaxis per CDC guidelines (2001) to emergency department staff would be clinically appropriate, owing to their high risk of incurring a sharps injury. Ideally, all hospital employees would have access to HBV serology testing and post-exposure prophylaxis. Additionally, implementing an employee hepatitis B vaccination program could be considered, as none currently exists; although employees are encouraged to know their HBV status.

CONCLUSION

The emergency department in this study is one of the major medical institutions in Ghana. Employees are at increased risk for contracting bloodborne disease in the workplace in this clinical setting with high volume and high patient acuity. There are appropriate post-exposure guidelines currently in place at the institution, and there exist several realistic, low cost interventions which could further improve the safety of nurses and other HCWs as they provide patient care.

As a result of bloodborne exposures, 66,000-70,000 HCWs are likely to be infected with HBV, 15,000-16,000 with HCV, and 1000 with HIV with more than 90% of these infections occurring in developing countries (Pruss-Ustun, Rapiti, and Hutin, 2005; WHO, 2003; WHO, 2005b; Yarahmadi et al., 2014). The cost of occupationally acquired diseases is high in terms of long term treatments required for HCV, HBV, and HIV. Additionally, loss of employee time, cost of laboratory testing and treatment, and the expense to replace staff adds to the burden of costs incurred by the health care facility and the affected worker. Decreasing the risk of infection caused by bloodborne pathogens in Ghana and other developing countries has the potential to significantly influence healthcare economics, positively impact infection control and improve the working environment for all healthcare providers.

Acknowledgements

Financial support for this project was received by (Dr. Marjorie McCullagh and Alicia Krueger) from the Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health training grant #T42-OH-008455. The development of this article was also supported in part by research grant 1 K01 TW008763-01A1 from Fogarty International, National Institutes of Health (Dr. Jody Lori, PI). The content is solely the responsibility of the authors and does not necessarily represent the official views of Fogarty International, the National Institutes of Health, or NIOSH. The authors acknowledge Michael A. Cohen, PhD for his work in preparing the manuscript for submission.

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HIGHLIGHTS

- A high incidence of sharps-related injuries and associated exposure to bloodborne pathogens was found among the sample studied.
- Nearly 30% of subjects surveyed reported a sharps-related injury in the past 12 months.
- Over ½ the subjects completing the survey were aware the protocol to report a sharps-related injury.
- Less than 10% of subjects could list all three essential components of the hospital protocol to be followed when a sharps injury occurs.

Table 1

Emergency Department Nurses' Reports of Needlestick Injuries Within the Past 12 Months Survey item %

Survey item	%
Any needlestick/sharp injury	28.9
Of those nurses reporting any needlestick injury, frequency of injuries in past 12 months:	
One	45.5
Two	18.2
Three	0
Four or more	36.3
Needlesticks requiring a dressing or suturing	0

Table 2

Results of Review of Hospital Policies and Procedures

OSHA Bloodborne Pathogen Standard	Rating*	Notes
Exposure control plan identifies at-risk employees and tasks {1910.1030(c)}	A	
Employer review of exposure control plan q 12 mo {1910.1030(c)(1)(iv)}	A	
Worker input in selection of devices{1910.1030(c)(1)(v)}	A	
Employer provides safety equipment including sharps disposal containers {1910.1030(d)(2)(i)}	A	
Workers are provided with personal protective equipment {1910.1030(d)(3)}	A	
Workers trained on safety devices, work practices, PPE on hire and annually; records kept{1910.1030(g)(2)}	A	An infection prevention and control committee coordinates training during the orientation of new employees. Training is conducted over 2-3 days (depending on the number of participants at a given time), and includes the proper technique for handling needles, as well as information about bloodborne pathogens, universal precautions, employee protective equipment, procedures surrounding needlestick injuries, workplace hazards, and other relevant new hire information. Documentation of the employee who led each training, training curriculum, date, and participating employees is recorded and maintained for five years.
Prohibits certain practices (bending, recapping, removing contaminated needles {1910.1030(d)(2)(vii)}	A	
All equipment and working surfaces decontaminated after contact with blood or other infectious materials {1910.1030(d)(4)(ii)}	A	
Contaminated materials discarded ASAP in leakproof color coded containers {1910.1030(d)(2)(viii)}	A	
Hepatitis B vaccine available at no cost to workers {1910.1030(f)(2)}	C	Hepatitis B vaccine is not available nor is it a requirement of employment.
Screening & treatment provided after exposure {1910.1030(f)}	B	No immunoglobulin for prevention of hepatitis B available.

