A UNIVERSAL PRECAUTIONS EDUCATION INTERVENTION FOR HEALTH WORKERS IN SARDJITO AND PKU HOSPITAL INDONESIA

Ali Ghufron Mukti[1], Carla Treloar[2], Suprawimbarti[1], Ahmad Husain Asdie[1], Kate D'Este[2], Nick Higginbotham[2] and Richard Heller[2]

[1]Clinical Epidemiology and Biostatistics Sardjito General Hospital, Faculty of Medicine, Gadjah Mada University, Indonesia; [2]Center for Clinical Epidemiology and Biostatistics, Faculty of Medicine and Health Sciences, The University of Newcastle, Australia

Abstract. A non-randomized control trial was conducted to develop and evaluate a culturally appropriate academic detailing intervention on the universal precautions knowledge, attitude and behavior of health care workers in hospitals. Fivety-five health care workers (44 nurses and 11 doctors) participated in the study. They were visited individually to discuss principles of universal precautions as well as the effect of automatic pilot on their work practices. Self-reported measures of knowledge and attitudes were collected from each participant before and after the intervention. A nurse observer collected measures of participants' compliance with the universal precautions guidelines according to a pre-determined protocol before and after the intervention. There was a significantly different level of knowledge, attitudes and compliance on universal precautions between the control and intervention hospital with p=0.0007, p=0.038 and p=0.03 respectively following the intervention. It is concluded that an academic detailing approach of education used in this study has significantly improved knowledge, attitudes and compliance scores.

INTRODUCTION

Health care workers are at risk of occupational exposure to infection. Infection can occur as a result of exposure to blood-borne pathogens such as hepatitis B virus (HBV) and human immunodeficiency virus (HIV) following 'sharps' injuries. McCormick *et al* (1991) conducted a 14-year prospective epidemiological study of hospital sharps injuries comparing pre-AIDS and AIDS eras and found that in 1975-1979 the annual incidence, per 1,000 nursing personnel, was 69 and increased 2.8 fold in 1987-1988 to 180. The finding also showed that the annual incidence of sharp injuries in the same period reported by house officers increased 9.4 fold.

Among sharp injuries, needlestick appeared to be the most common. In developed countries, for example in the United States, it has been estimated that about 2,000 needlestick injuries occur every day among health care workers (Morgan, 1990). Subsequent HIV seroconversion occurs in 0.2% to 0.4% and infection with HBV or hepatitis C occurs in 6% to 30% (Marcus, 1988; Dore *et al*, 1997). In developing countries, the incidence is difficult to estimate. Because of lack of preventive measures, the incidence of injury could be higher than in developed countries.

In terms of the monetary cost, Jagger *et al* (1990) calculated the cost of needlestick injuries. In her calculation she included cost of treatment, prophylaxis and employee health department personnel time and estimated that the average cost of the injury was US$ 405. Another study has shown that the cost of the injury was US$ 363 (Laufer and Chiarello, 1994). The US$ 363 consisted of US$ 184 cost of reporting the incident, initial testing and treatment follow up for HBV plus US$ 179 for the initial evaluation, follow up, and prophylactic treatment (if any) for HIV infection (Laufer and Chiarello, 1994).

Emotional and psychological impact of the accidental injuries may also be severe. In an interview study Treloar *et al* (1995) found that a majority of injured workers experienced distress as consequences of their exposure regardless of the risk of the exposure. Further more, injured workers must wait at less three months to determine whether they have been infected with a life-threatening virus such as HIV (Treloar *et al*, 1995).

Correspondence: Dr Ali Ghufron Mukti, Clinical Epidemiology and Biostatistics, Sardjito General Hospital/ Department of Public Health, Faculty of Medicine, Gadjah Mada University, Sekip Utara, Yogyakarta, Indonesia. Tel/Fax: 62-274-563388; E-mail: cebu@yogya.wasantara.net.id or amukti@yogya.wasantara.net.id

The severe physical, financial, emotional and psychological consequences of accidental exposure warrant development of an effective program to minimize their incidence. CDC (1987) has developed and promoted a Universal Precautions (UP) model of infection control that aimed to protect health care workers against exposure by recommending that all patients and their body substances be treated as if they are infectious with HIV and other viruses.

