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Korean Society of  
Nursing Science

Contents lists available at ScienceDirect

Asian Nursing Research

journal homepage: [www.asian-nursingresearch.com](http://www.asian-nursingresearch.com)

## Research Article

## Exploring Nursing Intention, Stress, and Professionalism in Response to Infectious Disease Emergencies: The Experience of Local Public Hospital Nurses During the 2015 MERS Outbreak in South Korea

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## ARTICLE INFO

## Article history:

Received 20 February 2017

Received in revised form

14 August 2017

Accepted 17 August 2017

## Keywords:

emotional stress

intention

Middle East respiratory syndrome

Coronavirus

nurse

professionalism

## SUMMARY

**Purpose:** This study aimed to examine levels of stress and professionalism of nurses who provided nursing care during the 2015 Middle East respiratory syndrome outbreak based on their experience, to investigate the nurses' intention to respond to possible future outbreaks in relation to their experience during the outbreak, and to determine the relationship between the outbreak experience and nursing intention considering stress and professionalism.

**Methods:** A self-administered questionnaire was designed based on modifications of related questionnaires, and used to assess levels of stress, professionalism, and nursing intention according to participants' experiences during the outbreak. Multiple regression analysis was used to examine the relationship between the outbreak nursing experience and nursing intention considering stress and nursing professionalism.

**Results:** The overall stress, professionalism, and nursing intention scores for the firsthand experience group were 33.72, 103.00, and 16.92, respectively, whereas those of the secondhand experience group were 32.25, 98.99, and 15.60, respectively. There were significant differences in professionalism and nursing intention scores between the groups ( $p = .001$  and  $p < .001$ , respectively). The regression analysis revealed that the regression estimate between stress and nursing intention was  $B(SE) = -0.08(0.02)$ ,  $\beta = -0.21$ ,  $p < .001$  and the regression estimate between professionalism in nursing and nursing intention was  $B(SE) = 0.05(0.01)$ ,  $\beta = 0.23$ ,  $p < .001$ .

**Conclusion:** Prior outbreak nursing experience was importantly associated with intention to provide care for patients with a newly emerging infectious disease in the future considering stress and professionalism. Gathering information about nurses' experience of epidemics and regular assessment of job stress and professionalism are required.

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## Introduction

Newly emerging infectious diseases are defined as diseases that have been recognized in human hosts for the first time [1]. They tend to originate within a country and severely affect the associated population, often causing detrimental effects. With rapid increases in international and overseas travel because of globalization and

developments in transportation, there is a greater likelihood of worldwide spread of newly emerging infectious diseases [2]. One of the well-known newly emerging infectious diseases of the 21<sup>st</sup> century, that had a global effect, was severe acute respiratory syndrome (SARS). It began in China, from where it spread to 29 countries, resulting in 8,422 cases and 916 deaths, worldwide [3]. Other examples include novel swine-origin influenza A (H1N1) that originated in Mexico in 2009, Ebola in Guinea in 2013, and the Middle East respiratory syndrome (MERS) in 2012.

MERS is a respiratory disease caused by the MERS-associated coronavirus (MERS-CoV). From April 2012 to October 2015, approximately 1,616 confirmed cases were reported in 26 countries, resulting in 624 deaths [4]. The infectivity of MERS-CoV is

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known to be lower than that of SARS-CoV, but MERS has a higher mortality rate (30–40% vs. 9.6%); Saudi Arabia reported 1,279 confirmed cases and 549 deaths [4]. The first case of MERS in South Korea—occurring in a male patient who had visited Saudi Arabia—was confirmed on May 20, 2015. Fear of MERS subsequently spread throughout the peninsula, with 186 confirmed cases and 38 deaths (mortality rate 20.4%) within approximately 2 months [5]. In the South Korean MERS outbreak, 21.0% of confirmed cases occurred in medical workers and 31 cases were hospital-acquired infections [6]. The first confirmed case among medical workers occurred in a nurse who had had direct contact with the index case; her case was confirmed a week after the index case presented.

Medical workers, especially nurses, are vulnerable to many occupational risks and experience a great deal of emotional stress related to their work [7]. It was reported that nurses working with patients with SARS experienced psychological distress [8]. Moreover, 91.8% of healthcare providers in Saudi Arabia, nearly half of them nurses, were found to have a negative attitude toward treating patients with suspected or confirmed MERS [9]. As MERS-related deaths began to be reported, levels of anxiety and stress increased, mainly because of the possibility of involuntary placement and dispatch to other front-line areas with a workforce shortage. Moreover, if healthcare workers involved in the management of cases are infected or die, there is a higher probability of workers avoiding suspected cases [10].

