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ORIGINAL RESEARCH

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## EXPLORING HEALTHCARE-ASSOCIATED INFECTIONS: KNOWLEDGE, ATTITUDE, AND BEHAVIOR OF EMERGENCY NURSES WORKING IN BANDUNG, INDONESIA

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### ABSTRACT

**Background:** Healthcare associated Infections (HAIs) is considered being the most serious patient safety issue in health care settings and nurses in Emergency Department (ED) face greater risk of exposure to infectious pathogens.

**Objective:** The objectives of this study were to examine knowledge, attitude and behavior towards HAIs of Indonesian nurses working in ED and to examine the relationship among the above three variables.

**Method:** A cross-sectional study with self-reported survey was conducted at four hospitals in Bandung, Indonesia. The Healthcare Associated Infections Survey consisting of four domains: demographic characteristics, knowledge, attitude and behavior related to HAIs was used. The participants of this study covered 115 nurses.

**Results:** The mean of overall performance on the knowledge was good  $21.23 \pm 5.173$  (range 9-30) and 92.2% of them believed that guideline for HAIs control practice can reduce the risk of infections. The mean score for behavior when practicing infection control was  $37.7 \pm 5.570$  (26-50). Marital status and working hours per week, influenced nurses' knowledge of HAIs ( $r_s = 0.185$ ,  $p = 0.048$ ). Work experienced have negative correlation with attitude towards HAIs ( $r_s = -0.196$ ,  $p = 0.035$ ). Furthermore, type of hospital and working hours per week have been associated with nurses' behavior towards HAIs ( $r = 0.191$ ,  $p = 0.04$ ). There was no significant relationship between knowledge, attitude and behavior towards HAIs.

**Conclusion:** Even though the majority of ED nurses in Indonesia believe that precautionary guidelines can reduce the risk of HAIs, this study has indicated that nurses' behavior toward HAIs is still insufficient.

**Keywords:** nurses knowledge, attitude, behavior, healthcare-associated infections

## INTRODUCTION

Health care-Associated Infections (HAIs) nowadays has become the fifth leading cause of death in acute-care hospitals and considered to be one of the most serious patient safety issues in health care.<sup>1</sup> The World Health Organization (WHO) has reported that approximately 1.4 million people suffered HAIs in developing countries, the risk can be up to 20 times greater than in developed countries.<sup>2</sup> The concept of HAI is now extends to not only infections suffered by patients, but also acquired by health-care workers as a result of their work within the health-care system.<sup>3</sup> As the front line of medical care, nearly half of hospital admissions contribute by emergency department (ED) and place it as a high-paced and high-volume health care environment in the hospital.<sup>4</sup> A 5-year surveillance study about occupational exposure to blood borne pathogens in Mexico showed that the majority of HAIs occurred in the emergency room with a total of 34.06% and followed by the internal medicine wards of 16.8% and makes ED the higher proportion of HAIs occurrence than in any other hospital settings.<sup>5</sup>

HAIs in the healthcare setting cause harm for both patients and nurses, and therefore reflect the quality of healthcare.<sup>6</sup> Thus, to reduce the occurrence of HAIs and improve the quality of healthcare services, comprehensive education such as increasing knowledge, attitude and adherence towards standard precaution guideline for nurses are needed.<sup>7,8,9,10,11</sup> To date, there is limited data about knowledge, attitude, and behavior of infection control practice within ED in Indonesia. This information is necessary to assess whether ED personnel are prepared in preventing HAIs, especially nurses contribute the majority of staffing in hospital. Therefore, the objectives of this

study were to examine knowledge, attitude and behavior towards HAIs of Indonesian nurses working in ED and to examine the relationship among the above three variables.

## METHODS

### *Subjects and Setting*

A cross-sectional with self-reported survey was conducted from March to May of 2015 at four hospitals conveniently selected from Bandung City region in Indonesia. These hospitals were classified as type A, B and C.