The Center for Clinical Epidemiology and Biostatistics, Faculty of Medicine and Health Sciences, The University of Newcastle developed, conducted and evaluated an academic detailing approach of education intervention focussed on preventing health care workers performing high risk procedures. The intervention successfully improved health care workers' compliance with the universal precautions (UP) guidelines in clinical situations and the incidence of any other unsafe practices (Treloar *et al*, 1996). The question is how the existing Australian education program can be adopted to suit the needs and context of health care setting in Indonesia?

Academic detailing refers to the strategies usually used by pharmaceutical company representatives to persuade a doctor to prescribe a certain brand name of drug (Soumerai and Avorn, 1990). To date, few studies on academic detailing as a preventive measure to change risky behavior of health care workers have been conducted in developing countries, and none in Indonesia.

The focus of the academic detailing intervention was "automatic pilot" and its role in accidental exposures. The emergency department was chosen as the setting because health workers in this department have higher risk of needlestick injuries as a result of the effect of "automatic pilot" or relying on "mindlessness" of their work practices.

This study is aimed to modify and evaluate the Australian academic detailing intervention of the universal precautions to health care workers in an emergency department of a referral hospital in Indonesia.

The hypothesis tested in this study was that the modified academic detailing intervention would increase the score of knowledge, attitude and behavior of compliance on universal precautions among health providers in study site compared to the control.

MATERIALS AND METHODS

Design

This was a non-randomized controlled trial of an educational intervention study that used a pre- and post-intervention questionnaire administered to workers in two hospitals as well as observing their behavior before and after the intervention. Following administration of the pre-intervention questionnaires and conducting observations, an academic detailing script was used to educate (interview) health workers. Six months after the intervention, post-questionnaires were administered and post-intervention observation was performed.

The trial was conducted in the emergency department of two relatively comparable hospitals in Yogyakarta, Indonesia namely Sardjito and PKU. Both are referral hospitals at provincial level with various type of specialties. Sardjito as a public hospital has approximately 500 beds while PKU as a private hospital has approximately 350 beds. Based on the convenience and agreement of the researchers the Sardjito was chosen as the intervention, while, PKU was the control site. Sardjito was chosen as the intervention site because it was more convenient, closer and more familiar to the researchers.

Study population

All full-time health workers in the emergency department of both hospitals were recruited to participate in the study. A senior nurse explained the objectives of the study to them, if they were willing to participate in the study, an arrangement was made to give them the questionnaire. In the intervention site, another arrangement for interview was also made.

Interventions

A revised academic detailing intervention used by the Australian collaborating center was implemented in the intervention site of the hospital. The revised academic detailing materials were pilot tested to assess their suitability to the local setting.

The same education intervention was applied for both doctors and nurses, however, the detailer was different. The detailing activities for doctors were conducted by a senior doctor who was the head of department of internal medicine of the hospital, while for nurses they were conducted by a trained senior nurse. The interviews were performed twice, the second was aimed at boosting

the effect of the program. The first interview took 7-10 minutes and the second took approximately 5 minutes. The time between the first and the second interview varied from two weeks to three months. Interviews were mostly conducted in the emergency department.

The content of the interview emphasized that staff working in the emergency department may be tired, stressed, or had just worked a "quick shift" and this might result in them being on automatic pilot. Automatic pilot was described as the phenomenon of performing a procedure but not concentrating or focusing on that task (Treloar *et al*, 1996). The educator then discussed the principles of Universal Precautions, this included the importance of hand washing, wearing gloves, facemask and gown whenever it was considered necessary as recommended by relevant bodies (CDC, 1991; WHO, 1993a,b). Based on the pilot study, it was also shown how to perform certain procedures in a safe manner, for example recapping the needle with certain method and proper disposal of sharp objects.

Educators placed stickers and posters on the wall around the emergency department of the intervention hospital. After approximately one month the posters were exchanged. The content of posters were pictures of what have been discussed in the detailing education included the necessity to wash hands between patients and after removing gloves, wearing gloves when handling blood and other body substances, wearing face masks when splashing is likely, wearing gowns when soiling is likely and immediate disposal of sharp objects in an appropriate container.

Outcome measures

Three outcome measures were used in the study. The measures were knowledge, attitudes and practice or compliance with universal precaution guidelines. Knowledge and attitudes measures were collected by self-reported questionnaire before and after the intervention. The questionnaire contained a total of 87 items that examined knowledge and attitudes regarding universal precautions. The knowledge items included preventive measures need to be taken in caring for HIV infected patients, management of sharp disposal and other items. Attitudes items included items about the possibility of getting HIV infection and the possibility of complying with the universal precautions guidelines.

