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Accidental exposures and KAP surveys concerning the universal precaution among the clinical-year medical students of Faculty of Medicine, Chulalongkorn University

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Objectives : *To study the epidemiology of the accidental exposures during health care delivery and knowledges, attitudes and avoidance practices according to the universal precautions among clinical - years medical students, Faculty of Medicine, Chulalongkorn University who have their clinical training in King Chulalongkorn Memorial Hospital.*

Setting : *Department of Preventive and Social Medicine, Faculty of Medicine, Chulalongkorn University.*

Research Design : *Retrospective descriptive study.*

Subjects : *294 clinical- year medical students of the Faculty of Medicine, Chulalongkorn University in academic year 1995 who have their clinical training in King Chulalongkorn Memorial Hospital.*

Method : *Questionnaire survey of clinical year medical students in the academic year 1995.*

Result : *90.9% of them had at least one accidental exposure during the previous year with an average of 4.3 exposures per student.*

The 6th year medical students had the highest exposure rate of 98.9% . 53.4% of the exposures were due to cutaneous or mucous membrane contact, 34.7% due to needle stick injury, 7.2% due to glass injury and 4.7% due to other sharp object injury. After the exposures only 20% of the students reported the episode. 88.4% and 75.8% had high levels of overall knowledge and a proper attitude respectively, regarding the universal precautions, but 63.6% of the medical students had only fair levels of avoidance practice . There was significant association between the knowledge, attitude and avoidance practice with the year of study but no significant association between knowledge, attitude or avoidance practice to accidental exposure.

Conclusion : *The accidental exposure rate among the clinical- years medical students during health care deliveries was high. Despite high level in knowledge and proper attitude, the practice according to the universal precaution was only in fair level which might be due to other contributing factors such as inadequacy of protective barriers, impracticability to follow the complicated step of universal precaution especially in the emergency situation, hurry and carelessness. To solve this problem required the distinct policies and strategies of the hospitals administrators, the standard and less complicated guidelines concerning the universal precaution, regular, supervised, continuously-monitored and properly adjusted practices during health care deliveries.*

Key words : *Accidental exposure, KAP survey, Behavior, Universal precaution, Medical students, Faculty of Medicine, Chulalongkorn University.*

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นรินทร์ หิรัญสุทธิกุล, มยุรี จิรวินิชฎ์, โชคชัย เปลี่ยนไฟโรจน์. อุบัติเหตุจากการทำงานและการสำรวจความรู้ เจตคติ และการปฏิบัติตามหลักการป้องกันแบบครอบครัวของนิสิตแพทย์ระยะคลินิก คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย. จุฬาลงกรณ์เวชสาร 2540 ตุลาคม;41(10): 717-32

วัตถุประสงค์ : เพื่อศึกษาระบาดวิทยา ของอุบัติเหตุจากการทำงาน ระหว่างการให้บริการอนามัย และความรู้เจตคติ และการปฏิบัติ ตามหลักการป้องกันแบบครอบครัวของนิสิตแพทย์ ระยะคลินิก คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย

สถานที่ทำการศึกษา : ภาควิชาเวชศาสตร์ป้องกัน และสังคม คณะแพทยศาสตร์ จุฬา ฯ

รูปแบบการศึกษา : การศึกษาเชิงพรรณนา ชนิดย้อนหลัง

ประชากรที่ศึกษา : นิสิตแพทย์ในระยะคลินิก คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย ในปีการศึกษา 2538 ที่ปฏิบัติงานในโรงพยาบาลจุฬาลงกรณ์ จำนวน 294 คน