### *Human Subject Protection*

Ethical approvals were obtained from the Institutional Review Board of Hasan Sadikin Bandung General Hospital. Next, the researcher identified eligible participants along with the head nurses of those selected hospitals, then gave the informed consent to the participants. 141 ED nurses were invited and agreed to participate in this study. After signing the informed consent, participants were given the questionnaire.

### *Instrument*

This study used the healthcare-associated infections survey for data collection which comprised of four sessions: (1) demographic and occupational characteristics; (2) knowledge about the risk of acquiring and/or transmitting certain HAIs for/to a patient and standard precautions for prevention; (3) attitude toward precautionary guidelines and perception of the risk of acquiring HAI; and (4) practice of standard precautions.

There were seven questions related to ED nurses' knowledge towards HAIs. Correct answers receive a score of 1 point and false answer received 0 point, correct answers to each item were based on the review of published literature, policies and

guidelines.<sup>12,13</sup> The attitude section of questionnaire comprises of 4 questions, three questions are related to ED nurses' attitude toward HAIs. These questions demand a response whether ED nurses agree (scored 1) or uncertain/disagree (scored 0) that precautionary guidelines can reduced the risk of HAIs. Another question measured ED nurses' perception about the risk of acquiring HAI, the possibility response ranging from 1 to 5 scales with 1 meaning no risk and 5 indicating very high risk. Last, the behavior part of questionnaire consists of 14 questions with the scale ranging from 0 to 4, 0 = never, 1 = rarely, 2 = sometimes, 3 = often and 4 = always. The question consists of standard precautions guideline which includes hand hygiene practice, glove-use practice, protective eyewear practice, mask-use practice, sharps handling practice and sharps disposal practice.

#### Statistical Analysis

The differences of mean between knowledge, attitude and behavior by demographic and occupational characteristics were analyzed using Mann-Whitney U-test and Kruskal-Wallis test, independent t-tests and one-way ANOVA.

In addition, continuous types of data were analyzed using Pearson and Spearman correlation.

The relationship among knowledge, attitude, and behavior was determined using Spearman correlation. All statistical analysis was performed with statistical software package SPSS for Windows (Version 17.0, SPSS, Chicago, IL) with the  $\alpha$  level was set at  $<0.05$  as statistically significant.

## RESULTS

### Demographic Characteristics

Of the 141 ED nurses agreed to participate, only 115 (81.6% response rate) completed the survey, including 63 (54.8%) nurses from type A hospital, 42 (36.5%) nurses from type B hospitals and 10 (8.7%) nurses from type C hospital. The majority of respondents were female (71.3%) and married (87.8%). Participants' ages were ranged between 24 to 55 years with the average of 33.97 (SD = 5.724). Their working experience was 1-24 years with the average of 8.58 (SD = 5.294). Their number of working hours per week was 34-78 hours with the average of 47.61 (SD = 5.491).

**Table 1** Total score of knowledge, attitude and behavior of HAIs

| Variables             | n   | %    | Mean  | Standard Deviation (SD) | Minimum | Maximum |
|-----------------------|-----|------|-------|-------------------------|---------|---------|
| <b>Knowledge</b>      | 115 |      | 21.23 | 5.173                   | 9       | 30      |
| <b>Attitude</b>       |     |      |       |                         |         |         |
| Agree                 | 106 | 92.2 |       |                         |         |         |
| Disagree              | 9   | 7.8  |       |                         |         |         |
| <b>Perceived risk</b> |     |      |       |                         |         |         |
| 1 (no risk)           | 0   | 0    |       |                         |         |         |
| 2 (mild risk)         | 0   | 0    |       |                         |         |         |
| 3 (moderate risk)     | 9   | 7.8  |       |                         |         |         |
| 4 (high risk)         | 24  | 20.9 |       |                         |         |         |
| 5 (very high risk)    | 82  | 71.3 |       |                         |         |         |
| <b>Behavior</b>       | 115 |      | 37.7  | 5.570                   | 26      | 50      |

*Nurses' Knowledge, Attitude and Behavior toward HAIs*

Table 1 summarize the total score of knowledge about HAIs which ranged from 9-30 with the mean score of 21.23 (SD = 5.173). Concerning about nurses' attitude, almost all of the respondents (92.2%) agreed that guideline for HAIs control practice can reduce the risk of infections and the majority of them perceived the risk of acquiring HAIs as very risky (71.3%). While, the total score for behavior ranged from 26-50 with a mean score of 37.7 (SD = 5.570).

