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Original Article

Knowledge, Awareness and Compliance with Universal Precautions among Health Care Workers at the University Hospital of the West Indies, Jamaica

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Abstract

Background: Universal precautions are not well understood or implemented by health care practitioners, though crucial in the prevention and transmission of blood-borne pathogens like HIV.

Objective: To assess knowledge, awareness and compliance of universal precautions among health care workers at the University Hospital of the West Indies, Jamaica.

Method: A cross-sectional survey was conducted in September and October 2007. A 28-item self-administered questionnaire was provided to 200 health care workers including medical doctors, medical technologists, nurses and porters to assess their knowledge, awareness and practice towards universal precautions.

Results: Almost two-thirds (64.0%) of the respondents were very knowledgeable of universal precautions with significantly more females (75.4%) than males (42.9%) ($p<0.0001$). More nurses (90.0%), medical doctors (88.0%) and medical technologists (70%) were very knowledgeable of universal precautions ($p<0.0001$). More respondents (92.9%) who were employed in the health sector for 16 years and over reported high levels of awareness of universal precautions than those who were employed for less than five years ($p<0.0001$). 28.6% of males and only 6.2% of females reported that they do not use protective gear. More nurses reported frequent use of protective equipment followed by medical technologists and medical doctors ($p<0.0001$).

Conclusions: There was adequate knowledge and a fair level of awareness among medical doctors, medical technologists, and nurses towards universal precautions.

Keywords: Health care workers; Knowledge; Awareness; Compliance; Universal precautions

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Introduction

Infection is one of the most important problems in health care services worldwide. It constitutes one of the most important causes of morbidity and mortality associated with clinical, diagnostic and therapeutic procedures.[1,2] Health care workers are at a high risk of needle stick injuries and blood-borne

pathogens as they perform their clinical activities in a hospital.[3] They are exposed to blood-borne infections by pathogens, such as human immunodeficiency virus (HIV), hepatitis B and hepatitis C viruses, from sharp injuries and contacts with blood and other body fluids.[4,5] According to a World Health Organization (WHO) estimate, in year 2002, sharp injuries resulted in 16 000 hepatitis C virus, 66 000 hepatitis B virus and 1000 HIV infections in health care workers worldwide.[6] Recapping, disassembly, and inappropriate disposal increase the risk of needle stick injury.[7,8] The incidence rate of these causative factors is higher in developing countries for the higher rate of injection with previously used syringes.[9] Developing countries where the prevalence of HIV-infected patients is very high, record the highest needle stick injuries too.[9] Needle stick injuries were also reported as the most common occupational health hazard in a Nigerian teaching hospital.[10]

Interventional measures have been proposed to minimize exposure of health care workers and patients to infection with the implementation of universal precautions as one of the strategies. In 1983, the US Centre for Disease Control and Prevention (CDC) published a document that recommended blood and body fluid precautions when a patient was known or suspected to be infected with blood-borne pathogens.[11,12] In 1987, the CDC recommended that regardless of patients infection status, the precautions must be consistently used. This extension of blood and body fluid precautions to all patients is referred to as "universal blood and body fluid precautions" or simply "universal precautions."[13,14] These precautions include set of precautions devised to prevent transmission of all known blood-borne pathogens including HIV, hepatitis B virus, and hepatitis C virus to/from health care personnel when providing first aid or other health care services. This applies to blood and other body fluids containing visible blood and also to vaginal secretions and semen.[15] In 1996, the CDC included the universal precautions in a new prevention concept the so-called "standard precautions."[16] The "standard precautions," which are devised to be used for the care of all patients in hospitals regardless of their diagnosis or presumed infection status, now replace the "universal precautions."

The fact that "standard precautions" are recommended for the care delivery to all patients, regardless of their presumed infection state, is important when handling equipment and devices that are contaminated or suspected of contamination, and in situations of contact risk with blood, body fluids, secretions and excretions except sweat, without considering the presence or absence of visible blood and skin with solution of continuity and mucous tissues.[16] Standard precautions include hand washing; use of barriers (*e.g.*, gloves, gown, cap, mask); care with devices, equipment and clothing used during care; environmental control (*e.g.*, surface processing protocols, health service waste handling); adequate discarding of sharp instruments including needles; and patient's accommodation in accord to requirement levels as an infection transmission source.[16] Another important measure is adequate professional immunization, as this guarantees anticipated protection against immune-preventable diseases.