วิธีการศึกษา : การสำรวจโดยใช้แบบสอบถาม

ผลการศึกษา : ร้อยละ 90.9 ของนิสิตแพทย์ที่ตอบแบบสอบถาม เกิดอุบัติเหตุอย่างน้อย 1 ครั้ง ในรอบปีที่ผ่านมา และโดยเฉลี่ยนิสิตแพทย์ แต่ละคน เกิดอุบัติเหตุ 4.3 ครั้ง นิสิตแพทย์ปีที่ 6 มีอัตราการ เกิดอุบัติเหตุสูงที่สุด (ร้อยละ 98.9) ร้อยละ 53.4 ของอุบัติเหตุ เกิดจากการสัมผัสเลือด หรือสิ่งคัดหลั่ง บริเวณ ผิวหนัง และเยื่อบุร้อยละ 34.7 เกิดจากถูกเข็มตำ ร้อยละ 7.2 เป็นอุบัติเหตุ จาก เครื่องแก้ว และร้อยละ 4.7 เป็นอุบัติเหตุ จากของมีคมหลังเกิดอุบัติเหตุ นิสิตแพทย์ เพียงร้อยละ 20 รายงาน การเกิดอุบัติเหตุ นิสิตแพทย์ ร้อยละ 89.2 และ 75.8 มีความรู้ และเจตคติโดยรวมเกี่ยวกับหลักการ ป้องกันแบบ ครอบครัว ในระดับสูง ขณะที่นิสิตแพทย์ร้อยละ 62.5 มีผลการปฏิบัติโดยรวมตามหลักการ ป้องกันแบบครอบครัว ในระดับปานกลาง พบความสัมพันธ์ อย่าง มีนัยสำคัญทางสถิติ ระหว่างความรู้ เจตคติ และการปฏิบัติตามหลัก การป้องกันแบบครอบครัวกับชั้นปีการศึกษาแต่ไม่พบความสัมพันธ์ และระหว่าง ความรู้ เจตคติ และการปฏิบัติตามหลักการป้องกัน แบบครอบครัว กับการเกิดอุบัติเหตุจากการทำงาน

สรุป

: การเกิดอุบัติเหตุจากการทำงานระหว่างการให้บริการอนามัย ของนิสิต แพทย์ระยะคลินิก คณะแพทยศาสตร์จุฬาลงกรณ์มหาวิทยาลัย มีอัตราสูง แม้ว่า นิสิตแพทย์ส่วนใหญ่ จะมีความรู้ในระดับสูง ที่เหมาะสม และ เจตคติเกี่ยวกับหลักการป้องกันแบบครอบจักรวาล แต่การปฏิบัติตาม หลักการดังกล่าว เพียงอยู่ในระดับปานกลาง ซึ่งอาจเป็นผลจากปัจจัย ที่เกี่ยวข้อง อื่น ๆ ได้แก่ การขาด อุปกรณ์ป้องกันตามหลักการป้องกัน แบบครอบจักรวาลขั้นตอนในการปฏิบัติตามหลักการป้องกันแบบ ครอบจักรวาลที่ยุ้งยากในทางปฏิบัติ โดยเฉพาะในภาวะฉุกเฉิน ความ รีบร้อน และความประมาท เป็นต้น การแก้ปัญหาดังกล่าว ต้องอาศัย นโยบาย และกลยุทธ์ที่ชัดเจน ของผู้บริหารโรงพยาบาล เกี่ยวกับการ ป้องกันแบบ ครอบจักรวาล แนวทางปฏิบัติ ที่มีมาตรฐานเดียวกันและไม่ ยุ้งยาก การปฏิบัติตามหลักการป้องกันแบบครอบจักรวาลอย่างสม่ำเสมอ ภายใต้การแนะนำ และเฝ้าติดตามอย่างต่อเนื่อง และการปรับเปลี่ยน ที่เหมาะสมระหว่างการให้บริการอนามัย