Concerning about nurses' HAI related behavior, the majority (95.6% and 90.4%) of them always or often place needles in sharp's containers and always change gloves before going to another patient. In contrast, 93% of nurses always or often recap needles after using. Poor behaviors also reported in hands hygiene measures before wearing gloves, using intravenous cannulation with retractable needle, using syringes with retractable needle and wearing protective eyewear when at direct contact with a patient (See Table 2).

**Table 2** Nurses' behavior related to HAI

| No | Practice   | Always<br>n (%) | Often<br>n (%) | Sometime<br>s<br>n (%) | Rarely<br>n (%) | Never<br>n (%) |
|----|--|-----------------|----------------|------------------------|-----------------|----------------|
| 1  | Placing needles in sharp's containers                            | 102 (88.7)      | 8 (7)          | 2 (1.7)                | 1 (0.9)         | 2 (1.7)        |
| 2  | *Recapping needles after using                                   | 94 (81.7)       | 13 (11.3)      | 2 (1.7)                | 5 (4.3)         | 1 (0.9)        |
| 3  | Changing gloves before going to another patient                  | 84 (73)         | 20 (17.4)      | 10 (8.7)               | 1 (0.9)         | 0 (0)          |
| 4  | Hands hygiene measures before starting the working activity      | 73 (63.5)       | 26 (22.6)      | 15 (13.0)              | 1 (0.9)         | 0 (0)          |
| 5  | Hands hygiene measures after removing gloves                     | 80 (69.6)       | 19 (16.5)      | 13 (11.3)              | 2 (1.7)         | 1 (0.9)        |
| 6  | Using scalpels with protective shield                            | 81 (70.4)       | 15 (13.0)      | 4 (3.5)                | 9 (7.8)         | 6 (5.2)        |
| 7  | Hands hygiene measures before going to another patient           | 63 (54.8)       | 29 (25.2)      | 22 (19.1)              | 1 (0.9)         | 0 (0)          |
| 8  | Using syringes with protective shield                            | 69 (60.0)       | 22 (19.1)      | 18 (15.7)              | 5 (4.3)         | 1 (0.9)        |
| 9  | Wearing mask when at direct contact with a patient               | 40 (34.8)       | 42 (36.5)      | 29 (25.2)              | 3 (2.6)         | 1 (0.9)        |
| 10 | Wearing gloves when at direct contact with a patient             | 49 (42.6)       | 30 (26.1)      | 32 (27.8)              | 4 (3.5)         | 0 (0)          |
| 11 | Hands hygiene measures before wearing gloves                     | 27 (23.5)       | 29 (25.2)      | 46 (40.0)              | 12 (10.4)       | 1 (0.9)        |
| 12 | Using intravenous cannulation with retractable needle            | 26 (22.6)       | 9 (7.8)        | 26 (22.6)              | 22 (19.1)       | 32 (27.8)      |
| 13 | Using syringes with retractable needle                           | 22 (19.1)       | 9 (7.8)        | 21 (18.3)              | 30 (26.1)       | 33 (28.7)      |
| 14 | Wearing protective eyewear when at direct contact with a patient | 6 (5.2)         | 5 (4.3)        | 21 (18.3)              | 21 (18.3)       | 62 (53.9)      |

\*Negative behavior

*Nurses' Knowledge, Attitude and Behavior toward HAIs by Demographic Characteristics*

Table 3 and 4 presented the score of ED nurses' knowledge, attitude and

behavior by their demographic and occupational characteristics. The results showed there were significant differences in marital status ( $Z = -2.838, p = 0.005$ ) on knowledge performance among

participants. Working hour per week was also found to have positive correlation with nurses' level of knowledge ( $r^s = 0.185, p = 0.048$ ).

