Benchmarking of Percutaneous Injuries at the Ministry of Health Hospitals of Saudi Arabia in Comparison with the United States Hospitals Participating in Exposure Prevention Information Network (EPINet™)

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Abstract

Background: Exposure to blood-borne pathogens from needle-stick and sharp injuries continues to pose a significant risk to health care workers. These events are of concern because of the risk to transmit blood-borne diseases such as hepatitis B virus, hepatitis C virus, and the human immunodeficiency virus.

Objective: To benchmark different risk factors associated with needle-stick incidents among health care workers in the Ministry of Health hospitals in the Kingdom of Saudi Arabia compared to the US hospitals participating in Exposure Prevention Information Network (EPINet™).

Methods: Prospective surveillance of needle-stick and sharp incidents carried out during the year 2012 using EPINet™ ver 1.5 that provides uniform needle stick and sharp injury report form.

Results: The annual percutaneous incidents (PIs) rate per 100 occupied beds was 3.2 at the studied MOH hospitals. Nurses were the most affected job category by PIs (59.4%). Most PIs happened in patients' wards in the Ministry of Health hospitals (34.6%). Disposable syringes were the most common cause of PIs (47.20%). Most PIs occurred during use of the syringes (36.4%).

Conclusion: Among health care workers, nurses and physicians appear especially at risk of exposure to PIs. Important risk factors of injuries include working in patient room, using disposable syringes, devices without safety features. Preventive strategies such as continuous
training of health care workers with special emphasis on nurses and physicians, encourage-
ment of reporting of such incidents, observation of sharp handling, their use and implementa-
tion of safety devices are warranted.

Keywords: Needlestick injuries; Benchmarking; Health personnel; Blood-borne patho-
gens; Occupational exposure

Introduction

Exposure to blood and body fluids oc-
curs across a variety of occupations. Health care workers (HCWs), emergency response and public safety staff, and other workers are exposed to blood through needle-stick and other sharps in-
juries, and mucous membrane and skin exposures. The pathogens of primary con-
cern are the human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV).1-3

The risk of blood exposure is high for HCWs performing invasive procedures, those procedures which involve the use of sharp instruments and/or where there is a risk of contact between a patient’s blood or body fluids and the blood of the HCW.4

The risk of HBV, HCV and HIV trans-
mision after exposure to blood and body
fluids increases respectively, by 6%–30%, 0.5%, and 0.3%, with increasing viral load of the source patient and the amount of blood exposure.3 More than three million HCWs worldwide are exposed to HBV, HCV or HIV each year as a result of needle-stick and sharps injuries (NSSIs).5

Reporting of NSSIs is important for the treatment and prevention. For the injured person, NSSI reporting prompts evaluation for post-exposure prophylaxis, allows early detection of seroconversion and helps to decrease anxiety. Furthermore, injury reporting allows identification of hazardous devices or procedures and so serves to diminish the risk of future injuries.6

The epidemiological aspects of needle-
stick injuries in the Kingdom of Saudi Arabia (KSA) has so far been described at localized health care institutions.7-13 We conducted this study to benchmark different risk factors associated with needle-
stick incidents among health care workers in the Ministry of Health (MOH) hospitals in the KSA compared to the US hospitals participating in Exposure Prevention In-
formation Network (EPINet™). To the best of our knowledge, this is the first re-
port from the MOH, KSA at national level using aggregate reported needle-stick in-
cidents from 52 hospitals participating in EPINet™ program during the year 2012.

Materials and Methods

All reported cases of percutaneous injuries (PIs) in 52 MOH hospitals in KSA using EPINet™ ver 1.5 program reports during 2012 were compared to the US EPINet™ reports in 2011. The US reports included PIs occurred in nine teaching hospitals and 23 non-teaching hospitals.

According to the MOH policy, HCWs sustaining PIs are instructed to inform their supervisors and report the incident to the infection control staff in their facil-
ity. The infection control staff recorded the information about the incident using EPINet™ ver 1.5. PIs report form is uniform and includes job category, where and when the injury occurred, type of device and original purpose of the sharp item, whether the sharp item was contaminated, and if the source patient was known, who was the original user of the sharp item, and the place and severity of the injury.