It is well appreciated today that exposure to a patient's blood or other body fluids via direct contact or inoculation from accidental injuries during health care practice can result in the transmission of a number of pathogens, of which the best known examples are hepatitis B virus (HBV) and the human immunodeficiency virus (HIV). Especially, the risk of HIV transmission has increased the awareness of this problem. Accidental exposure to blood-borne pathogens can occur by percutaneous injuries (needle stick, other sharp object or glass injuries) or by cutaneous and mucous membrane contacts (contact of blood or other body fluid via wounded or abraded skin or via intact mucosa) during health care deliveries. The rate of HIV and HBV transmission to health care workers by accidental exposure has been approximately 0.31%^(1,2) and 2-40% (depending on the status of HBe Ag)⁽³⁾, respectively. These and other accidental blood-borne transmissions, however, can be prevented by application of the principles and practices of exposure avoidance according to the universal precautions.

King Chulalongkorn Memorial Hospital, apart from being a 1300-bed service hospital, has been a university and teaching hospital with nearly 300 medical students annually. Medical students in the clinical years (4th - 6th years) spend most of their time learning and practicing health care deliveries to patients. But due to their limited experience and expertise in invasive procedures, and because they may have insufficient background knowledge to recognize the level of risk posed by

a particular patient, they are prone to accidental exposure to blood-borne pathogens. Even though King Chulalongkorn Memorial Hospital has used the universal precautions since 1992 in order to diminish accidental exposure among health care workers, including medical and nursing students, there has been no data collected concerning the outcome of this strategy. Therefore, this study was conducted with the objectives to obtain information about exposures that occurred among the clinical-years medical students in King Chulalongkorn Memorial Hospital during health care practice, and avoidance behavior, according to the universal precautions.

Materials and methods

The population in this study were all clinical-years medical students of the Faculty of Medicine, Chulalongkorn University during academic year 1995.

We use a self-administered questionnaire to collect the information. The questionnaire was produced after review of the literature concerning universal precautions, and it also made use of a practical handbook for prevention of occupationally acquired infections during health care which was issued by the Ministry of Public Health. It was composed of five parts corresponding to the objectives and data to be collected as follows:

Part 1 Demographic data

We collected the following variables: Age, sex, year of study, and attendance of courses regarding universal precautions.

Part 2 Accidental exposure data

We compiled accidental exposures during the previous year (January 1, 1995 to December 31, 1995) among the clinical-years medical students, including the total number of accidental

exposures; the number and type of needle sticks, other sharp object and glass injuries and the number of cutaneous and mucous membrane contacts during health care practice and also the reports following the exposures.

Part 3 Knowledge about the Universal Precautions

This part contained 8 positive and negative questions and 3 multiple choice questions.

Table 1. Questionnaire regarding knowledge in the universal precaution of clinical-year medical students.

Item	Knowledge	Correct	Incorrect	Did Not Know
1.	The principle of the universal precaution is to promote the quality of prevention of occupationally acquired infection due to health care practice			
2.	Universal precaution is specifically used for HIV+ve patient			
3.	A patient's blood test for HIV infection is the prevention and control of AIDS.			
4.	Recapping of a needle is prohibited in order to decrease the accidental injury.			
5.	If recapping is unavioded the best way is to recap a needle with one hand technique.			
6.	Wearing gloves is mandatory for transporting or contacting the patients contaminated with blood or other body fluids.			
7.	Wearing gloves is mandatory for intravenous injection.			
8.	Hand washing prior to minor surgery or after contact with microbial pathogens must be not less than 30 seconds with liquid disinfectants.			

The scoring criteria was as follows:

Answer (in each item)	Positive Question Score	Netgative Question Score
Correct	1	0
Incorrect	0	1
Did Not Know	0	0

The total score was calculated into the percentages and graded by comparing to the Min-

istry of Education evaluation criteria for knowl- edge: High 75%, fair 50-74%. and low 0-49%.

Part 4 Attitude about the Universal Precautions

This part also contained 8 positive and negative questions and 3 multiple choice questions.

Table 2. Questionnaire regarding attitude in the universal precaution of clinical-year medical students.