The level of practice of universal precautions by health care workers may differ from one type of health care worker to another. The differences in knowledge of universal precaution by health care workers may be influenced by their different type of training. Various studies carried out among different categories of health care workers found that exposure to blood or other body fluids was approximately 9.3%.[17-19] A similar study conducted in

Ibadan found a higher exposure rate of 25.1%.[20] Several factors ranging from personal to organizational causes were responsible for non-adherence to the basic principles of universal precautions among health care providers.[21,22]

Universal precaution awareness education has not been pronounced among health care workers, particularly in developing countries. To the best of our knowledge, the compliance with universal precautions among health care workers in Jamaica has not been assessed. We, therefore, conducted this study to assess the knowledge, awareness and compliance with universal precautions among health care workers in the course of their duties at the University Hospital of the West Indies (UHWI), Kingston, Jamaica.

Participants and Methods

This study was conducted in September and October 2007 at the University Hospital of the West Indies (UHWI), Jamaica. The study was granted ethical approval by the University of the West Indies/University Hospital of the West Indies Ethics Committee. UHWI is the major teaching hospital of the University of the West Indies, with approximately 500 beds. It is one of two large general hospitals serving the Kingston metropolitan area with a population of 1 160 204. It is also a referral center for the entire island (population of approximately 2.8 million). It provides services in community health, surgery, obstetrics and gynecology, pediatrics, psychiatry and general services. UHWI has approximately 1500 staff members inclusive of administrative, clerical and medical staffs. UHWI has approximately 370 medical doctors, 600 nurses, 80 medical technologists and 150 porters as members of staff.

The number of participants in the four groups recruited in the study was predetermined to be 50 making the sample size of 200 employees recruited for the study. The participants were selected from the Departments of Surgery, Radiology, Anesthesiology and Intensive Care, Obstetrics and Gynecology/Child Health, Medicine, Pathology and Microbiology of the UHWI. The employees from these departments did their job in various wards. There were 21 wards at the UHWI. Medical doctors, nurses and porters were randomly selected from these 21 wards until 50 participants per group were obtained. The technologists were recruited mainly from the laboratories of the Departments of Pathology and Microbiology. The wards were visited on week days between 9:00 am and 5:00 pm over a period of one month. Medical doctors, nurses or porters on duty at the time of their visit were invited to participate in the study. After signing an informed written consent form, the questionnaire was given to each health care personnel. A similar procedure was carried out for the medical technologists.

Health care workers were included in the study if they had full-time employment at the UHWI, worked in one of the said departments, falls in one of the four groups and had direct contact with patients, specimen (*e.g.*, blood, urine, stool and other bodily fluids) and chemicals during their routine clinical duties. Those who did not complete the questionnaire were not included in the final data analysis.

The research was carried out by one of the authors who was appropriately trained in administering the informed consent and the self-report questionnaire to the health care workers.

In this cross-sectional study, a structured questionnaire prepared by the authors, was administered to the participants. A 28-item self-administered structured questionnaire about knowledge and awareness of universal precautions in the health care system was devised *de*

novo and tested. It included a full range of response options, designed to identify the practitioner's knowledge, awareness and compliance with universal precautions in the health care sector.

Prior to distribution of the questionnaire, a pilot study was done on a selective group of health care workers who were asked to fill out the questionnaire and return it back with their comments and criticism. Minor changes were then made to the final instrument.

The initial part of the questionnaire consisted of demographic information such as occupation, age, gender, and the years of service in the health sector. The second part of the questionnaire comprised of questions regarding their knowledge and awareness of universal precautions. This part also assessed awareness of policies regarding universal precautions, exposure to biological and chemical agents and awareness of potential harm when exposed to these agents, and availability and use of protective equipment. It took approximately 15 minutes to complete each questionnaire. Before administration of the questionnaire, the purpose of the study was explained to each respondent and confidentiality of the information assured.

Table 1: Demographic characteristics of the studied sample

Variable	n (%)
Gender	
Male	70 (35.0)
Female	130 (65.0)
Marital status	
Single	129 (64.5)
Married	63 (31.5)
Divorced/Separated	3 (1.5)
Other	5 (2.5)
Age group (yrs)	
17–29	104 (52.0)
30–39	50 (25.0)
40–49	25 (12.5)
50–59	15 (7.5)
≥60	6 (3.0)
Year of service (yrs)	
<1	36 (18.0)
1–5	83 (41.5)
6–10	40 (20.0)
11–15	13 (6.5)
16–20	6 (3.0)
>20	22 (11.0)
Knowledge of universal precaution	
Not knowledgeable	57 (28.5)
Some what knowledgeable	15 (7.5)
Very knowledgeable	128 (64.0)

We measured knowledge of universal precautions by examining questions about five areas: mode of transmission of hepatitis B and C virus, exposure to body fluids, use of protective barriers such as gloves and gown, recapping of needles and disposal of biohazards. We assigned a score of "1" for a correct answer and "0" for an incorrect answer. A health care worker who obtained a total score of "5" was considered "very knowledgeable;" "4 or 3" "somewhat knowledgeable;" and "1 or 0" "not knowledgeable."