Data Collection

EPINet™ is a software package created for recording and analyzing occupational ex-
posures to blood-borne viruses. The focus
Percutaneous Injuries in Saudi vs US Hospitals

Table 1: Rate of needle-stick injuries per 100 daily occupied beds in MOH hospitals of Saudi Arabia in 2012 and US teaching and non-teaching hospitals using EPINet™ in 2011

| Parameter                              | Saudi MOH hospitals | US teaching hospitals | US non-teaching hospitals |
|----------------------------------------|---------------------|-----------------------|---------------------------|
| Number of participating hospitals      | 52                  | 9                     | 23                        |
| Average daily census                   | 12,402              | 2,542                 | 1,096                     |
| Number of needle-stick injuries        | 397                 | 527                   | 181                       |
| Rate of needle-stick injuries per 100 occupied hospital beds | 3.2                 | 20.7                  | 16.5                      |

1.5 software were analyzed using SPSS® for Windows® ver 13. Then, risk analysis was performed to find significant epidemiologic characteristics of percutaneous injuries at MOH hospitals.

Ethics

To ensure privacy, dignity, and integrity of the participants, names of the HCWs were kept confidential. We collected data without any names. Every injured HCW was informed of the details of the study before their information were used for the analyses. No one refused to share. Institutional Ethical Committee clearance for accessing HCWs records was taken.

Results

The rates of needle-stick injuries in studied Saudi hospitals and US hospitals are shown in Table 1. The rate of needle-stick injuries per 100 occupied hospital beds in Saudi MOH hospitals was significantly (p<0.001) lower than that in US hospitals (Table 2). The rate of PIs among Saudi hospital nurses (59.4%) was significantly (p=0.004) higher than that reported from US hospitals. Saudi hospital surgery attendants had a significantly (p=0.01) lower rate of PIs (1.3%) than their US counterparts (7.6%). The rate of PIs reported from Saudi hospital operating/recovery rooms

**TAKE-HOME MESSAGE**

- Exposure to blood and body fluids occurs across a variety of occupations.
- The pathogens of primary concern are the human immunodeficiency virus, hepatitis B virus, and hepatitis C virus.
- The rate of percutaneous injuries in Saudi Arabia was significantly lower than the rates in both teaching and non-teaching hospitals in the USA.
- Nurses were the most affected job category.
- Disposable syringes were the most common cause of PIs.
| Characteristics                        | Saudi MOH hospitals n (%) | US hospitals n (%) | p value |
|---------------------------------------|--------------------------|--------------------|---------|
| **Job category**                      |                          |                    |         |
| Doctor                                | 61 (15.9)                | 161 (22.8)         | 0.3     |
| Nurse                                 | 227 (59.4)               | 296 (41.9)         | 0.004   |
| Respiratory therapist                 | 1 (0.3)                  | 21 (3.0)           | 0.3     |
| Surgery attendant                     | 5 (1.3)                  | 54 (7.6)           | 0.01    |
| Phlebotomist/venipuncture/IV team     | 1 (0.3)                  | 25 (3.5)           | 0.3     |
| Clinical laboratory worker            | 2 (0.5)                  | 3 (0.4)            | 0.3     |
| Housekeeper                           | 18 (4.7)                 | 15 (2.1)           | 0.2     |
| **Place of the injury**               |                          |                    |         |
| Patient room/ward                     | 133 (34.6)               | 234 (33.2)         | 0.8     |
| Emergency department                  | 70 (18.2)                | 61 (8.7)           | 0.03    |
| Intensive/critical care unit          | 29 (7.6)                 | 31 (4.4)           | 0.2     |
| Operating room/recovery               | 69 (17.9)                | 236 (33.5)         | 0.01    |
| Outpatient clinic/office              | 15 (3.90)                | 28 (4)             | 0.7     |
| **The injured worker the original user of the sharp item** | | | |
| Yes                                   | 292 (74.9)               | 453 (66.6)         | 0.12    |
| No/Unknown                            | 98 (25.1)                | 227 (33.4)         |         |
| **The original purpose of the sharp item** | | | |
| Injections, intramuscular/subcutaneous| 95 (25.2)                | 212 (30.5)         | 0.4     |
| Other injections, into IV injection site or port | 15 (3.9) | 7 (1.0) | 0.2 |
| To draw a venous blood sample         | 56 (14.9)                | 61 (8.8)           | 0.2     |
| To draw an arterial blood sample      | 10 (2.7)                 | 22 (3.2)           | 0.6     |
| To obtain a body fluid or tissue sample| 5 (1.3)                 | 14 (2.0)           | 0.5     |
| Finger stick/heel stick               | 12 (3.2)                 | 10 (1.4)           | 0.3     |
| Suturing                              | 66 (17.5)                | 130 (18.7)         | 0.3     |
| Cutting                               | 15 (3.9)                 | 60 (8.6)           | 0.2     |
| To place an arterial/central line     | 3 (0.8)                  | 12 (1.7)           | 0.6     |
Continued