Item	Attitude	Agreed	Disagreed	Uncertain
1.	You believe that health care practices following the principle of universal precaution can confidently prevent occupational acquired infection			
2.	You don't mind to provide health care to HIV infected patients.			
3.	You don't mind to provide health care to HBV infected patients			
4.	You think that wearing gloves is complicated and wasteful.			
5.	You think that hand washing is essential for prevention of occupationally acquired infection.			
6.	You think that blood test of the patient for HIV infection prior to operations or any procedures should be done in every cases.			
7.	You think that blood test of the patient for HBV infection prior to operations or any procedures should be done in every cases.			
8.	You think that the universal precaution should be used specifically for HIV and HBV infected patients			

The scoring criteria was based on Likert's scale as follows:

Answer (in each item)	Positive Question Score	Negative Question Score
Agreed	3	1
Disagreed	1	3
Uncertain	2	2

The total score was calculated into the mean and graded by comparson with the evaluation

criteria for attitude as below: Good 2.50-3.00, fair 1.50-2.49 and poor 1.00-1.49.

Part 5 Avoidance practice according to the Universal Precautions

This part also contained 8 positive and negative questions and 3 multiple choices questions.

Table 3. Questionnaire regarding practice in the universal precaution of clinical-year medical students.

Item	Practice	Always	Occasionally	Never
1.	You recapped the used needles with one hand technique.			
2.	You held the suture needle or blade with needle holder or forceps during medical procedures.			
3.	After using a disposable syringe and needle you immediately put them in a designated puncture resistant container.			
4.	You washed your hands after physical examination or contact the patients.			
5.	You wore non-sterile gloves during venipuncture or other procedures involving vascular access.			
6.	You wore mask and sterile gloves during dressing the actively bleeding wound.			
7.	You wore mask and sterile gloves during suction the patient's respiratory secretion.			
8.	During the procedure, if you found a leakage in your gloves, you immediately removed them and washed your hands before wearing new ones.			

The scoring criteria was as following:

Answer (in each item)	Score
Always	2
Occasionally	1
Never	0

The total score was calculated into percentage and graded by percentile as followings; Percentile 67-100 good, 34-66 fair and 0-33 poor.

Result

There were 198 medical students sending

back the questionnaires. The response rate was 67.3% (56.0%, 48.5%, and 97.9% for 4th year, 5th year and 6th year medical students respectively)

There were 116 males and 82 females and the age range was 19-27 years with a mean \pm SD = 22.2 \pm 1.4 years old.

85.9% of the students (170/198) had already attended conferences or lectures regarding the universal precautions.

90.9% (180/198) of the students had at least one accidental exposure during the prior year.

The 6th year students had the highest exposure rate (98.9%), followed by the 4th year (83.9%) and the 5th year (83.3%) students, respectively. The number of exposures for each medical student surveyed according to the year of study were shown in Table 4.

Table 4. Number of medical students with accidental exposures according to the number of exposures and the year of study.

No of accidental exposure	No. of medical student			
	4 th year	5 th year	6 th year	Total(%)
0	10	7	1	18(9.1)
1	11	10	7	28(14.1)
2	12	8	16	36(18.2)
3	6	6	10	31(15.7)
4	4	6	12	22(11.1)
5	4	4	13	21(10.6)
6-10	7	2	17	26(13.1)
>10	2	4	10	16(9.1)
Total	56	47	95	198(100.0)

Type of accidental injuries was shown in Table 5.

Table 5. Accidental exposures due to the type of injuries among clinical-year medical students.

Type of injuries	Number (%)
Cutaneous or mucous membrane contacts	450(53.4)
Needle stick injuries	292(34.7)
Glass injuries	61(7.2)
Sharp object injuries	39(4.7)
Total	842(100.0)

Injuries from suture needle were the most common needle stick injuries (62%) while injuries from breaking ampoules and injuries from scalpel blades were the most common glass injuries (86.9%) and sharp object injuries (65.4%) respectively.