In an unusual situation requiring emergency management, such as the spread of a newly emerging infectious disease, professionalism in nursing is required to deal with the situation. The MERS outbreak challenged medical professionalism, defined as those values that sustain the interests of the patient above one's own interests [11]. Despite the efforts of many medical personnel, some nurses resigned from the national medical center and some local clinics avoided suspected patients during the epidemic. Nurses' negative and passive attitudes about patients with newly emerging infectious diseases impede the development of appropriate patient–nurse relationships and decrease the quality of medical care and patient satisfaction [12]. In such a situation, the safety not only of confirmed patients but also of the susceptible general population may not be guaranteed.

Nursing intention is the voluntary and active provision of nursing care. In the context of newly emerging infectious diseases, nursing intention is of paramount importance in overcoming these diseases. Without proper provisions of medical care, infectious diseases are easily distributed and may cause detrimental effects that are avoidable if appropriately managed. Abrupt resignation of nurses because of stress that developed during an epidemic of an infectious disease not only causes a workforce shortage, but also maximizes the distress of other remaining medical personnel by influencing the overall workplace atmosphere. In addition, based on a previous research finding [12] that showed how professionalism in nursing influenced nursing intention, it is necessary to evaluate nursing intention with regard to professionalism as well. Therefore, in this study, it was hypothesized that nurses' intention to respond to possible future instances of infectious disease may not only be associated with prior outbreak nursing experience, but also their stress at the time of the outbreak and professionalism in nursing. To evaluate not only the effect of the outbreak experience but also the role at the time, we developed the following study objectives. The aims of the present study were as follows: (1) to examine levels of stress and professionalism of nurses who provided nursing care during the 2015 South Korean MERS outbreak according to their experience, (2) to investigate the nurses' intentions to respond to possible future infectious disease outbreaks in relation to their experience during the outbreak, and (3) to determine the relationship between nursing intention and experience during the outbreak considering stress and professionalism.

## Methods

### *Study design and data collection*

This was a cross-sectional descriptive study conducted at five local public hospitals in June 2016 to understand nursing intention to respond to possible future infectious disease outbreaks considering stress and professionalism of nurses who experienced MERS by voluntarily completing prepared questionnaires. A self-administered questionnaire comprising 60 questions based on modifications of previously designed questionnaires was used for the study. The questionnaire was designed to evaluate personal and career-related characteristics (nine questions); experiences during the outbreak (five questions); and level of stress at the time of the outbreak, professionalism in nursing, and nursing intention. A five-point Likert scale was used (1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = agree, and 5 = strongly agree) to evaluate the level of stress, professionalism in nursing, and nursing intention.

### *Questionnaire for stress*

The 12 questions evaluating levels of stress during the outbreak were based on a trauma appraisal questionnaire [13] and a stress questionnaire developed by the Korean Neuro-Psychiatric Association for medical workers who experienced the MERS outbreak [14]. The stress questionnaire comprised six questions about fear, four about isolation, and two questions about outrage. The maximum score for stress during the outbreak was 60 and higher values indicated higher levels of stress. Cronbach  $\alpha$  was .87.

### *Questionnaire for professionalism*

The questionnaire for professionalism in Korean nurses [15] was edited and used to evaluate professionalism in the nursing of patients with newly emerging infectious diseases. It comprised 29 questions about self-esteem, social awareness, professionalism in nursing practice, and work independence. In this study, nursing intention is defined as voluntary and active provision of nursing care for patients with any newly emerging infectious diseases in the future. The maximum score for professionalism in nursing was 145 and nurses with higher values were considered to have higher levels of professionalism. Cronbach  $\alpha$  was .92.

### *Questionnaire for nursing intention*

The Instrument for Predictive Nursing Intention for SARS Patient Care [16], based on the theory of planned behavior [17], was modified in this study to evaluate the intention of providing nursing care to patients with newly emerging infectious diseases; five questions about positive behavior beliefs, negative behavior beliefs, norms, and control beliefs were included. The maximum score for nursing intention was 25 and the higher values indicated the higher level of nursing intention in the future. Cronbach  $\alpha$  was .71.

### *Study participants and classification*

Five local public hospitals that participated in patient care during the MERS outbreak were sampled conventionally. Of these, two local public hospitals were classified as MERS-treating hospitals with beds authorized for inpatient care and facilities for isolation of confirmed cases. One of the other three hospitals was a MERS-treating hospital with no authorized beds, and the other two were MERS-screening hospitals. In each hospital, the questionnaire

was to be distributed to at least half of the total number of nurses. A total of 360 nurses completed the questionnaires and 349 responses were collected (response rate 96.9%). Responses from 29 nurses with less than 1 year of clinical experience were excluded because it can be deduced that they did not experience the 2015 MERS outbreak. In addition, seven incomplete responses were excluded. The final analysis included data from 313 nurses. The study participants were classified according to their outbreak nursing experience. Nurses who provided either inpatient nursing care or screening services of suspected or confirmed cases were classified as the “firsthand group,” whereas participants who participated in medical care of the general population with no suspected MERS symptoms during the outbreak period were classified as the “secondhand group.”