Results showed that negative correlation was found between working experience ( $r = -0.196, p = 0.035$ ) and attitude, indicating that more experienced nurses have less agreement with the guideline for HAIs control practice.

In behavior, significant difference was identified by types of hospital ( $F_{(113)} = 5.560, p = 0.005$ ). Further post-hoc

analysis indicated that nurses who worked in type A and B hospital ( $M = 37.84, SD = 5.178$  and  $M = 38.88, SD = 5.823$ , respectively) have better behavior compared to those who worked in type C hospital ( $M = 32.60, SD = 4.274$ ). In addition, result also indicated a positive correlation between working hour per week and nurses' behavior ( $r = 0.191, p = 0.04$ ). No significant relationships among knowledge, attitude and behavior toward HAIs for nurses who practicing infection control guideline.

**Table 3** Differences of ED nurses' knowledge, attitudes and behavior by the demographic and occupational characteristics

|                         | Knowledge   | Z/ $\chi^2$       | Attitude   | Z/ $\chi^2$       | Perceived risk | Z/ $\chi^2$       | Behavior    | t/F            |
|-------------------------|-------------|-------------------|------------|-------------------|----------------|-------------------|-------------|----------------|
| <b>Gender</b>           |             | -0.976            |            | -0.365            |                | -0.687            |             | -1.036         |
| Male                    | 20.61±4.808 |                   | 2.88±0.485 |                   | 4.58±0.663     |                   | 36.79±6.927 |                |
| Female                  | 21.49±5.320 |                   | 2.90±0.337 |                   | 4.66±0.613     |                   | 38.16±4.915 |                |
| <b>Marital status</b>   |             | <b>-2.838**</b>   |            | -0.029            |                | -0.320            |             | -0.950         |
| Married                 | 21.79±4.873 |                   | 2.90±0.361 |                   | 4.64±0.610     |                   | 37.56±5.716 |                |
| Not married             | 16.92±5.795 |                   | 2.85±0.555 |                   | 4.54±0.776     |                   | 38.77±4.086 |                |
| <b>Type of hospital</b> |             | 2.53 <sup>a</sup> |            | 2.27 <sup>a</sup> |                | 3.93 <sup>a</sup> |             | <b>5.560**</b> |
| Type A                  | 21.51±5.264 |                   | 2.86±0.435 |                   | 4.63±0.630     |                   | 37.84±5.178 |                |
| Type B                  | 21.40±5.066 |                   | 2.93±0.342 |                   | 4.74±0.497     |                   | 38.88±5.823 |                |
| Type C                  | 18.80±4.894 |                   | 3.00±0.000 |                   | 4.20±0.919     |                   | 32.60±4.274 |                |

Note. Analyzed by Mann-Whitney U, Kruskal-Wallis, independent t-test and one-way ANOVA,  $a=\chi^2$ . \*  $p < 0.05$ . \*\*  $p < 0.01$ .

**Table 4** Correlation between continuous variables of demographic and occupational characteristics and ED nurses' knowledge, attitudes and behavior

|                       | Knowledge | Attitude | Perceived risk | Behavior |
|-----------------------|-----------|----------|----------------|----------|
| Age                   | -0.059    | -0.086   | 0.079          | 0.020    |
| Working experience    | 0.004     | -0.196*  | 0.102          | -0.024   |
| Working hour per week | 0.185*    | -0.079   | 0.149          | 0.191*   |

Note. Analysis using Spearman Correlation test. \* $p < 0.05$  (2-tailed)

## DISCUSSIONS

### *Nurses' Knowledge, Attitude and Behavior toward HAIs*

This study revealed that nurses' knowledge was considered to be good with majority of them were aware that tuberculosis and hepatitis B can be transmitted from patient to nurse and vice

versa. This finding was not surprising, since tuberculosis were a common infectious disease in Indonesia with the prevalence of 0.4% and the prevalence of hepatitis at all ages were increasing from 0.6 percent in 2007 to 1.2 percent in 2013.<sup>14</sup>

In terms of nurses' attitude, almost all of them agreed that the use of guidelines for HAIs control practices can reduce the risk of infections. There is possibility to attribute these positive attitudes toward HAIs with the high knowledge of ED nurses which has been reported earlier.