After the exposures, only 40 medical students (28.6%) reported the episode and 140 medical students did not (18 medical students had no exposure). The reasons for not reporting the exposures were shown in Table 6.

Table 6. The reasons for not reporting the exposures among the exposed medical students.

Reasons of not reporting the exposures	No. (%)
Thought that it's not necessary	63(45.0)
Didn't know that it must be reported	24(17.1)
Didn't know to whom it should be reported	18(12.9)
Thought that it's not beneficial	17(12.1)
Miscellaneous*	13(9.3)
Missing cases	5(3.6)
Total	842(100.0)

* Miscellaneous includes: Concerning the problem of confidentiality(5), didn't know how to report(3), forgot to report(3) and the report was time-consuming.(2)

For the knowledge in the universal precaution, the result was shown in Table 7.

Table 7. Knowledge according to the universal precaution of clinical-year medical students.

Medical student's year	Knowledge (%)		Total(%)
	High	Fair	
4 th Year	43(76.8)	13(23.2)	56(100.0)
5 th Year	43(91.5)	4(8.5)	47(100.0)
6 th Year	90(94.7)	5(5.3)	95(100.0)
Total	176(88.4)	22(10.6)	198(100.0)

$$X^2_{\alpha=0.05, df=2} = 5.99$$

$$X^2_{cal} = 11.27, P < 0.05$$

We found that 88.4% of medical students had overall high knowledge. 10.6% had fair knowledge and no medical students in our study had low knowledge. There was significant association

between the knowledge and the year of study. The 6th year medical student had the highest knowledge followed by the 5th year and the 4th year medical student respectively. Considering the problem from

the detail of knowledge, more than half of medical students thought that it was incorrect to prohibit recapping of the needle in order to decrease the accidental exposure.

Concerning the attitude in the universal precaution, the result was shown in Table 8.

Table 8. Attitude according to the universal precaution of clinical-year medical student.

Medical student's year	Attitude (%)		Total(%)
	Good	Fair	
4 th Year	34(60.7)	22(39.3)	56(100.0)
5 th Year	37(78.7)	10(26.3)	47(100.0)
6 th Year	90(94.7)	16(16.8)	95(100.0)
Total	176(88.4)	48(24.2)	198(100.0)

$$X^2_{\alpha=0.05, df=2} = 5.99$$

$$X^2_{cal} = 9.89, P < 0.05$$

We found that 75.8% of the students had overall good attitudes. 24.2% had fair attitudes and no students had poor attitudes. There was significant association between the attitude and the year of study. The 6th year medical students had the good attitude in the highest percentage followed by the

5th year and the 4th year medical students respectively. Considering the problem from the detail of attitude, two-thirds of medical students thought that blood test for HIV infection prior to an operation or any procedure should be done in every patients.

For the practice according to the universal precaution, the result was shown in Table 9.

Table 9. Practice according to the universal precaution of clinical-year medical students.

Medical student's year	Practice (%)			Total (%)
	Good	Fair	Poor	
4 th Year	21(37.5)	35(62.5)	0	56(100.0)
5 th Year	9(19.1)	36(76.6)	2(4.3)	47(100.0)
6 th Year	39(41.1)	55(57.9)	1(1.0)	95(100.0)
Total	69(34.9)	126(63.6)	3(1.5)	198(100.0)

$$X^2_{\alpha=0.05} = 5.99$$

df= 2

$$X^2_{Cal} = 6.92, p < 0.05$$

If was shown that 63.6% of medical students had overall fair practice according to the universal precaution. 34.9% and 1.5% had good and poor practice respectively. There was significant association between the practice and the year of study. The 6th year had the good practice in the highest percentage followed by the 4th year and 5th year respectively. Considering the problem from the detail of practice, less than half of medical

students always held the suture needle or blade with needle holder or forceps during medical procedure, washed their hands after physical examination or contact the patients and wore mask or sterile gloves during dressing the actively bleeding wound .