#### *General and hospital-related characteristics*

The general characteristics of the study participants included personal and career-related characteristics. Personal characteristics included gender, age (20–29, 30–39, 40–49, and  $\geq 50$  years), marital status (yes, no), and number of children (0, 1, 2,  $\geq 3$ ). Career-related characteristics included years of clinical experience (<5, 5–10, and >10 years), position (staff nurse, head nurse), working division (ward, outpatient, special care, other care), duty type (8-hour shifts, daytime only, other type), and daily contact with patients (yes, no). The special care division included the emergency care unit, operating room, and delivery room. The “other care” division included medical support divisions such as administration, laboratory, and medical check-up centers. The “other type” duty type included night-time only and full-time workers. Variables related to hospital conditions during the outbreak included hospital type (MERS-treating hospital with authorized beds, MERS-treating hospital without authorized beds, MERS-screening hospital) and goods supply condition (sufficient, insufficient, unknown). In addition, personal conditions during the outbreak, including isolation experience and knowledge about the disease before the outbreak occurred (a lot, moderate, a little), were also evaluated. The response scores for level of stress, professionalism in nursing, and nursing intention were summed separately.

#### *Ethical considerations*

The objective of this study was explained to the head nurses of selected local public hospitals and official permissions were obtained. The study objectives were explained to all study participants and informed consent was obtained separately from all of them afterwards. All responses were kept confidential and only used for the study purpose. The institutional review board of Kyungpook National University (KPNU) provided ethics approval (Approval no.: 2016-0085).

#### *Data analysis*

First, differences in general characteristics and conditions during the outbreak according to outbreak nursing experience were examined using a  $\chi^2$  test. Mean scores for levels of stress and professionalism in nursing were compared using Student *t* test. For evaluation of nursing intention according to general characteristics and conditions during the outbreak, Student *t* test and analysis of variance were used. Multiple regression analysis was used to examine the relationship between outbreak nursing experience and nursing intention considering stress and professionalism. All statistical analyses were performed using SAS version 9.4 (SAS Institute Inc., Cary, NC, USA), and  $p < .050$  was considered to indicate statistical significance.

## **Results**

### *General characteristics and conditions during the outbreak*

Table 1 presents the study participants' general characteristics and conditions during the outbreak. There were 141 (45.1%) participants in the firsthand group and 172 (54.9%) in the secondhand group. Female nurses were predominant in both groups; only five male nurses were included in the study. The proportion of nurses aged  $\geq 50$  years was higher in the firsthand (7.1%) than in the secondhand (1.1%) group. While 12.8% of the secondhand group had two or more children, 29.8% of the firsthand group had two or more children.

A significantly higher proportion of head nurses was included in the firsthand than in the secondhand group (15.6% vs. 2.9%, respectively,  $p < .001$ ). Duty type differed significantly between the groups, with a lower proportion of 8-hour shift workers and a higher proportion of night-time only or full-time workers in the firsthand group. The hospital authorized type was significantly different between the groups ( $p = .003$ ). The proportion of participants who experienced isolation during the outbreak was significantly higher among the participants with close contact with MERS patients ( $p = .031$ ).

The overall mean stress score of total study participants was 32.91. The mean stress scores of the firsthand and secondhand groups were 33.72 and 32.25, respectively ( $p = .066$ ). The overall mean professionalism score of all participants was 110.82 of 145. The overall mean scores for professionalism in nursing were significantly higher in the firsthand than in the secondhand group (103.00 vs. 98.99, respectively,  $p = .001$ ).

### *Nursing intention according to general characteristics and conditions during the outbreak*

Nursing intention scores are presented in Table 2. The mean score for nursing intention of the study participants was 16.19 and the overall mean nursing intention score of participants with firsthand experience was 16.92, significantly higher than that of participants with secondhand experience (15.60). The participants in the firsthand group showed higher scores regardless of general characteristics and conditions during the outbreak, except for nurses aged  $\geq 50$  years. The mean nursing intention score of participants in the secondhand group aged  $\geq 50$  years was the highest (20.00), but did not differ significantly between the groups. The mean score of daytime-only workers in the secondhand group was the lowest (14.00) and differed significantly from that of the firsthand group ( $p = .026$ ). There were statistically significant differences in the mean nursing intention scores between the groups according to marital status, years of clinical experience, and hospital authorized type. Further analyses performed within each group according to general characteristics and conditions during the outbreak suggested a possible association between nursing intention and hospital authorized type. For both groups, the mean nursing intention score was significantly higher among the nurses employed at MERS-treating hospitals with authorized beds.