A senior nurse who was employed in the same department but was not actively treating patients was trained by the researchers to became an observer. The trained nurse observer observed and recorded participants' compliance with the universal precautions guidelines according to a pre-determined protocol before and after intervention.

Before observation was initiated the observer documented the workload situation, type of activities being observed, and priority of emergency. The specific behaviors observed were whether health providers wore gloves, gown, avoided recapping needle, prevented blood splash, washed hands after removing gloves or handling patient, wiped up spills with a appropriate disinfectant, properly disposed sharp objects and reported injuries.

The observation took approximately 30 minutes. Each participant was observed 3 times with a different patient who was non-randomly selected.

Data analysis

Comparison of characteristics between the intervention and the control group was done by chi-square analysis for categorical data and independent Student's *t*-test for continuous data.

Scores for knowledge questions were obtained by giving values of 1 and 0 for a correct and incorrect answer respectively. While scores for attitudes were obtained by giving a range of values from1 to 5 for the most unfavorable to the most favorable attitudes.

Differences in universal precautions knowledge scores and attitudes were compared before and after intervention between hospitals. Change in universal precautions knowledge was evaluated with a Wilcoxon matched-paired signed rank test comparing the sum of true-false statements answered correctly before and after the intervention. Wilcoxon matched-paired signed rank tests were also used to assess pre and post intervention attitude changes.

The observation data was analysed by Wilcoxon rank sum test to assess the change between pre and post percentage of behavior score. The scores were obtained by giving value 1 for each activity performed and 0 if the activity was not performed. The total number of correct activities then is summed to provide a score. Score for each observation then is added together for a total score. The denominator was determined by calculating possible correct

score. Percentage of correct score was calculated by dividing the actual correct by the possible correct scores and multiplying by 100.

All statistical analysis was performed in Stata for Windows and SPSS for Windows, alpha was set at 0.05 and p-values were two tailed.

RESULTS

Fifty-five providers consisting of 44 nurses and 11 doctors participated in the study. Twenty-eight out of 44 nurses and 7 out of 11 doctors were from the intervention hospital. One doctor from PKU hospital who completed the knowledge and attitude questionnaire could not be observed his compliance after the intervention. Table 1 shows the comparison of the respondent characteristics from the participating hospitals.

The characteristics of respondents in terms of their age and year of experience working in the hospitals were not significantly different between study and control hospitals ($p>0.05$). However, more health providers from the intervention hospital had received training on material related to universal precautions than those from the control hospital ($p<0.05$). There were more male health providers in the intervention hospital than in the control hospital ($p<0.05$)

The change or improvement of knowledge, attitude and compliance scores of pre-intervention and post-intervention in the intervention site was significantly higher than the improvement scores in the control site (Table 2).

It can be seen in Table 3 that not all universal precaution activities observed were significantly different before and after implementation of the intervention. Significant increases compliance were

Table 1
Comparison of characteristics between intervention and control study participants.

Characteristics	Intervention (Sardjito) n = 35	Control (PKU) n = 20	χ^2/t	p-value[a]
Mean of age ± SD	32 ± 5.7	30 ± 6.9	1.36	0.17
Mean of year experience	6.6 ± 4.4	5.5 ± 2.8	1.57	0.12
Previous training in UP[b]				
Yes	28 (80%)	7 (35%)	5.1	0.03
No	7 (20%)	13 (65%)		
Sex				
Male	14 (40%)	2 (10%)	11.1	0.001
Female	21 (60%)	18 (90%)		

[a]P value for sex and UP training was derived from χ^2 analysis, the rest was done by independent Student's *t*-test
[b]UP = universal precautions

Table 2
Median, 25% and 75% percentile score of providers' knowledge, attitudes and compliance on universal precautions pre-intervention and post-intervention in the intervention and control site.