Table 2: Comparison of the characteristics of percutaneous injuries reported in Saudi MOH hospitals in 2012 and US hospitals in 2011

| Characteristics | Saudi MOH hospitals n (%) | US hospitals n (%) | p value |
|-----------------|--------------------------|-------------------|---------|
| **Type of activity associated with the injury** | | | |
| Before use of an item | 8 (2.2) | 18 (2.6) | 0.6 |
| During use of an item | 133 (36.5) | 283 (40.7) | 0.6 |
| Between steps of a multi-step procedure | 26 (7.2) | 82 (11.8) | 0.2 |
| While recapping a used needle | 31 (5.6) | 19 (2.7) | 0.3 |
| Others, after use, before disposal | 50 (13.9) | 108 (15.5) | 0.7 |
| While putting the item into the disposal container | 18 (4.9) | 22 (3.2) | 0.5 |
| Restraining patient | 4 (1.10) | 3 (0.4) | 0.3 |
| Device left on the floor, table, bed, or other inappropriate places | 18 (4.9) | 36 (5.2) | 0.7 |
| **Type of device associated with the injury** | | | |
| Syringe, disposable | 118 (47.2) | 250 (37.4) | 0.2 |
| IV catheter | 14 (5.6) | 26 (3.9) | 0.5 |
| Suture needle | 33 (13.2) | 124 (18.6) | 0.2 |
| Scalpel, reusable | 1 (0.4) | 27 (4.0) | 0.1 |
| Scalpel, disposable | 4 (1.6) | 20 (3.0) | 0.3 |
| **Injured item with a safety device feature** | | | |
| Yes | 31 (13.2) | 287 (44.3) | 0.04 |
| No | 204 (86.8) | 361 (55.7) | |
| **Glove use during incidents** | | | |
| Single pair of gloves | 255 (68.0) | 465 (68.9) | 0.8 |
| Double pair of gloves | 39 (10.4) | 124 (18.4) | 0.1 |
| No gloves | 81 (21.6) | 86 (12.7) | 0.06 |
(p=0.04) higher than that reported in US hospital workers (55.7%).

**Discussion**

This study included 52 MOH hospitals in Saudi Arabia and 32 US hospitals that were using EPINet™ ver 1.5. The number of reported PIs during 2012 in Saudi Arabia was 397 that translated to a rate per 100 occupied beds of 3.2 at the studied MOH hospitals. This rate was significantly (p<0.001) lower than the rates in both teaching and non-teaching hospitals in the US (20.7% and 16.5%, respectively). This may be due to under-reporting of such incidents in MOH hospitals in KSA, which represent a serious threat to development of an accurate estimate of incidence rates. There are several possible reasons for under-reporting of PIs in KSA including perception of low risk of infection, lack of time, and fear of consequences. Therefore, great efforts should be made in Saudi Arabia to enhance the health education among HCWs.