*A= standard fully met; B= standard partially met; C= standard not met

Table 3

Review of Post-exposure Evaluation and Follow-up

OSHA Standard	Rating*	Hospital Algorithm
Following a report of an exposure incident, the employer shall make immediately available to the exposed employee a confidential medical evaluation and follow-up.	**A**	If the injury occurs during a weekday from 9am to 5pm, the employee is instructed to report to the voluntary counseling and testing center for a risk assessment with a counselor or a post-exposure prophylaxis team member; if the injury occurs during the weekend, the employee reports to the dispensary, where risk assessment with a pharmacist or by phone with a post-exposure prophylaxis team member takes place.
(f)(3)(i) Documentation of the route(s) of exposure, and the circumstances under which the exposure incident occurred;	C	No direction provided by algorithm/protocol.
f)(3)(ii) Identification and documentation of the source individual, unless the employer can establish that identification is infeasible or prohibited by state or local law;	A	Details surrounding the exposure (such as patient name, time, and location) should be documented.
(f)(3)(ii)(A) The source individual's blood shall be tested as soon as feasible and after consent is obtained in order to determine HBV and HIV infectivity. If consent is not obtained, the employer shall establish that legally required consent cannot be obtained. When the source individual's consent is not required by law, the source individual's blood, if available, shall be tested and the results documented.	B	A source blood draw for HIV testing is performed following all needlestick exposures. Regardless of when the needlestick injury happens, the counselor, post-exposure prophylaxis team member, or pharmacist rates the risk of infection (i.e., negligible/very low risk; significant risk). If the incident is rated as a significant risk, HIV post-exposure prophylaxis is started immediately (with employee consent) by the public health MD/physician or pharmacist.
(f)(3)(ii)(B) When the source individual is already known to be infected with HBV or HIV, testing for the source individual's known HBV or HIV status need not be repeated.	C	No direction provided by algorithm/protocol.
(f)(3)(ii)(C) Results of the source individual's testing shall be made available to the exposed employee, and the employee shall be informed of applicable laws and regulations concerning disclosure of the identity and infectious status of the source individual.	C	No direction provided by algorithm/protocol.
(f)(3)(iii) Collection and testing of blood for HBV and HIV serological status; (f)(3)(iii)(A) The exposed employee's blood shall be collected as soon as feasible and tested after consent is obtained.	A	A blood draw HIV testing is performed following all needlestick exposures.
(f)(3)(iii)(B) If the employee consents to baseline blood collection, but does not give consent at that time for HIV serologic testing, the sample shall be preserved for at least 90 days. If, within 90 days of the exposure incident, the employee elects to have the baseline sample tested, such testing shall be done as soon as feasible.	C	No direction provided by algorithm/protocol.
(f)(3)(iv) Post-exposure prophylaxis, when medically indicated, as recommended by	A	If the incident is rated as a significant risk, HIV post-exposure prophylaxis is started

OSHA Standard	Rating*	Hospital Algorithm
the U.S. Public Health Service;		immediately (with employee consent) by the public health MD/physician or pharmacist.
(f)(3)(v) Counseling	A	All needlestick injuries reported to the voluntary counseling and testing center/dispensary are then documented on a post-exposure prophylaxis record sheet completed and signed by the employee, employee's supervisor, and counselor/post exposure prophylaxis team member/pharmacist.
(f)(3)(vi) Evaluation of reported illnesses.	A	The voluntary counseling and testing center maintains copies of these documents for five years, and the public health unit enters this information into the public health unit computer system. Additionally, the counselor, public health MD/physician, or pharmacist instructs the employee in HIV post exposure prophylaxis medication administration, and to return to the center in 3 and/or 6 months, as necessary.

*A= standard fully met; B= standard partially met; C= standard not met