The personal protective equipment required by the health care worker include N95 mask, surgical mask, paper mask, protective goggles, gowns, gloves, and hair cover, among other things. These vary depending on the duty performed by the health care provider. If less than half of the personal protective equipment identified by the particular health care worker was provided, then provision was considered "inadequate." If more than half of the protective equipment identified by the particular health care worker was provided, then provision was considered "adequate."

Statistical analysis

The data were coded and analyzed by SPSS® for Windows® ver 12.0. Strict confidentiality was maintained. All the data were stored in computers at a secured lo-

Table 2: Awareness of universal precaution stratified by particular variables

Variable	Awareness of universal precaution, n (%)		
	Not	Somewhat	Very
Protective equipment*			
Yes	5 (8.6)	3(5.4)	49 (86.0)
No	52 (37.7)	10 (7.3)	76 (55.0)
Gender*			
Male	34(48.6)	6 (8.6)	30 (42.9)
Female	23 (17.7)	9 (6.9)	98 (75.4)
Provision of protective equipment†			
Inadequate	49 (43.4)	11 (9.7)	53 (46.9)
Adequate	8 (9.3)	4 (4.7)	74 (86.0)
Length of service in health sector (yrs)*			
0–5	47 (39.5)	7 (5.9)	65 (54.6)
6–15	9 (17.0)	7 (13.2)	37 (69.8)
≥16	1 (3.6)	1 (3.6)	26 (92.8)
Utilized protective gear*			
Low	49 (47.1)	10 (9.6)	45 (43.3)
Moderate-to-high	8 (8.3)	5 (5.2)	83 (86.5)
Exposure to chemical agents*			
Low	53 (35.1)	7 (4.6)	91 (60.3)
Moderate-to-high	4 (8.2)	8 (16.3)	37 (75.5)
Exposure to biological agents*			
Low	44 (69.8)	4 (6.4)	15 (23.8)
Moderate-to-high	13 (9.5)	11 (8.0)	113 (82.5)
Occupation*			
Medical technologist	6 (12.0)	9 (18.0)	35 (70.0)
Doctor	3 (6.0)	3 (6.0)	44 (88.0)
Nurses	4 (8.0)	1(2.0)	45 (90.0)
Porter	44 (88.0)	2 (4.0)	4 (8.0)

Significantly different: *$p<0.0001$; †$p<0.01$

cation, with access provided only to the researchers involved in the study. The χ^2 test was used to test association between categorical variables. A p value <0.05 (two-tailed) was considered statistically significant.

Results

All the selected health care workers fully completed the questionnaire, giving a response rate of 100%.

Table 1 presents demographic information on the studied sample. The sample consisted of 200 respondents—65% females, 32% married, and 77% less than 40 years old. Forty (20%) respondents have spent between 6 and 10 years in their current occupation, 119 (59.5%) less than six years and 22 (11%) at least 20 years. The mean±SD number of years of service for the studied health care workers was 6.8±7.0 years. Fifty-seven (28.5%) of the workers reported no knowledge of universal precautions; more males (48.6%) than females (17.7%) were represented in this

TAKE-HOME MESSAGE

- Recapping, disassembly, and inappropriate disposal increase the risk of needle stick injury.
- Standard precautions include hand washing; use of barriers environmental control; adequate discarding of sharp instruments and adequate professional immunization.
- Level of awareness of universal precautions increased with longer year of service in health care sector.
- Knowledge of universal precautions was highest among women compared with men, and among nurses more than medical doctors.
- Training and education have been found to be of paramount importance to developing awareness among health care workers

category (p<0.0001). Fifteen (7.5%) respondents were somewhat knowledgeable of universal precautions (Table 1). Approximately, three quarters (75.4%) of the studied women and 42.9% of men were very knowledgeable (p<0.0001). There was a significant relationship between knowledge of universal precautions and occupation; more nurses (90.0%), medical doctors (88.0%) and medical technologists (70.0%) were very knowledgeable of universal precautions compared with only 8.0% of porters (p<0.0001).

