

# Investigating Nurses' Knowledge and Self-efficacy Regarding the Principles of Infection Control in the Operating Room

Maryam Nakhaei<sup>1</sup>, Samaneh Alinejad Mofrad<sup>2\*</sup>

<sup>1</sup>Assistant Professor, Department of Nursing & Midwifery, Faculty of Nursing & Midwifery, Birjand University of Medical Science, Birjand, Iran

<sup>2</sup>MSc of Nursing, Department of Nursing & Midwifery, Faculty of Nursing & Midwifery, Mashhad University of Medical Science, Mashhad, Iran

## \*Correspondence to

Samaneh Alinejad Mofrad; Department of Nursing & Midwifery, Faculty of Nursing & Midwifery, Mashhad University of Medical Science, Mashhad, Iran.  
Tel: 0511-8026256;  
Email: [alinejads1@yahoo.com](mailto:alinejads1@yahoo.com)

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## Introduction

Nosocomial infections have been always among the major problems of healthcare delivery systems. According to the statistics provided by the World Health Organization (WHO), 17–29 billion dollars was spent on nosocomial infections in 2004. Moreover, these statistics showed that one twentieth of patients develop nosocomial infections (1). The rate of nosocomial infections in some hospitals located in the United States reaches even to 15% (2). In developing countries, these infections are the fifth leading

cause of hospital death and the eleventh leading cause of death nationwide (2). In our country, Iran, the incidence of nosocomial infections is 1.9%–25% (3).

Among hospital wards, the operating room is an appropriate place for causing severe nosocomial infections. A simple carelessness in infection control in the operating rooms can endanger the life of a patient who has undergone a minor surgery (4). It is estimated that 24% of all nosocomial infections are related to the infections of surgical sites. In the United States, 2.8% of all

## Abstract

**Background and Aim:** Nosocomial infections have been always among the major problems of healthcare delivery systems. The operating room is an appropriate place for causing severe nosocomial infections. Knowledge of infection control guidelines and standards is the key to infection prevention. This study was conducted to investigate nurses' knowledge and self-efficacy regarding the principles of infection control in the operating room.

**Methods:** This cross-sectional descriptive-analytic study was conducted in 2013. The census method was employed to recruit 62 nurses from the operating rooms of Imam Reza (PBUH) and Valiasr (PBUH) teaching hospitals, Birjand, Iran. The study data were collected by using a 3-part questionnaire on nurses' demographic characteristics, knowledge of infection control principles (25 questions), and self-efficacy (10 questions). The validity of the questionnaire was confirmed through assessing its content validity. Moreover, the Cronbach alpha values for the knowledge and the self-efficacy parts of the questionnaire were 0.82 and 0.86, respectively. The data were analyzed by conducting the Pearson correlation test and the independent-samples *t* test by the SPSS software (v. 16.0).

**Results:** From 62 participating nurses, 44 nurses (71%) were female, 46 nurses (74.2%) were married, 27 nurses (43.5%) had a work experience of less than 10 years, and 40 nurses (65%) held bachelor's degree. The participants' mean age was  $29 \pm 7.0$  years. Most of the participants (42 nurses; 67.7%) had previously received in-service educations about infection control from whom, 26 nurses (64%) were dissatisfied with the educations and 28 nurses (68%) reported that they needed to participate in continuing education programs on infection control. The infection control knowledge of 41 nurses (66.1%) and the self-efficacy of 49 nurses (79%) were at moderate level. There was a significant correlation between nurses' knowledge and gender ( $P < 0.001$ ) and between their knowledge and self-efficacy ( $R = 0.271$  and  $P = 0.033$ ).

**Conclusion:** The findings of the present study indicated that nurses' knowledge and self-efficacy regarding the principles of infection control in the operating room were moderate. Accordingly, strategies are needed for enhancing nurses' knowledge and promoting their infection control practice.

**Keywords:** Knowledge, Self-efficacy, Nursing staffs, Infection control, Operating room.

surgeries result in infection (5). Moreover, in Iran, 50% of patients who undergo surgeries refer again to healthcare settings from which, 23% refer due to infections acquired in the operating rooms (3). The most common bacteria in the operating room are the bacteria which are transmitted by the operating room staffs (6).