### *Relationship between outbreak nursing experience and nursing intention considering stress and professionalism in nursing*

Four different regression models were designed to determine associations between outbreak nursing experience and nursing intention considering stress and professionalism in nursing. The main effect variable for the regression models was outbreak nursing experience (firsthand vs. secondhand). The covariates in Model 1 were personal characteristics and career-related characteristics (sex, age, marital status, number of children, career length, position, working division, duty type, and daily contact with patients). In

**Table 1** General Characteristics and Conditions During the MERS Outbreak of Study Subjects (N = 313).

Variables	Categories	Total	n (%)		$\chi^2$ or t	p
			1st hand (n = 141)	2nd hand (n = 172)		
Personal characteristics						
Gender	Female	308 (98.4)	139 (98.6)	169 (98.3)	0.05	>.999
	Male	5 (1.6)	2 (1.4)	3 (1.7)		
Age (yr)	20–29	154 (49.2)	63 (44.7)	91 (52.9)	23.97	<.001
	30–39	94 (30.0)	32 (22.7)	62 (36.1)		
	40–49	53 (16.9)	36 (25.5)	17 (9.9)		
	≥50	12 (3.8)	10 (7.1)	2 (1.1)		
Marriage	No	198 (63.3)	85 (60.3)	113 (65.7)	0.98	.323
	Yes	115 (36.7)	56 (39.7)	59 (34.3)		
No. of child	0	208 (66.5)	85 (60.3)	123 (71.5)	15.04	.002
	1	41 (13.1)	14 (9.9)	27 (15.7)		
	2	53 (16.9)	36 (25.5)	17 (9.9)		
	≥3	11 (3.5)	6 (4.3)	5 (2.9)		
Career-related characteristics						
Clinical experience (yr)	<5	153 (48.9)	64 (45.4)	89 (51.7)	5.57	.062
	5–10	78 (24.9)	31 (22.0)	47 (27.3)		
	>10	82 (26.2)	46 (32.6)	36 (20.9)		
Position	Staff nurse	286 (91.4)	119 (84.4)	167 (97.1)	15.84	<.001
	Head nurse	27 (8.6)	22 (15.6)	5 (2.9)		
Working division	Ward	217 (69.3)	94 (66.7)	123 (71.5)	1.91	.591
	Outpatient	13 (4.2)	7 (5.0)	6 (3.5)		
	Special care <sup>a</sup>	62 (19.8)	28 (19.9)	34 (19.8)		
Duty type	Other care <sup>b</sup>	21 (6.7)	12 (8.5)	9 (5.2)	7.64	.018
	8-hour shifts	246 (78.6)	101 (71.6)	145 (84.3)		
	Daytime only	6 (1.9)	3 (2.1)	3 (1.7)		
Daily contact with patients	Yes	293 (93.6)	129 (91.5)	164 (95.4)	1.93	.165
	No	20 (6.4)	12 (8.5)	8 (4.6)		
Hospital condition during the outbreak						
Hospital type	Treat w/ authorized beds	161 (51.4)	86 (61.0)	75 (43.6)	11.42	.003
	Treat w/o authorized beds	53 (16.9)	15 (10.6)	38 (22.1)		
	Screening	99 (31.6)	40 (28.4)	59 (34.3)		
Goods supply	Sufficient	242 (77.3)	115 (81.6)	127 (73.8)	2.86	.239
	Insufficient	41 (13.1)	16 (11.4)	25 (14.5)		
	unknown	30 (9.6)	10 (7.1)	20 (11.6)		
Personal condition regarding the outbreak						
Isolation experience	Yes	7 (2.2)	6 (4.3)	1 (0.6)	4.78	.031
	No	306 (97.8)	135 (95.7)	171 (99.4)		
Prior knowledge about MERS	A lot	33 (10.5)	19 (13.5)	14 (8.1)	3.51	.173
	Moderate	182 (58.2)	75 (53.2)	107 (62.2)		
	A little	98 (31.3)	47 (33.3)	51 (29.7)		
Level of stress, <sup>d</sup> Mean ± SD		32.91 ± 7.30	33.72 ± 5.72	32.25 ± 8.34	–1.85	.066
Level of professionalism, Mean ± SD		100.82 ± 11.38	103.00 ± 8.13	98.99 ± 13.21	–3.33	.001
Level of nursing intention, Mean ± SD		16.19 ± 7.30	16.92 ± 2.50	15.60 ± 2.72	–4.44	<.001

Note. MERS = Middle East respiratory syndrome; SD = standard deviation.

Chi-square tests and exact chi-square tests were performed. For the evaluation of level of stress, professionalism and nursing intention, Student's t tests were performed.  $P < .05$  were considered as statistically significant.

<sup>a</sup> Special care division included emergency care unit, operation room, and delivery room.

<sup>b</sup> Other care included medical support divisions such as administration, laboratory, and medical check-up.

<sup>c</sup> Other duty type included nighttime only, and full-time.