In our study, nurses were the most affected job category by PIs, which coincides with many other studies (Table 2). Nurses are working most of the time in close contact with patients performing different procedures (IV access procedures, blood sampling, different types of injections, etc) and are thus more vulnerable. Furthermore, it seems that nurses have more compliance with reporting instructions as supported by other studies.

Physicians were the second group of HCWs affected by PIs; they do fewer procedures exposing them to PIs and may also. It may also be attributed to their under-reporting behavior, a finding that coincides with that of the US EPINet™ hospitals and other reports. The higher rate of PIs among housekeepers in Saudi MOH hospitals compared to the US hospitals explained by the very rapid turnover of these workers, as they are of different nationalities with low level of education due to the language barrier.

Most PIs happened in patients' wards in Saudi MOH hospitals (34.6%). This is similar to another study that reported that the patient room where the place of the largest proportion of overall NSSIs followed by the operating room. Another study also found that during a four-year period, wards consistently were the most common places of occurrence of NSSIs, while another report indicated that areas of the hospital with the highest activities, such as operating room and intensive care units, had the highest number of sharp injuries. In studied US hospitals, the operating/recovery room was the most common place where PIs reported. It would be due to strict policies of safety engineering devices used in the non-operating settings. Sharp injuries pertained to each clinical specialty differed across various studies that attributed to the type of sharp devices used and the variation in clinical practices among different health care settings.

The higher rate of PIs acquired by HCWs when they were the original users of the sharp item in our study comparred to those working in a similar condition in US EPINet™ hospitals may reflect the need for more education and training of HCWs on the best practice for preventing PIs.

There was a high rate of PIs occurred during injection procedures of different types—intramuscular, subcutaneous, or injection into IV injection site or port. This finding was similar to that of studied US hospitals, which might be due to the fact that these activities are the most frequent procedures done during patient care.

Most PIs occurred during use of the item in both studied Saudi MOH hospitals and US hospitals (36.8% and 40.7%, respectively) most probably due to malpractice. This finding warrants for revision of policies regarding safety devices use.

For more information on the psychosocial factors at work and blood-borne exposure among nurses see http://www.theijoem.com/ijoem/index.php/ijoem/article/view/361
Similar to previous studies, 1,10,25 inappropriate use of disposable syringe was the most common cause of PIs in both Saudi MOH hospitals and US hospitals (47.2% and 37.4%, respectively). This would probably because disposable syringe is the most commonly used device during patient care.

Most of the reported PIs in Saudi hospitals were caused by using a device without a safety feature (87%); this was significantly (p=0.04) different from that reported from US hospitals. This finding is in keeping with another report,1 which stress the importance of the MOH efforts to provide safety devices to all Saudi MOH facilities.

In conclusion, NSSIs represent a major occupational challenge to HCWs. Important risk factors for such injuries include being a nurse, working in patient room, using a disposable syringe with a needle, and using devices without safety features. Educational program addressing such issues together with observation of sharp handling and use practices, and proper engineering control measures are important interventions to control such incidents.

Conflicts of Interest: None declared.

References

1. Balkhy HH, Kamel E EI Beltagy, Aiman El-Saied, et al. Benchmarking of percutaneous injuries at a teaching tertiary care center in Saudi Arabia relative to United States hospitals participating in the Exposure Prevention Information Network. Am J Infect Control 2011;39:560-5.

2. National Institute for Occupational Safety and Health (NIOSH). Preventing needle stick injuries in health care settings. Department of Health and Human Services. Cincinnati: DHHS (NIOSH) Publication. 1999.

3. Centers for Disease Control and Prevention (CDC). Immunization of Health-Care Personnel. Recommendations of the Advisory Committee on Immunization Practices (ACIP). Morbidity and Mortality Weekly report (MMWR). Recommendations and Reports 2011;60:7.

4. Trim JC, Elliott TS. A review of sharps injuries and preventative strategies. J Hosp Infect 2003;53:237-42.

5. White SM. Needle stick. Anesthesia 2007;62:1199-201.

6. Cullen BL, Genasi F, Symington I, et al. Potential for reported needle stick injury prevention among healthcare workers through safety device usage and improvement of guideline adherence: expert panel assessment. J Hosp Infect 2006;63:445-51.

