Effectiveness of educational interventions to reduce incidence of occupational exposure to blood and body fluid in first-clinical-year medical students of a Thai university-based medical school

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Abstract

Background: Occupational exposures to patients' blood and body fluid are not uncommon and increase risk of blood-borne infections among medical students during their clinical clerkship. However, existing data on interventions to prevent such exposures are limited in Thailand. We conducted this study to evaluate effectiveness of the study interventions in decreasing incidences of the occupational exposures among first-clinical-year medical students (4th-year students) in a Thai university-based medical school.

Methods: A quasi-experimental study was conducted to compare the incidence of the occupational exposures between the pre-intervention period (2019 academic year) and the intervention period (2020 academic year). The interventions included an orientation session about occupation exposure prevention and procedure review for the medical students on the first day of each major department rotation and the use of LINE application to send video clips and articles for procedure review, weekly remind the students how to prevent themselves from common occupational exposures via short messages and provide Q&A sessions between the researchers and medical students regarding procedures and occupational exposure prevention.

Results: A total of 63 medical students, men (57%) and women (43%), and 66 medical students, men (47%) and women (53%) participated in the study during the pre-intervention and intervention periods, respectively. The incidence of occupational exposure among the students was significantly lower in the intervention period compared to the pre-intervention period (7.9 vs. 35.86 per 100 person-years; P<0.001). The most common exposures were mucosal exposure (44%), needle stick injury (25%), and sharp object injuries (25%). After the exposures, there was no acquisition of syphilis and infections due to human immunodeficiency virus, hepatitis B virus and hepatitis C virus among the students in both periods.

Conclusions: The study interventions that included focused orientation and the use of LINE application to communicate with the students regarding procedure review and occupational exposure prevention were associated with significant decrease in the incidence of occupational exposure during their clinical clerkship.

Background

- Occupational exposures through needle stick and sharp object injuries and contact with patients' blood and body fluid are not uncommon.
- Such exposures increase risk of blood-borne infections among medical students during their clinical clerkship, especially in those in their first clinical year.
- Existing data on interventions to prevent such exposures are limited in Thailand.

Methods

Population: The 4th-year medical students

Settings: Thammasat University Hospital (TUH), a 650-bed tertiary-care hospital in Pathumthani, Thailand

Design: A quasi-experimental study

Study period:
Pre-intervention period: 2019 academic year (9 September 2019 to 3 April 2020)
Intervention period: 2020 academic year (7 September 2020 to 2 April 2021)

The study interventions:
- An orientation session about occupation exposure prevention
- Procedure review for the medical students (conducted on the first day of each major department rotation)
- The use of LINE application to communicate between researchers and the students

LINE Application

- Sharing video clips of procedures
- Sharing articles for procedure review
- Weekly reminding the students how to prevent themselves from common occupational exposures via short messages
- Q&A sessions between the researchers and medical students regarding procedures and occupational exposure prevention

Statistical analysis:
- All statistical analyses were executed using the SPSS software.
- Categorical variables were compared using the Pearson's chi-square or Fisher's exact test, as appropriate.
- Continuous variables were compared using the Mann–Whitney U-test.
- P value of less than 0.05 was considered statistically significant.
- Incidences of blood and body fluid exposures among the medical students were calculated and compared between the pre-intervention and intervention periods using generalized linear models based on the Poisson distribution.

Results

Table 1 Baseline characteristics of the 4th-year medical student in the pre-intervention and intervention periods

Characteristic	Pre-intervention period (N = 63)	Intervention period (N = 66)	P-value
Sex			0.25
Male	36 (57.14)	31 (46.97)	
Female	27 (42.86)	35 (53.03)	
Age (year, median, IQR)	21 (21-22)	20 (20-21)	<0.001
Rotation			
Internal Medicine	63 (100)	66 (100)	1.00
Duration (day, median, IQR)	84 (84-84)	84 (84-84)	1.00
OB-GYN	63 (100)	66 (100)	1.00
Duration (day, median, IQR)	42 (42-42)	42 (42-42)	1.00
Surgery	63 (100)	66 (100)	1.00
Duration (day, median, IQR)	84 (84-84)	84 (84-84)	1.00
Rotation orientation	63 (100)	66 (100)	1.00
Illicit Drug use	0 (0)	0 (0)	1.00