<sup>d</sup> The level of emotional stress during the 2015 MERS outbreak.

Model 2, conditions during the outbreak (hospital type, goods supply, isolation experience, and prior knowledge) were also considered. Stress was additionally adjusted in Model 3. In Model 4, outbreak nursing experience, general characteristics, conditions during the outbreak, stress, and professionalism were all considered. Outbreak nursing experience was significantly associated with nursing intention in all four models. The  $R^2$  of Model 4 was the largest, 0.33, and was statistically significant ( $p < .001$ ). The regression estimate between stress and nursing intention was significant [B(SE) =  $-0.08(0.02)$ ,  $\beta = 0.21$ ,  $p < .010$ ]. The regression estimate between professionalism in nursing and nursing intention was also significant [B(SE) =  $0.05(0.01)$ ,  $\beta = 0.23$ ,  $p < .001$ ] (Table 3).

## Discussion

Healthcare personnel are at high risk of acquiring newly emerging infectious diseases while treating patients. Such risks

occur during an initial encounter with a patient, at the beginning of an outbreak, and when faced with an overwhelming number of patients [18]. Medical workers, especially nurses, are easily exposed to these risks because they are often the first to respond to patients and have a high level of occupational stress [7]. They are also required to perform their work with particular expertise and professionalism [19], especially, during an outbreak of a newly emerging infectious disease, when the level of stress increases.

The present study examined the level of stress, professionalism, and nursing intention of nurses who worked during the 2015 South Korean MERS outbreak, and investigated the relationship between outbreak nursing intention and nursing experience considering nurses' levels of stress and professionalism.

The mean nursing intention score was higher among the nurses with firsthand experience, and outbreak nursing experience was significantly associated with nursing intention in this study. This demonstrates the importance of prior outbreak nursing experience

**Table 2** Mean Scores for Nursing Intention of Nurses According to General Characteristics and Conditions During the MERS Outbreak.

Variables	Categories	1st hand			2nd hand			Group comparison: 1st hand vs. 2nd hand	
		Mean ± SD	t or F	p	Mean ± SD	t or F	p	t	p
Personal characteristics									
Gender	Female	16.94 ± 2.51	-0.81	.419	15.60 ± 2.73	-0.17	.866	-4.44	<.001
	Male	15.50 ± 0.71			15.33 ± 3.21			-0.07	.950
Age (yr)	20–29	16.87 ± 2.62	2.11	.100	15.62 ± 3.03	0.31	.818	-2.67	.008
	30–39	16.69 ± 2.56			15.32 ± 2.22			-2.68	.009
	40–49	17.06 ± 2.11			16.00 ± 2.42			-1.62	.135
	≥50	17.50 ± 3.03			20.00 ± 1.41			1.11	.293
Marriage	No	16.86 ± 2.58	-0.37	.713	15.37 ± 2.87	-1.52	.131	-3.77	.001
	Yes	17.02 ± 2.39			16.03 ± 2.40			-2.20	.030
No. of child	0	16.80 ± 2.57	1.41	.241	15.36 ± 2.82	0.62	.606	-3.76	.001
	1	17.14 ± 2.28			16.41 ± 2.32			-0.97	.340
	2	17.28 ± 2.39			16.18 ± 2.53			-1.54	.130
	≥3	16.00 ± 2.76			15.20 ± 2.59			-0.49	.634
Career-related characteristics									
Clinical experience (yr)	<5	17.08 ± 2.55	0.58	.560	15.72 ± 3.04	0.81	.449	-2.91	.004
	5–10	16.42 ± 2.55			15.23 ± 2.31			-2.12	.037
	>10	17.04 ± 2.39			15.78 ± 2.40			-2.37	.020
Position	Staff nurse	16.89 ± 2.62	-0.46	.646	15.56 ± 2.68	-1.17	.245	-4.19	<.001
	Head nurse	17.09 ± 1.69			17.00 ± 4.18			-0.05	.964
Working division	Ward	16.90 ± 2.55	1.10	.351	15.54 ± 2.94	0.59	.625	-3.57	.001
	Outpatient	17.29 ± 4.03			16.00 ± 3.10			-0.64	.538
	Special care <sup>a</sup>	16.57 ± 2.08			15.32 ± 1.98			-2.41	.019
	Other care <sup>b</sup>	17.67 ± 1.92			17.11 ± 1.45			-0.72	.478
Duty type	8-hour shifts	16.90 ± 2.60	2.78	.065	15.45 ± 2.77	0.28	.754	-4.14	<.001
	Daytime only	18.00 ± 1.00			14.00 ± 1.73			-3.46	.026
	Other type <sup>c</sup>	16.89 ± 2.29			16.71 ± 2.26			-0.31	.760
Daily contact with patients	Yes	16.94 ± 2.56	-0.25	.804	15.55 ± 2.77	1.85	.093	-4.38	<.001
	No	16.75 ± 1.66			16.50 ± 1.31			-0.36	.725
Hospital condition during the outbreak									
Hospital Type	Treat with authorized beds	17.66 ± 2.55 <sup>†</sup>	11.79	<.001	16.68 ± 2.45 <sup>‡</sup>	11.32	<.001	-2.49	.014
	Treat without authorized beds	16.07 ± 1.62			14.71 ± 2.14			-2.21	.032
	Screening	15.65 ± 2.03			14.80 ± 2.94			-1.71	.116
Goods supply	Sufficient	17.10 ± 2.45	3.47	.034 <sup>§</sup>	15.91 ± 2.58	2.04	.134	-3.67	.001
	Insufficient	16.44 ± 3.03			14.52 ± 3.53			-1.79	.065
	unknown	15.60 ± 1.58			14.95 ± 2.11			-0.86	.399
Personal condition regarding the outbreak									
Isolation experience	Yes	16.17 ± 2.48	0.76	.451	15.00 ± 0.00	0.22	.826	-0.43	.682
	No	16.96 ± 2.50			15.60 ± 2.73			-4.46	<.001
Prior knowledge about MERS	A lot	17.26 ± 2.47	0.26	.768	16.07 ± 2.06	2.80	.064	-1.47	.152
	Moderate	16.47 ± 2.18			15.60 ± 2.95			-2.28	.032
	A little	17.51 ± 2.86			15.47 ± 2.42			-3.82	.001