Variables	Median (25% and 75% Percentile Score)				Z	p
	Sardjito hospital n= 35		PKU hospital n= 20			
	Pre[a]	Post[b]	Pre[a]	Post[b]		
Knowledge	6 (6,7)	8 (7,8)	6 (6,7)	6 (7,7)	3.4	0.0007
Attitudes	23 (19,25)	27 (25,28)	23 (20,24)	24 (23,25)	2.07	0.038
Compliance	25 (22,26)	27 (26,31)	18 (17,19)	18 (15,19)	2.2	0.03

[a]Pre = pre-intervention; [b]Post = post-intervention

achieved in the specific compliance of wearing gloves, hand washing, use of disinfectant to clean blood spills and appropriate disposal of sharps ($p < 0.05$).

The practice of wearing gowns was very low in both hospitals before and after intervention. Although there was no significant difference, the practice of recapping needles was increased after intervention in both hospitals (Table 3).

DISCUSSION

This study achieved a significant increase median score of knowledge and attitudes toward universal precautions in relation to the prevention of the occupational spread of HIV after implementing the intervention. These finding support those of previous studies (McCann and Sharkey, 1998; Diekema *et al*, 1995; Santana *et al*, 1992). However, no previous studies have used an academic detailing approach to intervention.

The median of total compliance with the universal precautions was around 18-27% (Table 2). This is unacceptably low, when it is compared to the compliance with the universal precautions in developed countries. A survey with more than 6,000 hospital-employed physicians in one country in Europe revealed that only 35% of respondents were compliant with the basic principle of UP (Nelsing *et al*, 1997). Another study conducted in USA, showed that compliance with UP among health care workers was only 31-38% (Michalsen *et al*, 1997).

Needle recapping has attracted attention as a major contribution to needlestick injuries (Colebunders and Verstraeten, 1994; Morgan, 1990; Jagger, 1988). Unfortunately, in this study differences in avoiding recapping needles was not found (Table 3). In both hospitals an increase in recapping behavior with safer manner was observed. Contamination may have occurred when needle recapping was discussed as part of the intervention. The intervention emphasized that needle recapping should be avoided, however, based on the pilot study many nurses still prefer to recap the needles. Therefore the researchers decided if recapping cannot be avoided, recapping with safer manner should be applied. Health providers in the control site (PKU) may have received some information from other sources of information, or be influenced by completion of the pre-intervention questionnaire.

Randomization of health care workers to intervention and control groups was not possible in this study and might have resulted in biases. Differences in some characteristics of respondents such as proportion of respondents receiving previous training on UP might also create bias. Hawthorne effect meaning observation itself producing change could also have introduced biases. The small sample size used in this study might lead to the limitation of power to detect a significant difference. To minimize the biases, all full-time healthcare workers in both hospitals were

Table 3
Compliance among health care providers observed before and after intervention in study (Sardjito) and control (PKU) hospital.

Variables	Median (25% and 75% percentile score)				Z	p
	Sardjito hospital n = 35		PKU hospital n = 19			
	Pre	Post	Pre	Post		
Glove	0 (0,11)	21 (12,24)	10 (0,18)	10 (0,18)	2.8	0.006
Gown	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0.63	0.52
Recapping	0 (0,0)	19 (11,22)	0 (0,0)	18 (10,23)	0.64	0.53
Blood flash	25 (15,36)	24 (19,28)	33 (32,35)	26 (24,33)	0.77	0.41
Hand-washing	12 (7,16)	15 (14,17)	16 (14,17)	13 (12,16)	2.7	0.007
Disinfectant	24 (14,31)	31 (28,35)	25 (24,30)	24 (14,31)	2.8	0.005
Proper disposal	11 (11,12)	24 (17,27)	32 (29,35)	40 (33,43)	3.9	0.001

Pre = pre-intervention; Post = post-intervention

recruited to participate in the study. In both sites, the observation were carried out in as similar manner as possible.

The success of the study might be related to the involvement of a respected senior outstanding doctor or his representative in the education detailing. Further the content of the educational interview was developed in the local setting a recommendation for successful practice guidelines (Grimshaw and Russel,1993).

Wearing gloves, gown and avoiding recapping needles was still low in these hospitals, this should become a primary focus for dissemination, since recapping needles is a common cause of puncture injury (Jagger,1998). However, availability of gowns and gloves was limited and might continue to worsen because of the current economic crisis in Indonesia.

Conclusions and recommendations

Local modification of an academic detailing approach of education previously used in Australia has significantly improved knowledge, attitudes and compliance scores of health providers in Indonesia. Dissemination of the results to policy makers and other relevant bodies in Indonesia is recommended, however, the education intervention should be implemented with appropriate strategy to meet the local need such as involving a local opinion leader and developing locally based materials.