7. Memish ZA, Almuneef M, Dillon J. Epidemiology of needle stick and sharps injuries in a tertiary care center in Saudi Arabia. Am J Infect Control 2002;30:234-41.

8. Al-Turki KA, Abu-Gad HA. Frequency of and prevention measures for needle-stick injuries among hospital healthcare workers in Saudi Arabia. J Healthc Qual 2000;22:23-8.

9. Shanks NJ, Al-Kalai D. Occupation risk of needle stick injuries among health care personnel in Saudi Arabia. J Hosp Infect 1995;3:221-6.

10. Abu-Gad HA, Al-Turki KA. Some epidemiological aspects of needle stick injuries among the hospital health care workers: Eastern province, Saudi Arabia. European Journal of Epidemiology 2001;17:401-7.

11. Malak M, El-Hazmi, Fahad M, Al-Majid. Needle stick and sharps injuries among health care workers: A 5-year surveillance in a teaching center in Saudi Arabia. Biomedical Research 2008;19:133-40.

12. Hashmi A, Al Reesh SA, Indah L. Prevalence of Needle-stick and Sharps Injuries among Healthcare Workers, Najran, Saudi Arabia. Epidemiol 2012;2:117.

13. Ziad AM, Abdullah MA, Mervat ME, et al. Risk analysis of needle stick and sharp object injuries among health care workers in a tertiary care hospital (Saudi Arabia). Journal of Epidemiology and Global Health 2013;3:123-9.

14. University Of Virginia Health System. Epinet™: A global resource for occupational sharps injury & blood and body fluid exposure recordkeeping & surveillance. 2011, Available from www.healthsys-tem.virginia.edu (Accessed August 30, 2013).

15. Prüss-Üstün A, Rapiti E, Hutin Y. Estimation of the global burden of disease attributable to contaminated sharps injuries among health-care workers. Am J Ind Med 2005;48:482-90.

16. Hamory BH. Underreporting of needle stick injuries in a university hospital. Am J Infect Control
17. Mangione CM, Gerberding JL, Cummings SR. Occupational exposure to HIV: frequency and rates of underreporting of percutaneous and mucocutaneous exposures by medical house staff. *Am J Med* 1991;90:85-90.

18. Jagger J, Hunt EH, Brand-El Naggar J, Person RD. Rates of needle stick injury caused by various devices in a university hospital. *N Engl J Med* 1988;319:284-8.

19. Syam VCD, Delos AS, Hakawi A. Underreporting of needle stick and sharps injuries at one tertiary care hospital in Saudi Arabia. *Antimicrobial Resistance and Infection Control* 2013;2:298.

20. Jagger J, De Carli G, Perry J, et al. Occupational exposure to blood-borne pathogens: epidemiology and prevention. In: Wenzel RP, ed. *Prevention and Control of Nosocomial Infections*. 4th ed. Baltimore, Lippincott Williams & Wilkins; 2003:430-66.

21. Shah S, Bonauto D, Silverstein B, Foly M. Worker’s compensation claims for needle stick injuries among health care workers in Washington state 1996-2000. *Infect Control Hosp Epidemiol* 2005;26:775-81.

22. Cathy V, Katharine EA, Darlinga Alain KF, et al. Underreporting of needle stick and sharps injuries among healthcare workers in a Swiss University Hospital. *Swiss Med Wkly* 2012;142:w13523.

23. Lai KL, Ismail NH. Implication of the Prevalence of Needle stick Injuries in a General Hospital in Malaysia and Its Risk in Clinical Practice. *Environmental Health and Preventive Medicine* 2005:10:33-41.

24. Ghamdi SA, Al-Azraqi T, Bello C, et al. Needle stick and sharps injuries at Asir central hospital, Abha, Saudi Arabia. *Annals of Saudi Medicine* 2003;23:404-7.

25. Ippolito G, Puro V, Petrosillo N, De Carli G. Surveillance of occupational exposure to blood-borne pathogens in healthcare workers: the Italian national programme. *Eurosurveillance* 1999;4:33-6.

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