Note. ANOVA = analysis of variance; MERS = Middle East respiratory syndrome; SD = standard deviation.

Student's t tests and ANOVA were performed. Post hoc analysis was done with Scheffe test.  $P < .05$  were considered as statistically significant.

<sup>a</sup> Special care division included emergency care unit, operation room, and delivery room.

<sup>b</sup> Other care included medical support divisions such as administration, laboratory, and medical check-up.

<sup>c</sup> Other duty type included nighttime only, and full-time.

<sup>†</sup> Significant differences versus all other groups.

<sup>‡</sup> Significant difference versus screening.

<sup>§</sup> Although significant, post hoc analysis results revealed no significant differences between the groups.

when caring for patients with a newly emerging infectious disease in the future. The theory of planned behavior suggests that past experience is one of the determining factors of a person's beliefs [17]. A previous study about nursing intention in response to bio-terrorism suggested that nurses' intention to respond to medical emergencies is affected by their practice in primary care [20].

There was a significant difference in the mean nursing intention score between the groups according to hospital authorized type. Nurses in the firsthand group employed at MERS-treating hospitals either with or without authorized beds showed significantly higher nursing intention scores than participants in the secondhand group. However, for nurses employed at MERS-screening hospitals, there were no significant differences between the groups. It should be emphasized that participants in the secondhand group employed at MERS-treating hospitals with authorized beds showed higher level of nursing intention than participants in the firsthand group employed at MERS-treating hospitals without authorized beds. In addition,

there were significant differences in the mean nursing intention scores within the groups according to hospital authorized type. A previous study reported that the attributes of nursing environment, including resources and management significantly predicted nurses' job satisfaction and intention to leave [21]. It can be inferred that nursing intention is influenced by systemic management infrastructure and resources for patients with infectious diseases.

In this study, the level of professionalism in nursing significantly differed between the groups. The fact that a significantly higher proportion of head nurses were included in the firsthand group might partly explain the result. It has been reported that professionalism in nursing was correlated significantly with experience as a registered nurse and age [19]. In addition, there was a significant positive association between nursing intention and professionalism in nursing in the present study. It might be more difficult to interpret this relation in the same way as the above because the relationship between professionalism in