Although infection prevention is the responsibility of all hospital staffs, nurses have a unique position in infection prevention due to their continuous and direct relationship with patients (7). The most important points in clinical practice are knowing and adhering to guidelines (8). Nurses can effectively prevent nosocomial infections through knowing and doing simple procedures such as accurately disinfecting patients' skin before performing invasive procedures, wearing gloves and mask, and adhering to sterilization principles and standard precautions (7).

Infection prevention necessitates having knowledge and self-efficacy (9). Knowledge and self-efficacy are the prerequisites to behavior change and provide motivation for displaying a certain behavior (9). Self-efficacy is the confidence in one's own ability to display a behavior and it links knowledge to behavior (10). Studies have shown that nurses have limited (11,12) to moderate (13-16) knowledge and moderate self-efficacy (11) in the area of infection control.

Knowledge of infection control guidelines and standards is the key to preventing and minimizing infections. Despite the wealth of studies in the area of infection prevention, there is limited data about the infection control knowledge and self-efficacy of nurses who work in teaching hospitals located in Birjand, Iran. As knowing nurses' knowledge is necessary for educational planning and evaluation, this study was conducted to investigate nurses' knowledge and self-efficacy regarding the principles of infection control in the operating room.

## Methods

This cross-sectional descriptive-analytic study was conducted in 2013. The census method was employed to recruit 62 nurses from the operating rooms of Imam Reza (PBUH) and Valiasr (PBUH) teaching hospitals, Birjand, Iran. The inclusion criteria were having associate degree or higher in nursing, giving consent for participation in the study, and having a minimum work experience of six months in the operating room.

The data collection tool was a 3-part researcher-made questionnaire on nurses' demographic characteristics, knowledge of infection control principles, and self-efficacy. The second part of the questionnaire (i.e. the part on infection control principles) consisted of 25 four-choice questions. The five domains of this part were knowledge about the principles of wearing the operating room uniform, knowledge about performing scrub, knowledge about the principles of wearing gown and gloves, knowledge about maintaining sterility, and knowledge about the principles of post-surgery infection

control. This part of the questionnaire was developed through reviewing two textbooks in nursing and in infection control practice in the operating room (7,14). The correct and the wrong answers to the questions of this part were scored respectively 1 and 0, leading to a total score of 0–25. Unanswered questions were also scored 0. The total score of infection control principles part was classified into the three levels of limited knowledge (0–8), moderate knowledge (9–17), and great knowledge (18–25).

The third part of the questionnaire consisted of 10 questions on nurses' self-efficacy in preventing and fighting infections in the operating room. This part was developed by reviewing the existing literature, using the standardized Bandura's self-assessment questionnaire (17), and reviewing other self-efficacy questionnaires (11,18). The questions of this part were scored on a 5-point Likert scale from 1 (Completely agree) to 5 (Completely disagree). Thus, the total score of the self-efficacy part was 10–50. Scores of 10–23, 24–37, and 38–50 were respectively interpreted as poor, moderate, and high self-efficacy.

The content validity assessment method was used for evaluating the validity of the questionnaire. Accordingly, the questionnaire was given to 15 faculty members of Mashhad and Birjand Universities of Medical Sciences, Birjand and Mashhad, Iran. Then, the questionnaire was amended based on their comments. Moreover, for evaluating the reliability of the questionnaire, a pilot study was done on ten nursing staffs working in the operating room. The nurses were asked to complete the questionnaire. The Cronbach alpha of the knowledge and the self-efficacy parts of the questionnaire were respectively 0.82 and 0.86.

For data collection, written consent was initially obtained from all participants. Then, the questionnaire was given to the nurses who worked in the morning, evening, and night working shifts. The nurses were asked to complete the questionnaire in the same working shift, without consulting others, and in the presence of the second author.