The level of awareness of universal precautions was significantly associated with many variables (Table 2). The longer a health care worker was employed to the health care sector, the more likely that his or her level of awareness of universal precautions increased. Most of the respondents (92.9%) employed in the health care sector for 16 years and over-reported higher levels of awareness of universal precautions than those who served for a shorter period. Conversely, more respondents (39.5%) who served for less than five years were not aware of universal precautions (Table 2).

Almost three-quarters of the studied sample (70.8%) reported that personal protective equipment provided by the UHWI was inadequate. More porters (n=47, 94%; p<0.0001) than any other health care workers reported inadequacy (25 [50%] nurses, 30 [60%] medical doctors, and 36 [73%] medical technologists). More of the older respondents (83.3% of those aged 60 years and older) reported that protective gear was adequate (p<0.0001) compared with their younger counterparts (26.0% of workers aged 17–39 years and 33.3% of those aged 40–59 years). There was a significant (p<0.001) statistical relationship between utilization of protective gear and gender of the respondents. Approximately 29% of men reported that they did not use any protective gear compared with 6% of women. This indicates that men are 4.6 times more likely not to use protective gear than their female counterparts. Furthermore, women are 2.2 times more likely to use protective gears (12.3%) at all times than men (5.7%). Men, on the other hand, were most likely to utilize protective gears sometimes (47.1%) and women most times (48.5%).

More nurses reported frequent use of protective gear followed by medical technologists and medical doctors. Over half of the porters (54%) reported no use of protective gear and none reported using it most or all of the time. The majority of the respondents (59.3%) indicated that there were no penalties for not wearing protective gears. Furthermore, 39.2% of the studied workers was not aware if penalties existed, while only 1.5% reported that penalties did exist for failure to use protective

gear.

All medical technologists and medical doctors were aware of the potential harmful effects of biological agents compared with 98.0% of nurses. The majority of the respondents (84.0%) identified HIV as a potential harm followed by hepatitis (73.0%) and bacterial infections (69.5%). Knowledge of potential harmful effects of biological agents was relatively high given that more than one-half the studied sample was able to identify the specific effects. Furthermore, more of the respondents who had knowledge of the harmful effects of biological agents (56.2%) reported using protective gear on a regular basis ($p<0.0001$) compared with their counterparts who reported no knowledge and regular use (3.2%).

Discussion

This study showed that knowledge and awareness of universal precautions among some health care professionals working at the UHWI was variable. The majority (64.0%) of the health care workers had knowledge of universal precautions while just over one-quarter had no knowledge. Knowledge of universal precautions was highest among women compared with men, and among nurses (90.0%), followed by medical doctors (88.0%) and medical technologists (70.0%). The results of this study concur with those of Danchaivijtr, *et al*,[23] who reported that 94.9% of medical doctors in Thailand had knowledge of standard precautions. Surprisingly, only approximately one-tenth of the porters had knowledge of universal precautions.

The adequate knowledge of universal precautions among nurses and medical doctors may reflect the fact that universal precautions have been incorporated in the nursing and medical student curriculum at the University of the West Indies, and also in on-the-job training protocols at the UHWI. The low awareness and understanding of universal precautions among porters may be attributed to the absence of this information during introductory training courses and orientation program. Furthermore, the deficient knowledge base among some of the health care workers may be due to a lack of investment in staff training or to limited understanding of health care workers' safe behavior in the clinical setting or complacency.[24,25] However, it is important to note that due to insufficient information retention, knowledge and adherence to taught practice may still be deficient in spite of training and education.[26,27]

It is very important that health care workers have good understanding about the risk of blood-borne pathogens at work place and about the preventive measures for reducing risk. In this study, the majority of the respondents were very knowledgeable of the harmful effects of blood-borne pathogens and identified HIV as a potential harm followed by hepatitis and bacterial infections. They also recognized that they are at risk of exposure to these blood-borne pathogens. In a study conducted in Pakistan, 93% and 88% of the orthopedic medical residents knew that hepatitis C virus could be transmitted through blood transfusion, and through a needle stick injury, respectively. In addition, 74% of these residents had been vaccinated for hepatitis B virus.[28]

In this study, health care workers employed in the health sector for longer periods were more aware of universal precautions compared with those who served for shorter periods. Training and education have been found to be of paramount importance to developing awareness among health care workers, as well as improving adherence to good clinical practice.[29,30] The greater awareness of universal precautions among health care workers employed for a longer period at the UHWI

may reflect their participation in a greater number of training and educational sessions on universal precautions which not only encouraged safer work practices but also improved concordance with policy and procedures.[31,32] In the present survey, 64% had a high awareness of the universal precaution guidelines. In another survey investigating knowledge and practices among health care workers on needle stick injuries, 61% were aware of universal precaution guidelines.[33]