Data in numbers (%) unless indicated otherwise.
IQR = interquartile range; OB-GYN = obstetrics and gynecology

Table 2 Outcomes of blood and body fluid exposure among the 4th-year medical students

Outcomes	Pre-intervention period (N = 63)	Intervention period (N = 66)	P-value
Exposure			
Rate (%)	13 (20.63)	3 (4.54)	0.007
Incidence (per 100 person-year)	35.86	7.9	<0.001
Subsequence infection associated with the exposure			
HIV infection	0 (0)	0 (0)	1.00
HBV infection	0 (0)	0 (0)	1.00
HCV infection	0 (0)	0 (0)	1.00
Syphilis	0 (0)	0 (0)	1.00

Data in numbers (%) unless indicated otherwise.
HBV = hepatitis B virus; HCV = hepatitis C virus; HIV = human immunodeficiency virus

Table 3 Rotation which the 16 occupational exposures occurred

Rotation	Pre-intervention period (N = 13)	Intervention period (N = 3)
Internal medicine	6 (46.15%)	1 (33.33%)
Surgery	6 (46.15%)	0 (0)
Obstetrics and gynecology	1 (7.7%)	2 (66.67%)

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Table 4 Characteristics of blood and body fluid exposure and post-exposure management among the 4th-year medical students

Characteristic	Pre-intervention period (N = 13)	Intervention period (N = 3)	P-value
Type			
Needle stick injury	2 (15.38)	2 (66.67)	0.14
Injury caused by other sharp objects	3 (23.07)	1 (33.33)	1.00
Mucocutaneous exposure	7 (53.85)	0 (0)	0.21
Open-wound contamination	1 (7.7)	0 (0)	1.00
Organ involvement			
Eyes	7 (53.85)	0 (0)	0.21
Nose	0 (0)	0 (0)	1.00
Mouth	0 (0)	0 (0)	1.00
Finger	6 (46.15)	3 (100)	0.21
Procedure			
Venous puncture	0 (0)	0 (0)	1.00
Arterial puncture	1 (7.7)	0 (0)	1.00
Normal Labor	1 (7.7)	2 (66.67)	0.071
Suturing	0 (0)	0 (0)	1.00
Dressing wound	3 (23.07)	0 (0)	1.00
Recapping syringe	0 (0)	0 (0)	1.00
Collecting material after used	8 (61.53)	1 (33.33)	0.55
Infection status of the index patient			
HIV positive	1 (7.7)	0 (0)	1.00
HBV positive	1 (7.7)	0 (0)	1.00
HCV positive	0 (0)	0 (0)	1.00
Protection equipment wearing			
Goggles	0 (0)	3 (100)	0.002
Gloves	13 (100)	3 (100)	1.00
Surgical masks	13 (100)	3 (100)	1.00
Gowns	13 (100)	3 (100)	1.00
Post-exposure cleasing			
Cleansing with water	0 (0)	0 (0)	1.00
Cleansing with 4%chlorhexidine	13 (100)	3 (100)	1.00
Cleansing with 4%chlorhexidine and 70% alcohol	0 (0)	0 (0)	1.00

Conclusion

- **The study interventions, including the comprehensive orientation and the use of LINE application, significantly decreased the incidence of blood and body fluid exposure during clinical clerkship of the medical students.**
- **The decrease in the incidence of blood and body fluid exposure was likely due to 1) continuous education provided in each rotation 2) weekly reminder message enhancing awareness of accident prevention and 3) Q&A sessions in the app filling the gaps of knowledge in a friendly environment.**
- **Based on the study findings, wearing standard personal protective equipment, including goggles could further decrease in incidences of occupational exposure among the medical students.**