The collected data were entered into the SPSS software (v. 16.0). The measures of mean, standard deviation, and absolute and relative frequencies were used for data description. The correlation of knowledge and self-efficacy was examined by conducting the Pearson correlation test. Moreover, the independent-samples *t* test was used for comparing the scores of different domains of the questionnaire with each other as well as for comparing knowledge and self-efficacy scores in different levels of nurses' demographic characteristics.

## Results

From 62 participating nurses, 44 nurses (71%) were female, 46 nurses (74.2%) were married, 27 nurses (43.5%) had a work experience of less than ten years, and 40 nurses (65%) held bachelor's degree. The participants'

mean age was  $29 \pm 7.0$  years. Most of the participants (42 nurses; 67.7%) had previously received in-service educations about infection control from whom, 26 nurses (64%) were dissatisfied with the received educations and 28 nurses (68%) reported that they needed to participate in continuing education programs on infection control. The mean score of nurses' knowledge of infection control was  $15.8 \pm 3.5$ . Most of the participants (41 nurses; 66.1%) had moderate infection control knowledge. Nurses' knowledge in the two areas of maintaining the sterility of surgical site and wearing gown and gloves was great (Table 1). Moreover, female participants' scores in the

two areas of wearing gown and gloves and post-surgery infection control were significantly higher than their male counterparts ( $P=0.03$  and  $0.001$ , respectively; Table 2). The mean of nurses' self-efficacy score was  $32 \pm 5.6$  while 49 nurses (79%) had moderate self-efficacy. The results of the independent-samples t test illustrated that the two hospitals which were studied did not differ significantly from each other regarding the total score of self-efficacy and the scores of knowledge domains ( $P>0.05$ ). However, there was a significant difference between male and female participants regarding the total score of infection control knowledge. Moreover, there was a significant correlation

**Table 1.** The Operating Room Staffs' Knowledge and Self-efficacy in the Area of Infection Control Principles

The Assessed Domains	The Level of Knowledge			Total Evaluation	
	Limited	Moderate	Great	Mean $\pm$ SD	Level
	No. (%)	No. (%)	No. (%)		
Knowledge about the principles of wearing the operating room uniform	19 (30.6)	34 (54.8)	9 (14.6)	$2.3 \pm 1$	Moderate
Knowledge about performing scrub	2 (3.3)	34 (54.8)	26 (41.9)	$3.35 \pm 1$	Moderate
Knowledge about the principles of wearing gown and gloves	4 (6.4)	23 (37.1)	35 (56.5)	$4 \pm 1.1$	Great
Knowledge about maintaining sterility	2 (3.3)	15 (24.3)	45 (72.4)	$4 \pm 0.94$	Great
Knowledge about the principles of post-surgery infection control	4 (6.5)	37 (59.7)	21 (33.8)	$2.93 \pm 1$	Moderate
Total knowledge	1 (1.6)	41 (66.1)	20 (32.3)	$15.8 \pm 3.5$	Moderate
Total self-efficacy	6 (9.8)	49 (79.0)	7 (11.2)	$32 \pm 0.6$	Moderate

**Table 2.** Comparing the Operating Room Staffs' Knowledge and Self-efficacy Based on Their Gender, Education, Marital Status, and the Affiliating Hospital