This study showed that nurses have overall good behavior toward HAIs. However, there were only few ED nurses who performed infection control practice such as using intravenous cannulation with retractable needle, using syringes with retractable needle and wearing protective eyewear when at direct contact with a patient. This may be attributed to that the unavailability of those equipment in the hospital. The highest adherence was placing needles in sharp's containers (95.6%), this finding was similar with the study in Kuwait.<sup>15</sup> Surprisingly, most of nurses (93%) were still recapping the needles after using which is dangerous. These findings may answer the high incidence of healthcare worker experiencing needle stick accident in Surabaya and Semarang.<sup>16</sup>

#### *Differences of Nurses' Knowledge, Attitude and Behavior toward HAIs by Demographic Characteristics*

This study indicated a significant difference between the married group and single group regarding knowledge about HAIs. Previous studies stated that younger age had a higher level of knowledge than their older colleagues.<sup>17,18</sup> This finding reflected that younger age had a better ability to acquire an up-to-date knowledge, while in older age, the efficacy of their prior knowledge decreased over time.<sup>19</sup>

Positive correlation also found between nurses' working hour per week and knowledge. This finding was inconsistent with previous study in Italy which found no significant relationship

between length of working time and knowledge.<sup>20</sup> Reasonable explanation is that working longer than forty hour per week increased the risk of exposure to infectious pathogens up to 1.2 times higher compared to those who worked fewer hours.<sup>21</sup> Our finding may be attributed to that the majority of participants worked more than 40 hours per week and that they perceived themselves at very high risk of acquiring HAIs.

Concerning attitude, this study indicated that more experienced nurses did not believe that precautionary guidelines can reduce the risk of HAIs. This finding was supported by Ferguson<sup>22</sup> which showed that some experienced healthcare workers were too sophisticated with the precaution guidelines because they viewed their experience as sufficient for a safer method as the recommended guidelines.

In terms of behavior, this study found significant differences between types of hospital and behavior of nurses towards infection control. Parallel to this finding, previous studies conducted in China has reported that nurses from grade A and B hospitals performed significantly better than those of grade C hospitals.<sup>23,24</sup> Barrier for smaller hospitals' sub optimal behavior towards infection control practices were identified as the lack of financial support, undertrained personnel working in infection control, and shortage of equipment and supplies.<sup>25</sup>

#### *Limitations and Future Research*

This study has several limitations. First, the selection of participating hospitals using convenience sampling and the number of participants was small, therefore limited the generalizability of the findings to other hospitals elsewhere in Indonesia. Second, self-reported response, especially if related to practice, can lead to overestimation, thus resulting a bias. Finally, future research should consider to

recruit participants from different regions around the country to represent the cultural and geographical differences comprehensively.

## CONCLUSION

The majority of ED nurses have good knowledge, showed positive attitude, and majority of them perceived the risk of acquiring HAIs as very high risk. However, low behavior scores were found in several items.

To monitor adherence of desired behavior, a trained infection control practitioner is crucial for healthcare institution to conduct surveillance, monitoring good behavior of infection control practice and provide ongoing education of healthcare workers. To achieve these objectives, Wright<sup>26</sup> recommended 1.0 to 1.5 infection control practitioner per 100 occupied beds.

## Declaration of Conflicting Interest

There is no conflict of interest to be declared in this study.

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## Authorship Contribution

All authors contributed equally in this study.

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