**Table 3** Regression Estimates for Nursing Intention.

Variables	Categories	Crude			Model 1			Model 2			Model 3			Model 4		
		B (SE)	β	t	B (SE)	β	t	B (SE)	β	t	B (SE)	β	t	B (SE)	β	t
Experience (ref = secondhand)		1.32 (0.30)	.24**	4.44	1.18 (0.32)	.22**	3.37	0.88 (0.30)	.16**	2.92	1.02 (0.30)	.19**	3.46	0.88 (0.29)	.16**	3.05
General characteristics																
Gender (ref = male)					-0.74 (1.20)	-.03	-0.62	-0.65 (1.14)	-.03	-0.57	-1.04 (1.11)	-.05	-0.94	-1.27 (1.09)	-.06	-1.17
Age (yr) (ref = 20–29)	30–39				-1.64 (1.30)	-.03	-1.26	-1.01 (1.24)	-.19	-0.81	-1.25 (1.21)	-.23	-1.03	-1.49 (1.18)	-.28	-1.26
	40–49				-1.89 (1.21)	-.32	-1.57	-1.33 (1.16)	-.23	-1.15	-1.20 (1.12)	-.20	-1.07	-1.33 (1.09)	-.23	-1.22
	≥50				-1.44 (0.98)	-.20	-1.48	-1.35 (0.92)	-.19	-1.46	-1.15 (0.90)	-.16	-1.28	-1.23 (0.88)	-.17	-1.40
Marriage (ref = no)					-0.11 (0.61)	-.02	-0.19	-0.58 (0.59)	-.10	-0.99	-0.63 (0.57)	-.11	-1.10	-0.60 (0.56)	-.11	-1.07
No. of child (ref = 0)	1				1.27 (0.72)	.16	1.76	0.62 (0.70)	.08	0.90	0.76 (0.68)	.09	1.12	0.70 (0.66)	.09	1.06
	2				0.96 (0.77)	.13	1.25	0.42 (0.73)	.06	0.58	0.77 (0.71)	.11	1.08	0.59 (0.70)	.08	0.84
	≥3				-0.23 (1.08)	-.02	-0.21	0.05 (1.02)	.01	0.05	-0.31 (0.99)	-.02	-0.31	-0.76 (0.97)	-.05	-0.78
Years of clinical experience (yr) (ref = <5)	5–10				-0.73 (0.43)	-.12	-1.69	-0.74 (0.41)	-.11	-1.83	-0.96 (0.40)	-.15*	-2.40	-0.94 (0.39)	-.15*	-2.44
	>10				-0.93 (0.70)	-.15	-1.33	-0.54 (0.66)	-.09	-0.82	-0.94 (0.65)	-.15	-1.45	-0.97 (0.63)	-.16	-1.54
Position (ref = head nurse)					0.14 (0.94)	.01	0.15	0.01 (0.89)	.01	0.00	0.22 (0.86)	.02	0.26	0.16 (0.84)	.02	0.19
Working division (ref = ward)	Outpatient				0.53 (0.83)	.04	0.63	-0.21 (0.81)	-.02	-0.26	-0.64 (0.80)	-.05	-0.80	-0.36 (0.78)	-.03	-0.46
	Special care <sup>a</sup>				-0.17 (0.42)	-.03	-0.41	-0.38 (0.41)	-.06	-0.91	-0.45 (0.40)	-.07	-1.12	-0.46 (0.39)	-.07	-1.17
	Other care <sup>b</sup>				1.20 (0.93)	.11	1.29	0.02 (0.89)	.01	0.02	-0.63 (0.88)	-.06	-0.72	-0.53 (0.86)	-.05	-0.62
Duty type (ref = 8-hour shifts)	Daytime only				-0.65 (1.16)	-.03	-0.56	-0.49 (1.09)	-.02	-0.45	-0.12 (1.07)	-.01	-0.12	0.26 (1.04)	.01	0.25
	Other type <sup>c</sup>				-0.31 (0.72)	-.05	-0.44	-0.17 (0.68)	-.02	-0.25	-0.07 (0.66)	-.01	-0.11	-0.04 (0.64)	-.01	-0.06
Daily contact with patients (ref = no)					0.32 (0.76)	.03	0.42	0.01 (0.72)	.01	0.01	-0.22 (0.70)	-.02	-0.32	-0.21 (0.68)	-.02	-0.32
Conditions during the outbreak																
Hospital type (ref = screening)	Treat with authorized beds							1.66 (0.36)	.31***	4.72	1.42 (0.35)	.26***	4.09	1.29 (0.34)	.24**	3.79
	Treat without authorized beds							-0.28 (0.47)	-.04	-0.59	-0.52 (0.46)	-.07	-1.12	-0.13 (0.46)	-.02	-0.29
Goods supply (ref = sufficient)	Insufficient							-1.12 (0.45)	-.14*	-2.47	-0.89 (0.44)	-.11*	-2.01	-0.43 (0.45)	-.05	-0.97
	Unknown							-0.98 (0.50)	-.11	-1.96	-0.93 (0.48)	-.10	-1.93	-0.55 (0.48)	-.06	-1.14
Isolation experience (ref = no)								-1.20 (0.98)	-.07	-1.22	-0.97 (0.96)	-.05	-1.02	-1.04 (0.93)	-.06	-1.11
Prior knowledge about MERS (ref = a lot)	Moderate							-0.34 (0.51)	-.06	-0.68	-0.20 (0.50)	-.04	-0.41	0.09 (0.49)	.02	0.19
	A little							-0.07 (0.54)	-.01	-0.13	0.12 (0.83)	.02	0.23	0.59 (0.53)	.10	1.12
Stress <sup>d</sup>											-0.09 (0.02)	-.24***	-4.24	-0.08 (0.02)	-.21**	-3.75
Professionalism in nursing													0.05 (0.01)	.23***	3.96	
R <sup>2</sup>		0.06			0.12			0.24			.029			0.33		
Adj R <sup>2</sup>		0.06			0.06			0.18			0.22			0.26		
F		19.68***			2.15**			3.69***			4.44***			5.08***		

Note. MERS = Middle East respiratory syndrome.