Variables	The assessed domains					Total knowledge	Total Self-efficacy
	Knowledge about wearing the operating room uniform	Knowledge about performing scrub	Knowledge about wearing gown and gloves	Knowledge about maintaining sterility	Knowledge about post-surgery infection control		
	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD	Mean $\pm$ SD		
<b>Gender</b>							
Male	$2.09 \pm 1.11$	$3.20 \pm 1$	$3.4 \pm 1.24$	$3.72 \pm 1$	$3.63 \pm 1$	$17.7 \pm 3.04$	$20.5 \pm 6.3$
Female	$2.5 \pm 0.93$	$3.72 \pm 0.75$	$4.11 \pm 0.83$	$3.77 \pm 0.87$	$3.66 \pm 0.9$	$15 \pm 3.41$	$18.6 \pm 3.5$
P value	0.18	0.11	0.03	0.85	0.001	0.005	0.22
<b>Education</b>							
Associate diploma	$2.15 \pm 0.93$	$3.55 \pm 0.9$	$3.55 \pm 1.27$	$3.7 \pm 1.03$	$2.95 \pm 0.94$	$15.8 \pm 3.8$	$19.83 \pm 6.1$
Bachelor's	$2.23 \pm 1.18$	$3.26 \pm 1$	$3.64 \pm 1.14$	$3.76 \pm 0.95$	$2.92 \pm 1.17$	$15.9 \pm 2.7$	$20.3 \pm 4.8$
P value	0.77	0.31	0.78	0.81	0.94	0.94	0.76
<b>Marital status</b>							
Single	$1.81 \pm 0.91$	$3 \pm 0.96$	$3.25 \pm 1.3$	$3.43 \pm 1$	$2.5 \pm 0.8$	$14 \pm 3.26$	$20.9 \pm 5.4$
Married	$2.34 \pm 1.1$	$3.47 \pm 1.04$	$3.73 \pm 1.08$	$3.84 \pm 0.9$	$3 \pm 1.15$	$16.5 \pm 3.26$	$19.6 \pm 5.8$
P value	0.09	0.11	0.51	0.14	0.03	0.13	0.44
<b>Hospital</b>							
Valiasr	$1.9 \pm 1.13$	$3.1 \pm 1.11$	$3.72 \pm 1.3$	$3.51 \pm 1.1$	$2.75 \pm 1.2$	$15.03 \pm 3.86$	$19.79 \pm 5.56$
Imam Reza	$2.45 \pm 1$	$3.57 \pm 0.93$	$3.51 \pm 1$	$3.93 \pm 0.7$	$3 \pm 0.9$	$16.57 \pm 3.04$	$20.15 \pm 5.87$
P value	0.06	0.07	0.49	0.08	0.23	0.08	0.8

between nurses' knowledge and self-efficacy ( $R=0.271$  and  $P=0.033$ ).

### Discussion

This study was conducted to investigate nurses' knowledge and self-efficacy regarding the principles of infection control in the operating room. Study findings revealed that most of the participating nurses had moderate level of infection control knowledge. Previous studies also showed that nurses' infection control knowledge was either limited (11,12) or moderate (13-16) due to lack of in-service continuing education programs on nosocomial infection control (11-16). Although nurses' knowledge of nosocomial infection control depends on many factors such as personal characteristics, educational status, participation in in-service educational programs, as well as managerial and motivational factors, Gould and Chamberlain (19) noted that most nurses usually do not use their knowledge in their daily practice because they forget what they learn. Therefore, they highlighted the necessity to in-service continuing education for nurses.

The findings of the present study also revealed a significant difference between male and female participants regarding the mean score of infection control knowledge. Previous studies conducted in Mashhad (18) and Tehran (20), Iran, also indicated that female nurses' knowledge of infection control was greater than male nurses.

We also found that most of the participating nurses had moderate level of self-efficacy in infection control. However, Ghadamgahi et al found that nurses had great infection control knowledge (18). The reasons behind our participants limited knowledge may be their limited work experience (43.5% of them had a work experience of less than ten years) as well as difficult and stressful working condition of the operating rooms. Moreover, we found a significant correlation between knowledge and self-efficacy. This finding conflicts with the findings reported by Ghanbari et al (11). This conflict can be related to the fact that we studied operating room nurses while Ghanbari et al (11) conducted their study on all hospital staffs.

Although staff training is among the key components of infection control programs and can fill theory-practice gap, self-efficacy is also a significant factor in successful practice (17). This is of greater importance to hospital wards such as the operating rooms. Consequently, interventions are recommended for assessing staffs' educational needs, determining educational priorities, and enhancing staffs' motivation, knowledge, and practice.

### Conclusion

The findings of the present study indicated that nurses' knowledge and self-efficacy regarding the principles of infection control in the operating room were moderate. Given the undeniable role of nurses in infection control, educational staffs of hospitals (i.e. educational and infection control supervisors) need to provide nurses with

educations in order to promote their infection control practice.

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