We did not find significant association between the level of knowledge, attitude or practice with the accidental exposures. (Table 10-12)

Table 10. Knowledge of medical students according to the universal precaution and the accidental exposure.

Knowledge.	Accidental exposure		Total(%)
	Present	Absent	
High	157	18	175
Fair	21	2	23
Total	178	20	198

$$X^2_{\alpha=0.05} = 3.84$$

$$df=1$$

$$X^2_{cal} = 0.0109, P>0.05$$

Table 11. Attitude of medical students according to the universal precaution and the accidental exposure.

Attitude	Accidental exposure		Total(%)
	Present	Absent	
High	137	13	150
Fair	43	5	48
Total	180	18	198

$$X^2_{\alpha=0.05} = 3.84$$

$$df=1$$

$$X^2_{cal} = 0.0109, P>0.05$$

Table 12. Practice of medical students according to the universal precaution and the accidental exposure.

Attitude	Accidental exposure		Total(%)
	Present	Absent	
High	62	8	70
Fair	115	10	125
Low	3	0	3
Total	180	18	198

$X^2_{\alpha=0.05} = 5.99$
df=2

$X^2_{cal} = 0.6830, P>0.05$

The responding medical students also raised the following additional problems concerning accidental exposures and the universal precautions:

1. Protective barriers such as gloves, masks, goggles, gowns, etc. and puncture-resistant disposal containers were not adequate or readily available during health care practice, especially in the emergency rooms.
2. Steps according to the universal precautions were too sophisticated and time-consuming.
3. The hospital's policies about the universal precautions and management after accidental exposure were not well known.
4. The hospital's infectious control systems, including reports and consultations after accidental exposure, especially at off-work times, were not clearly informed and standardized.
5. Habits such as haste and carelessness during work, especially in emergency situations, were important contributing factors to accidental exposures.
6. Most of the medical students did not

know their HBV immunity. The hospital should arrange a program for HBV-profile serologic assessment of those medical students about to enter the clinical years and give a full course of HBV vaccination to the non-immune students.

Discussion

In our study, we found that 90.9% of the clinical years medical students had at least one accidental exposure during the prior year, with an average of 4.3 exposures per student per year, and the 6th year students had the highest exposure rates (98.9%) as might be expected considering the numbers of procedures they performed. These figures are comparable to the study of P. Vithayasai and colleagues who surveyed the 5th year and 6th year medical students at Chiangmai University. They found an accidental exposure rate of 98.6%.⁽⁴⁾ However, in a survey of 312 medical students at Los Angeles County, University of Southern California Medical Center during 1989-1990, T.M. O'Neill and colleagues found only 16% exposure rates⁽⁵⁾ similar to the study of F.S. Resnic and

colleagues of 110 medical students at New York Medical Center in 1992 and B. deVries and colleagues study of 138 medical students at the University of Sydney in the same year where the exposure rates were 27%⁽⁶⁾ and 22%⁽⁷⁾ respectively. Thus it appears that accidental exposure rates among Thai medical students is much higher than in some more developed countries even though most of the Thai students, 85.9% as in our study, had attended courses regarding the universal precautions.

As for the types of exposures, we found that the most common accidental exposure was contact with patient's blood or secreta (53.4%) followed by needle stick injury (34.7%), glass injury (7.2%) and other sharp object injury (4.7%) respectively. The most common needle stick injury was due to the suture needles which mainly occurred in the emergency room. Injuries from ampoules was the most common glass injury. For other sharp object injuries, more than half were due to scalpel blades and these commonly occurred during the manual attaching or removal of the blades to their holders.

After exposures, only 20% of the students reported the episodes. Among those who did not report the exposures, nearly half of them thought that it was not necessary. One-third did not know that exposures were required to be reported, to whom to report, or how to report, or they were concerned about the confidentiality. These figures reflect the problem of the postexposure reporting system in our hospital. This should be restructured and the health care workers and medical students better informed.