B: unstandardized regression coefficients, SE: standard error, β: standardized regression coefficients.

\*p < .05, \*\*p < .01, \*\*\*p < .001.

<sup>a</sup> Special care division included emergency care unit, operation room, and delivery room.

<sup>b</sup> Other care included medical support divisions such as administration, laboratory, and medical check-up.

<sup>c</sup> Other duty type included nighttime only, and full-time.

<sup>d</sup> The level of stress during the 2015 MERS outbreak.

nursing and clinical experience or age is complicated when providing nursing care for patients with newly developed infectious diseases. In fact, there was a significant difference in the mean nursing intention score between the groups according to years of clinical experience, but there was no significant difference within the groups and no proportional relationship between years of clinical experience and nursing intention was observed in this study. In addition, the highest mean nursing intention score was detected among nurses aged ≥50 years in the secondhand group. A previous study reported that years in nursing and having dependent children were negatively correlated with nurses' intention to respond to bioterrorism or other infectious disease emergencies, such as pandemic influenza, and the level of intention was higher in scenarios where the infection risk was lower [22]. This indicates that nurses make decision to respond during an outbreak based on a variety of information sources. Moreover, it has been reported that the level of professionalism is lowest

among nurses employed at public hospitals compared with nurses employed at private or university hospitals [23]. Although the present study did not compare the level of professionalism between public hospital nurses and nurses employed at private or university hospitals, our findings did indicate that the level of professionalism differs even among public hospitals according to hospital authorized type. How well hospitals, which play a vital role in patient care and management during the epidemic, are supported and systematically managed is associated with the development of additional cases. Therefore, along with the present study results that revealed possible associations of nursing intention with hospital authorized type and goods supply condition, it can be suggested that designating hospitals as infection management and control centers and providing appropriate education and resources are important to enhance nurses' levels of professionalism. Further studies conducted at private or university hospitals regarding the issue are required.

The negative association between nursing intention and stress was not surprising. A previous study reported that workload and emotional issues related to death and dying are major perceived stressors of nurses [24]. The findings of this study revealed no significant differences in stress between nurses according to experience during the outbreak. Although not significantly different, the level of stress was higher among nurses with firsthand experience of caring for MERS patients. The highest stress score, 45.00, was detected in one nurse with isolation experience who did not treat MERS patients closely. It was about 10 points higher than nurses with the same experience who had had close contact with MERS patients. This finding implies that the level of stress is not only affected by the isolation experience itself, but also by the whole experience of outbreak nursing. Although not enough studies have been performed to establish the safety of healthcare workers isolated for infection control, previous studies revealed that patients isolated for infection control experienced more preventable adverse events and expressed greater dissatisfaction with their treatment [25].

This study has several limitations. First, the evaluation of stress during the MERS outbreak was based on a retrospective survey; hence, the actual level of stress during the outbreak could have been overestimated or underestimated. Second, because there is no comparative data about nursing professionalism before and after experiencing the MERS outbreak, the study cannot determine whether the MERS event actually influenced nursing professionalism. Third, only some nurses employed at selected local public hospitals were included in the study; studies including all nurses who experienced the outbreak are required. Fourth, because the questionnaire used in the study was based on previously designed questionnaires and was modified for its purposes, it might have influenced the study result. Last, the study hospitals were sampled conventionally; thus, generalization of the present study findings is limited. Despite these limitations, the major strengths of this study include its investigation of nurses' intention to respond to possible future infectious disease outbreaks and its examination of the stress and professionalism status of nurses who experienced the 2015 MERS outbreak, which caused massive loss of human lives in South Korea. No other study has examined the levels of stress, professionalism in nursing, and nursing intention of nurses who experienced the outbreak; these data are essential for infection control measures and care of patients with any newly emerging diseases in the future.

## Conclusions

The present study revealed that prior outbreak nursing experience was importantly associated with an intention to provide care for patients with a newly emerging infectious disease in the future. In addition, a positive association between nursing intention and professionalism in nursing, but a negative association between nursing intention and stress was detected. Nurses who intend to treat patients with infectious diseases should be ready to work in the front lines in emergent situations. Therefore, gathering information about nurses' experience of epidemic as well as regular assessment of job stress and professionalism are required, but it is important to avoid involuntary placement of nursing staff during the outbreak to maintain both the quality of medical care and nurses' own safety. Moreover, mechanisms for improvement of professionalism in nursing are necessary, for example, by designating hospitals as infection management centers or conducting education programs for infection prevention.

## Conflicts of interest

The authors have no conflicts of interest associated with this study.

## Acknowledgement

This study was self-funded.

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