Protective barriers reduce the risk of exposure of the health care worker's skin or mucous membranes to potentially infectious materials. Protective barriers reduce the risk of exposure to blood and other body fluids to which universal precautions apply. Examples of protective barriers include gloves, gowns, masks, and protective eyewear. Just over one-half of the respondents indicated that they were provided with protective equipment most times. Furthermore, more nurses were provided with protective equipment than medical technologists and medical doctors. Interestingly, more respondents who were aware of universal precautions reported being provided with protective equipment more often than those who were somewhat or not aware. Sadoh, *et al*, reported that less than two-thirds of health care workers claimed that they always used personal protective equipment such as aprons, gowns and gloves, during surgeries and while conducting deliveries.[34]

In this study, provision of adequate protection equipment was reported by significantly more respondents who have worked in the health sector for longer periods and were very aware of universal precautions compared with those who were somewhat or not aware. Respondents who were aware of universal precautions reported frequent use of protective gears such as gloves, eyewear, masks and aprons. More women than men reported using protective gears most times with significantly more nurses reported frequent use followed by medical technologists and medical doctors. According to Jawaid, *et al*, among medical doctors working in a tertiary care hospital in Pakistan, compliance for hand washing was 86%, for wearing gloves was 79%, masks 46%, eye goggles 25% and for using gowns/plastic aprons was 45%.[35] However, there is sometimes a high rate of non-compliance among health care workers and this may be due to a lack of understanding among health care workers of how to properly use protective barriers.[23] Furthermore, non-compliance among medical doctors and nurses are associated with insufficient knowledge, workload, forgetfulness, workplace safety and the insight that colleagues also failed to follow.[36,37] A study carried out among health care workers at first level health care facilities in two rural districts in Pakistan showed that 48% had never worn gloves, 20.9% wore gloves for "most of the time" to "always," 75.9% had never used aprons in procedures where there was risk of blood or other body fluid splash and 59.3% always recapped the needle after use.[38] In our study, although the use of personal protective equipment was somewhat favorable, the concern among most of the health care workers, particularly the porters, was that the provision of protective gears was inadequate. It is the duty and responsibility of the employer to provide personal protective equipment and the appropriate training for the correct use. Furthermore, improvement in safety equipment is needed to better protect health care workers from exposure to blood-borne pathogens.

Non-compliance among health care workers could be due to their belief that their workload is increased by adhering to universal precautions and therefore, these procedures are difficult to accom-

modate due to day to day current clinical pressures.[39] Other reasons include perceived reduction in dexterity when wearing gloves, and the absence of penalties.[40] In this study, majority of the respondents indicated that there was no penalties while two-fifths were not aware if penalties existed for failure to use protective gear. Availability of supplies and awareness programs for these standard precautions are among the main suggestions for better compliance. There are studies that have reported significant improvement in compliance with the standard precautions from 48% to 74% after an educational symposium,[41] and after a 30-minute educational program.[42]

This study showed that there is adequate knowledge and a fair level of awareness among medical doctors, medical technologists, and nurses towards universal precautions. These findings suggest that training of health care workers to increase their knowledge about blood-borne pathogens and universal precautions could improve their use of universal precautions. Regular training should include the universal precautions, initial biohazard handling, safety policies, safety activities, safety equipment and materials, ongoing monitoring and potential exposure of staff. The increasing availability of personal protective equipment and compliance with standard precautions in hospitals in Jamaica should reduce health care workers' risk of blood-borne pathogen exposure.

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The St. Thaddeus Monastery, also known as *Ghareh Kelisa*—meaning "black church"—is an ancient Armenian monastery located about 20 km South of Maku, West Azarbaijan Province, northwestern Iran. In this place, the St. Thaddeus (St. Jude), one of the 12 Apostles, was martyred while spreading the Gospel. It is believed that a church was first built on this spot in 68 AD, but it was almost completely ruined in an earthquake in 1319. Most of the present structure dates back to early 19th century when it was rebuilt. Most of the earliest parts of the church are of black and white stone, hence its Turkish name *Ghareh Kelisa* (*Ghareh* means black). Every year, in late July, Christians hold a ritual ceremony in this place. In July 2008, the St. Thaddeus monastery was added to UNESCO's World Heritage List. (Photo courtesy of Marjan Bayat Maku, Shiraz)