ACKNOWLEDGEMENTS

Funding for this study was made possible through a Grant from the World AIDS Foundation and research teams were established through existing networks in the International Clinical Epidemiology Network (INCLEN) program. Researchers thank Sardjito and PKU general hospital staff for their cooperation and assistance.

REFERENCES

Centers for Disease Control and Prevention (CDC). Recommendation for preventing transmission of human immunodeficiency virus and hepatitis B virus to patients during exposure-prone invasive procedure. 1991;40: RR-8.

Centers for disease control and prevention. Recommendations for prevention of HIV transmission in health care setting. 1987; 36; 3S-18S.

Colebunders R, Verstraeten. Protection of health care workers against bloodborne infections in emergency department. *Eur J Emer Med* 1994; 1: 42-6.

Diekema DJ, Schuldt SS, Albanese M, Doebbeling BN. Universal precautions training of preclinical students: impact on knowledge, attitudes and compliance, *Prevent Med* 1995; 24: 580-5.

Dore GJ, Kaldor JM, McCaughan GW. Systematic review of role of polymerize chain reaction in defining infectiousness among people infected with hepatitis C virus. *Br Med J* 1997; 315: 333-7.

Essien EJ, Ross MW, Ezedinachi ENU, Meremikwu. HIV/AIDS infection control enforcement: a comparison between Nigeria and the United States. *Public Health*1997; 111: 205-9.

Grimshaw JM, Russel IT. Effect of clinical guidelines on medical practice: a systematic review of rigorous evaluation. *Lancet* 1993; 342: 1317-22.

Jagger J. Hunt EH, Perason RD. Estimated cost of needlestick injuries for six major needle devices. *Infect Control Hosp Epidemiol* 1990; 11: 584-8.

Jagger J, Hunt EH, Brand-Elnaggar J, Pearson RD. Rates of needle-stick injuries caused by various devices in a university hospital. *N Engl J Med* 1988; 319: 284-8.

Laufer FN, Chiarello LA. Application of cost-effectiveness methodology to the consideration of needlestick-prevention technology. *Am J Infect Control* 1994; 22: 75-82.

Marcus R. Centers for Disease Control Cooperative Needlestick Surveillance Group. Surveillance of health care workers exposed to blood from patients infected with the human immunodeficiency virus, *N Engl J Med* 1988; 319: 1118-23.

McCormick RD, Meisch MG, Ircink FG, Maki DG. Epidemiology of hospital sharps injuries: A 14-year prospective study in the pre-AIDS and AIDS eras. *Am J Med* 1991; 91: 301s-7s.

McCann TV, Sharkey RJ. Educational intervention with international nurses and changes in knowledge, attitudes and willingness to provide care to patients with HIV/AIDS. *J Adv Nurs* 1998; 27: 267-73.

Michalsen A, Delclos GL, Felknor SA, *et al*. Compliance with Universal Precautions among physicians. *JOEM* 1997; 39: 2.

Morgan DR, HIV and needlestick injuries. *Lancet* 1990; 335: 1280.

Nelsing S, Nielsen TL, Nielsen JO. Noncompliance with universal precautions and the associated risk of mucocutaneous blood exposure among Danish physicians. *Inf Cont Hosp Epidemiol* 1997; 18; 10: 692-8.

Santana R T, Monzon OT, Mandel J, Hall TL, Hearst N. AIDS education for hospital workers in Manila: effects on knowledge, attitudes and infection control practices. *AIDS* 1992; 6: 1359-63.

Soumerai SB, Avorn J. Principles of educational outreach ('academic detailing') to improve clinical decision-making. *JAMA* 1990; 263: 549-56.

Treloar CJ, Higginbotham N, Malcolm J, Sutherland , Berenger S. An Academic detailing intervention to decrease exposure to HIV infection among health-care workers. *J Health Psychol* 1996; 4: 455-68.

Treloar CJ, Higginbotham N, Malcolm J, Sutherland , Berenger S. The personal experience of Australian health care workers accidentally exposed to risk of HIV infection. *AIDS* 1995; 9: 1385-6.

WHO. HIV/AIDS Reference Library for Nurses (Infection Control), 1993a; 3.

WHO. HIV Prevention and Care: Teaching modules for nurses and midwives, 1993b.