Our study, indicated that overall knowledge of the universal precautions by the subject medical students were at a high level, and was significantly associated with the year of study. However, considering the detail of knowledge among the surveyed medical students, two-thirds of them thought that recapping of a needle should not be prohibited. According to the guidelines for universal precautions recommended by the Center for Disease Control (CDC) in 1987, needles should not be recapped, removed from disposable syringes or manipulated by hand⁽⁸⁾ due to frequent accidental injuries during such practices.

Considering avoidance attitudes, of the medical students this was also at high levels. Similar to the knowledge, the attitude was significantly associated with the year of study. However, a majority of medical students still thought that blood test for HIV infection prior to operations or any procedures should be done in every patients.

Universal blood test especially for HIV infection has a number of problems as a preventive strategy and is not a viable alternatives to the universal precaution. First, it does not work in emergencies, which are typically the situations in which the likelihood of HIV exposures is greatest. Second, the extraordinary expense and difficult logistics are inherent in a program of universal test. How often do we retest patients? What is the cost of doing that? How do we deal with the false positives, however small they might be? If we identify the positive patients, how will that affect care? Although the universal blood test might heighten consciousness about use of precautions, it

would also lead to discrimination in providing health care. Third, the issue of the false-negative window prior to antibody positivity continues to be a problem. Patients during this period are infective but have negative antibody tests. So the universal precaution should be used routinely in every patients regardless of their infectious status. However, this issue has been the focus of an emotional debate, so general agreement was reached that there are specific indications for pre-operative testing recommended by CDC in 1993 which we personally think that it can be applied to HIV testing as well⁽⁹⁾. The detail of this recommendation was beyond the scope of this article.

Avoidance practice according to the universal precautions, was only at a fair level and we have seen many defects regarding the behaviour to avoid accidental exposures which should be reemphasized and readjusted including holding the suture needle or blade with needle holder or forceps during medical procedure, washing their hands after physical examination or contact the patients and wearing mask or sterile gloves during dressing the actively bleeding wound everytime respectively.

We could not find significant association between the knowledge, attitude or practice to the accidental exposures which might be due to a very high exposure rate in our surveyed medical students. We also postulated that the high exposure rate despite high level of knowledge, attitude and fair level of practice should be due to other contributing factors including lack of adequate protective barriers such as gloves, gowns and masks especially in emergency conditions which

prevented the students from complying with the guidelines, lack of good models for students (especially residents) in practicing health care according to the universal precaution and lack of intentional monitoring and evaluation of universal precautions in our hospital.

Our study was a retrospective study. Eventhough in the questionnaire, we clearly limited the history of accidental exposures to be during 1st January and 31st December 1995 there might be some problems of information bias from memory. So further study, using prospective study design, should be done in order to compare the data of accidental exposure.

According to the data accumulated and the problems from the studied population's perspective, we determined that strategies to reduce accidental exposures in our hospital should include the following:

1. The hospital's administrators should have clear policies and strategies in supporting and promoting the avoidance practices according to the universal precautions in the hospital, and this should be strict and continuous.
2. The budget for maintaining use of the universal precautions (such as disinfectants, routine disposable instruments and protective barriers) should be sufficient.
3. Standard guidelines according to the universal precautions should be established specifically for different health care practices and should be as uncomplicated as possible. These include guidelines regarding post exposure man-

agement, especially the reporting system (how and to whom to report, and the confidentiality of the report), the consultation, and the counseling system.

4. Regular avoidance practices according to the universal precautions during health care delivery, especially in the emergency room and regular ward (doing bedside procedures and laboratory work), should be continuously emphasized, supervised, monitored and properly adjusted when necessary.

5. The medical students should be tested for vaccine-preventable disease immunity (such as HBV) before entering the clinical years and those who are non-immune should be full-dose vaccinated.

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